सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

FICSI
Food Industry Capacity and Skill Initiative

Participant Handbook

Sector
Food Processing

Sub-Sector
Bread & Bakery

Occupation
Processing-Bread and Bakery

Reference ID: **FIC/Q5002; Version:4.0**
NSQF Level 4

Craft Baker

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> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi
Prime Minister of India

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

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FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE

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SKILLING CONTENT: PARTICIPANT HANDBOOK

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We also wish to extend our gratitude to all authors who reviewed the content and provided valuable inputs for improving the quality, coherence, and content presentation in the chapters. The preparation of this participant Handbook would not have been possible without the support of the Food Processing Industries.

The Industry feedback has been highly encouraging from inception to conclusion & it is with their input we have tried to bridge the skill gaps existing today in the Industry. This participant handbook is dedicated to all 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.

About this book

This book is designed for upgrading the knowledge and basic skills to take up the job of 'Craft Baker'. All the activities carried out by the Craft Baker are covered in this course. Upon successful completion of this course, the candidate will be eligible to work as a Craft Baker.

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

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

- FIC/N5007 - Introduction to Food Processing Sector and the Job of 'Craft Baker
- FIC/N9905 - Establish Facilities for Artisanal Food Production
- FIC/N5002 - Prepare for the Production of Baked Products in Artisan Bakeries and Patisseries
- FIC/N5007 - Produce Baked Products in Artisan Bakeries and Patisseries
- FIC/N9904 - Basic Food Safety Standards
- FIC/N9903 - Ensure Workplace Health and Safety
- FIC/N9902 - Work Effectively in an Organization
- SGJ/N1702 - Optimize Resource Utilization at the Workplace
- DGT/VSQ/N0102 - Employability Skills

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Unit 1.1 Introduction to Food Processing Industry

Unit 1.2 Roles and Responsibilities of Craft Baker

FIC/N5007

Key Learning Objectives

At the end of this module, the trainees will be able to:

1. Describe the food processing sector in brief
2. Discuss the career opportunities available within the food processing sector

UNIT 1.1 Introduction to Food Processing Industry

Unit Objectives

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

1. Discuss the size and scope of the food processing industry in brief
2. Discuss the future trends and career growth opportunities available for Craft Baker in the food processing industry.

1.1.1 Food Processing

Agriculture is India's mainstay industry. The majority of the products from various agricultural occupations are consumed within the country and exported to different countries around the world. Agriculture produce is also used as a raw material in the food processing industry. Food processing is the process of transforming raw materials into finished goods. They could be processed foods, ready-to-eat foods, food additives, or ingredients used to make other foods.

The following figure explains the different level of food processing.

Primary Food Processing

- Primary Processing relates to the conversion of raw agricultural produce, milk, meat, and fish into a commodity that is fit for human consumption
- It involves steps such as cleaning, grading, sorting, packing, etc.

Secondary Processing

- Secondary food processing is the conversion of ingredients into edible products -
- This involves combining foods in a particular way to change properties. E.g. - Preparing of orange juices from oranges

Tertiary Food Processing

- Tertiary food processing is the commercial production of what is commonly called processed food
- These are ready-to-eat (RTE) or heat-and-serve foods.

Fig 1.1.1 Level of food processing

1.1.2 Journey of food from Harvest to Consumer

The flowchart below explains the process by which food material becomes a final, consumable product for various customers.

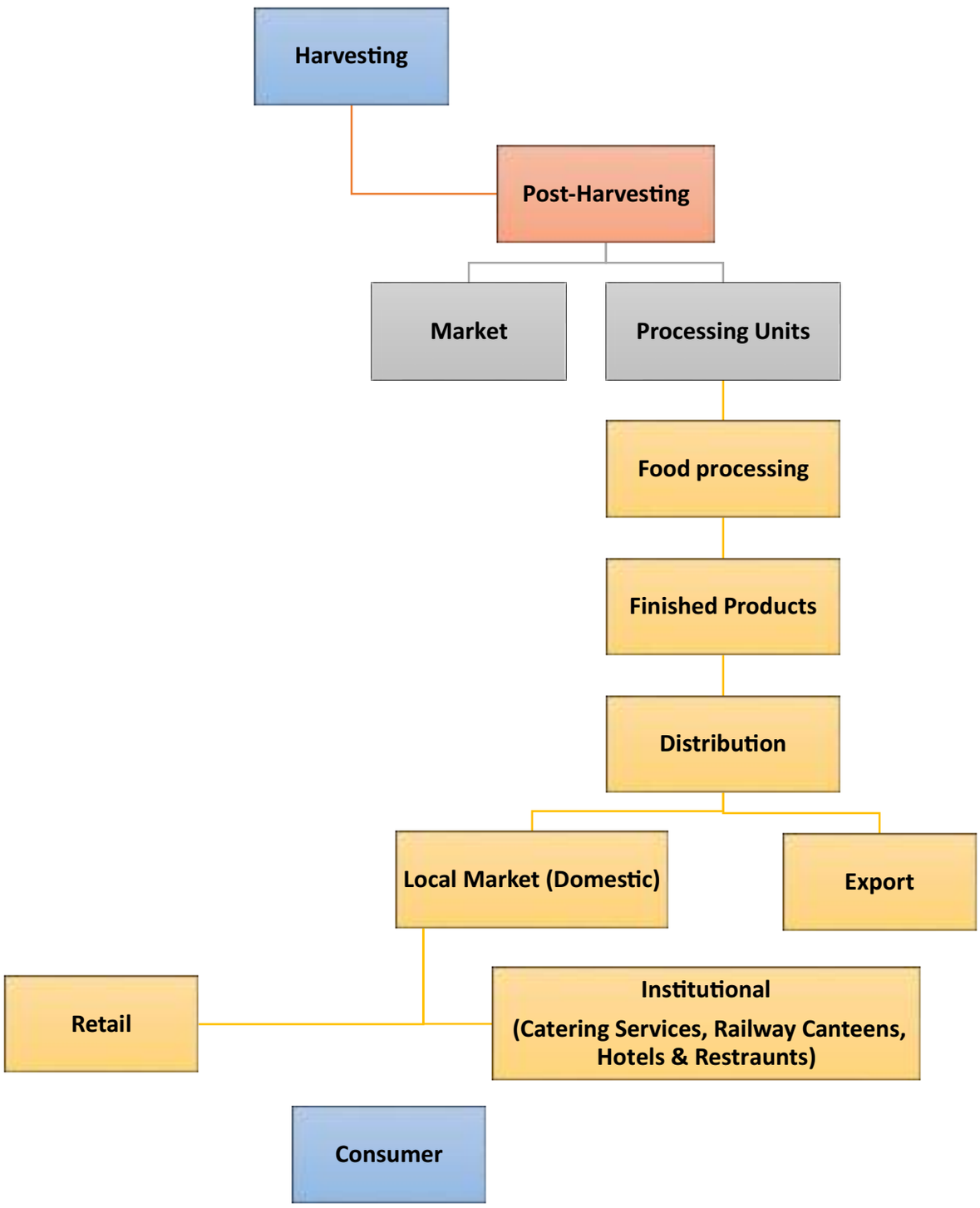

Fig 1.1.2 Journey of foods from farm to consumer

1.1.3 India's Food Processing Industry

- The major segments in the Food Processing sector comprise of Fruits and Vegetables, Dairy, Edible Oils, Meat and Poultry, Non-alcoholic beverages, Grain-based products, Marine products, Sugar and sugar-based products, Alcoholic beverages, Pulses, Aerated beverages, Malted beverages, Spices, and Salt.
- In India, the food processing industry is divided into several sub-sectors.

Dairy	•Whole milk powder, skimmed milk powder, condensed milk, ice-cream, butter and ghee, cheese etc.
Fruit and Vegetable Processing	•Beverages, juices, concentrates, pulps, slices, frozen and dehydrated products, potato wafers, pickles and pastes etc.
Grains and Cereals	•Flour, bakeries, starch glucose, cornflakes, malted foods, vermicelli, beer and malt extracts, grain-based alcohol etc.
Fisheries	•Fish oil, frozen and canned products
Meat and Poultry Processing	•Frozen and packed meat,egg powder, etc.
Bread and Bakery	•Biscuits, breads, buns, cakes, confectionery, pastries, cookies, etc.
Consumer Foods	•Snack foods,namkeen, biscuits, ready-to-eatfoods, alcoholic and non-alcoholic beverages

Fig 1.3 Sub-Sectors of the Food Processing Industry

1.1.4 Overview of The Bread and Bakery Sector

Bakery is largest of the food industry. India is the 2nd largest wheat producing and biscuit producing country in the world next only to China and USA, respectively. The present production of wheat in India is about 107.18 million tonnes indicating 3.46% growth rate as per Index mandi reports. The five major wheat producing states in India are U.P., Punjab, Haryana, Bihar and Himachal Pradesh. According to the latest report by IMARC Group, titled “Indian Bakery Market: Industry Trends, Share, Size, Growth, Opportunity and Forecast 2020-2025”, the Indian bakery market reached a value of around US$ 8 Billion in 2019.

Bakery industry today has an important place in the industrial map of the country. The Indian bakery market stood at a value of nearly USD 7.60 billion in 2020. The market is further

estimated to grow at a CAGR of 8.5% between 2021 and 2026 to reach a value of USD 12.39 billion by 2026. The Indian bakery market is being supported by the thriving biscuits and cookies industry in the region. The bakery industry comprises mainly of bread, biscuits, cakes and pastries manufacturing units whereas bread and biscuit still covers 80% of total bakery products produced in the country. Bakery Industry comprises of several large and small scale organised as well as unorganised units. So, PM FME scheme will help to formalise the unorganised sector of bakery industry. Bakery Industry is mainly concentrated in the states of Maharashtra, West Bengal, Andhra Pradesh, Karnataka and Uttar Pradesh. The per capita consumption of bakery products is highest in Maharashtra followed by New Delhi and West Bengal.

As per the IMARC Bakery Market analysis report:

- Approximately 45% of bakery industry belongs to Organised segment.
- Nutritionally enriched and brown breads segments is in high demand while white bread still remains the largest segment at 75%.
- The market value is expected to reach a value of US$ 13.3 billion by 2025

Market Potential and Future trends of Bakery Industry.

Bakery products have now become essential food items of vast majority of population in India due to urbanisation which is resulting in increased demand for convenient product at reasonable cost. With increase in the health awareness among the consumers, the demand for greater nutritional quality products is also increasing. The bakery products have become popular among all cross section of populations irrespective of age group, and economic conditions. Bakery Products can be broadly categorised by its type and ingredients:

Segments by type of products:

Sliced bread, pav, burger buns, pizza base, exotic breads, cakes, biscuit etc.

Segments by ingredients of products:

White bread, Brown bread, Fruit bread, Nutritional Bread etc. Bakery products which include bread, rolls, cookies, pies, pastries, and muffins, are usually prepared from flour or meal derived from some form of grain and cooked by dry heat process , especially in some kind of oven. Under PM FME scheme, bakery products have been opted as ODOP in following four states and their several respective districts:

1. Punjab
2. Uttar Pradesh
3. Tripura
4. Karnataka

With the advanced aspiration for increased socialisation, the demand for more hang-out options is observed. This demand has powered the rise of newer café formats like bakery cafés, which, at the core, is a provider of baked food, with the beverage segment only. A wide range of baked products are available in market, encompassing such exotic variants as wheat, rye, five-grain, multigrain, cracked wheat, flute, baguettes and ciabatta, and other baked goodies like brioches, croissants, cookies, muffins, cakes, scones, strudels, brownies, pies and puffs. The bakery industry would enjoy more innovative ideas and concepts, and is expected to grow with the growing awareness and a flourishing economic environment. The increase in demand of

bakery products and surplus wheat produced in the country can complement each other. Promotion of bakery industry under PM FME scheme will not only help country in economic development but will also help in the creation of more employment potential. To sum-up with the strengths, weaknesses and opportunities of Bakery Industry in India:

Strengths:

1. Abundant raw material.
2. Part of a bigger pie.
3. Low Capital Requirements.

Weakness:

1. Large share of un-organised players.
2. Dependence on one major raw material.
3. Sensitive to commodity price fluctuations.
4. Lack of Knowledge product technical specifications.
5. Poor understanding of process technology and machinery.
6. Fragmented Cold Chain Supply.

Opportunities:

1. E-Food Retailing in India.
2. Growing Consumption of biscuits.
3. Bakery potential in Rural India.
4. Expanding attractiveness of coffee bars.

Bakers also face a few challenges, such as, Government regulations; Demand-supply chain; Rising prices of flour, the major ingredient, and other raw materials such as oil, fat and eggs, and the price-sensitivity of the market.

UNIT 1.2 Roles and Responsibilities of Craft Baker

Unit Objectives

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

1. Summarise the key roles and responsibilities of 'Craft Baker'.
2. List the various terminologies used in the process of making craft baker.
3. Discuss the various organisational procedures and processes for craft baker.
4. Discuss the standards to be followed for handling hazards and ensuring a clean work area.

1.2.1 Roles and Responsibilities of Craft Baker

The following table explains the pickle and paste-making technician's roles and responsibilities.

Roles	Responsibilities
Ensure profitability by maintaining an accurate record of baking operations.	• Check raw material for quality • Ensure all ingredients are free from dirt, debris, foreign matter, glass and insects • Ensure minimum loss of material
Manage needed supplies and inventory levels.	• Document and maintain records of production • Schedule and process • Document and maintain records of finished products
Direct and supervise the production staff's activities to make sure that products are up to stand	• Adopt safety- and sanitation-related measures • Follow food safety norms and practices
Decorate baked products using glaze, icing and other toppings to achieve a finished appearance.	• Ensure smooth operation of machinery to • Complete production line • Optimise the use of tools and machinery Attend to minor repairs of tools and • Machinery when required • Ensure that safety rules and regulations are observed prevent accidents
Assess the quality of raw materials before baking.	• Adhere to Good Manufacturing Practice (GMP) • Ensure the products meet the quality standards set by the organisation
Conduct research to develop original recipes for products.	• Ensure conformance of quality as per organisational standards
Ensure the proper storage of baking utensils.	• Ensure safe and proper storage of raw material,packing material, and finished goods

Table 1.2.1 Roles and Responsibilities of craft baker

1.2.2 Various Terminologies used in Baking Industry

The following table explains various terms used in pickle and paste making.

Terminology	Meaning
Bain-marie	A water bath prevents delicate desserts from curdling, cracking or overcooking as they bake.
Batter	Generally speaking, a batter that is either thin enough to pour or thick enough to scoop contains flour, eggs, and dairy. However, it cannot be stretched out like dough.
Blind Baking (pre-baking)	Before adding the filling, a pie crust or comparable pastry is partially or fully baked.
Bloom/blooming (of gelatin)	A method whereby gelatin sheets or powder is soaked in cold water for a short period of time before use. By doing this, the gelatin is made simpler to dissolve and more evenly distributed throughout the liquid that will be gelled.
Caramelize	Heat is used to turn sugar into a liquid. The finished product will be golden brown or amber in colour.
Cream	Process of beating butter together with sugar.
Crumb Coat	a very thin frosting layer that is spread on a cake's top and edges to prevent crumbs from falling off; this layer serves as a foundation for the final,thicker decorative layer.

Table 1.2.2 Common Terminology for Baking

1.2.3 Standard Practices for Handling Hazards and Cleaning Work Area

Every employee is concerned about their health and safety. As a result, following safety guidelines is required to avoid hazards and accidents. Similarly, sanitisation and hygiene are the most important factors to consider when working in the food processing industry. The figure below depicts the standard practices for dealing with hazards, risks, and cleaning work areas:

Continued...

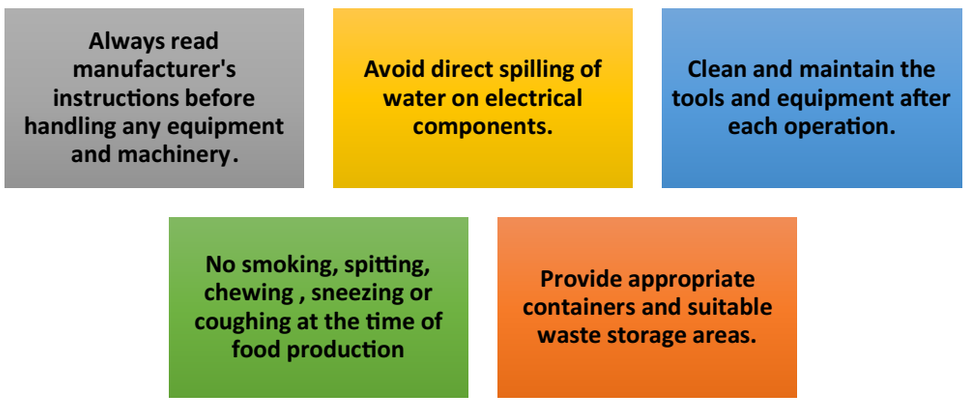

Fig 1.2.1 Standard practices for dealing with hazards, risks, and cleaning work areas

Scan the QR Codes to Watch the related Videos

https://www.youtube.com/watch?v=J-2EiMVNtpM&t=15s

Overview of Food Processing Industry

https://www.youtube.com/watch?v=mcpVs3CVNIw

Introduction to Bread and Bakery Industry

https://www.youtube.com/watch?v=OljRVDAM0N0&t=6s

Orientation Video

https://www.youtube.com/watch?v=1lgTQfNOGsM

Roles and responsibilities

Exercise

Answer the following questions:

1. List the roles and responsibilities of Craft Baker.

2. Name any two types of baked products.

3. Explain the term caramalize.

4. Write a short note on standard procedure for baking of bread.

Notes

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2. Establish Facilities for Artisanal Food Production

Unit 2.1 - Comply with Legislative Guidelines for a Production Facility
Unit 2.2 - Develop Recipes for Artisanal Production
Unit 2.3 - Selection of vendors for obtaining materials
Unit 2.4 - Perform entrepreneurial Activities

FIC/N9905

Key Learning Outcomes

At the end of this module, the participant will be able to:

1. Describe various legislative guidelines for a production facility
2. Apply appropriate practices to establish the standard procedure for the setting up production facility
3. Describe the procedure to develop new recipes for artisanal production
4. Demonstrate how to calculate the estimated cost, final product cost and fix the unit price of the product.

UNIT 2.1: Comply with Legislative Guidelines for a Production Facility

Unit Objectives

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

1. Outline the various legislations, regulations, and standards including FSSAI guidelines to be followed to produce artisanal product
2. State the importance of analysing and investigating the purpose and intent of legislation related to various factors
3. List the authorities responsible for administering legislation for setting up a food processing facility
4. Outline the procedure and importance of site inspections, reporting variances, and obtaining legislative approvals.
5. List the material and equipment requirements for setting up a production facility
6. State the significance of obtaining the accurate information from designated personnel in various recorded forms, like checklists, etc.

2.1.1 Introduction

Goods produced by skilled workers or craftspeople are known as artisanal products. They are made either with hands or with the help of tools or with advanced equipment and technology. However, the direct manual contribution of the artisan is the most substantial component of these products. The essence of artisanal products arises from their special and unique features, which can be practical, aesthetic, creative, culturally attached, functional, traditional, socially symbolic, and significant. Such examples are artisan foods produced with a greater focus on the uniqueness of each ingredient, offering freshness, novelty, and a sense of being close to the producer. It encompasses a variety of bakery items, fruit preserves, cured meat, cheeses, beverages, oil, and vinegar that requires skilled craft workers known as food artisans.

2.1.2 Legislative Guidelines and Authorities Responsible for Food Processing Facility

Specific regulations, standards, and guidelines protect the customer's interest. But, moreover, the customer also wants to be sure about the quality. They should not be left at the mercy of the manufacturers because they are ignorant about the quality. So, the government must fix legal standards to protect the consumer's interest and set quality standards to improve the quality of the product to a higher degree.

In India, we generally have two types of standards that administrate the sale of foods, including milk and milk products.

Legal standards - Specifications or requirements pertaining to the government's law are called

legal standards. The government sets them up to meet specific minimum requirements in terms of chemical quality (i.e., composition), bacteriological quality (i.e., hygienic quality), and labeling and packaging requirements. Legal standards or PFA (Prevention of Food Adulteration) standards prescribe the minimum standards for all types and categories of food. Following parameters are generally taken into consideration while fixing legal standards:

Fig 2.1.1 Parameter of Legal Standards

Quality standards - Specifications that are laid down by the government or some expert body constituted by the government to produce high-quality products are known as Quality Standards. While legal standards are compulsory, quality standards are not mandatory. Theyare on a voluntary basis. In India, we have two types of quality standards for producing export quality products: -

1. **BIS/ISI Standards** – These standards deal with many types of processed food products, apart from non-food products. For example, all dairy products except ghee and butter.
2. **Agmark Standards** – These deal with many types of foods, mainly raw agricultural produce. For example, cereals, oils, oilseeds, spices, eggs, legumes (pulses), ghee, butter, etc.

Due to globalization, Indian Standards needed to be harmonized within themselves and the international standards. Therefore, the act brought into force in place of the PFA is **the Food Safety and Standards Act, 2006** that overrides all other food-related laws.

The government of India enacted the "**The Food Safety and Standards Act, 2006**" in order to:

1. Merge the laws relating to food
2. Establish the Food Safety and Standards Authority of India for laying down science-based standards for food articles to:
   - regulate their manufacture, storage, distribution, sale, and import
   - ensure availability of safe and wholesome food for human consumption and matters connected therewith or incidental

Though this act was passed on 23rd August 2006, it came into force only in 2011. It extends to the whole of India. It combines various acts & orders that have hitherto handled food-related issues in various Ministries and Departments. The act also aims to establish a single reference point for all matters relating to food safety and standards by moving from multi-departmental control to a single line of command. To this effect, the act establishes an independent statutory

Authority – India's Food Safety and Standards Authority with head office at Delhi. Food Safety and Standards Authority of India (FSSAI) and the State Food Safety Authorities shall enforce various provisions of the act.

2.1.3 FSSAI Standards for Baking Products

Importance of Site Inspection and Reporting Variances

Inspections are essential to ensure compliance with the health and safety of an organization. Inspection and testing are crucial tools of the production process since they assist in controlling the quality of product, reduce manufacturing costs, reduce rejection losses, and assign causes for the production of a defective product. The food inspector or food safety officer is empowered by law and regulation to conduct inspections and ensure food safety and quality within the area assigned to them. Following are the types of inspection conducted by the officers:

1. Pre-Registration Inspection
2. Pre-License Inspection
3. Routine inspection
4. Follow-up Inspection
5. Inspection before Renewal of License
6. Inspection for investigation of a complaint

After receiving an application, the designated officer or inspector may assign inspection of the premise at least once a year as a part of a routine inspection. Routine inspection for food production facility includes:

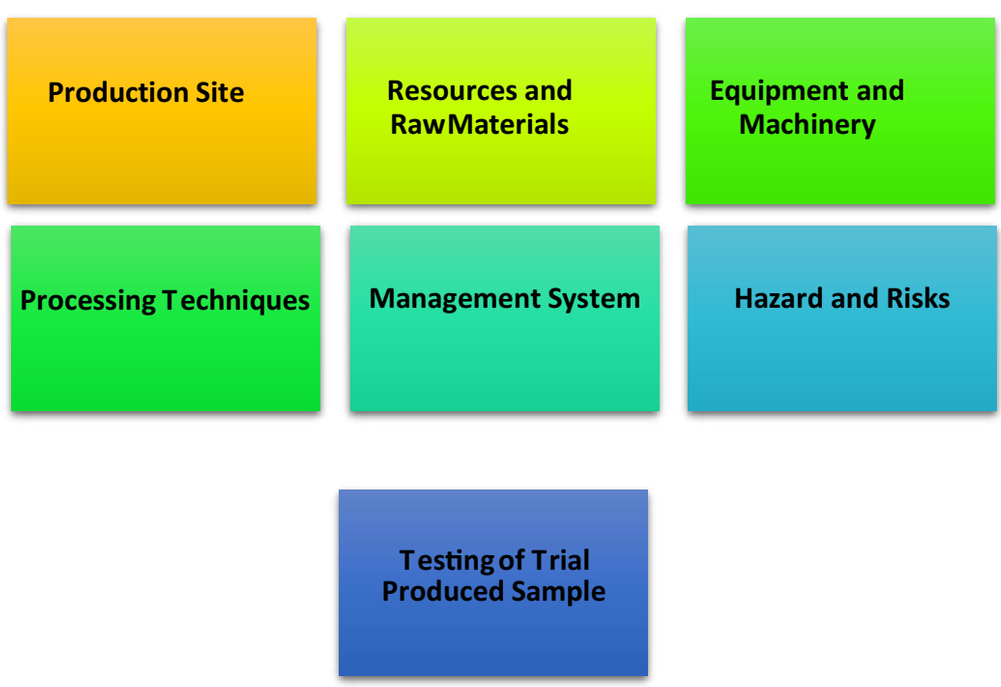


Fig 2.1.2 Routine Inspection of Food Production Facility

The following chart shows the standard procedure of inspection conducted by the food inspector or food safety officer:

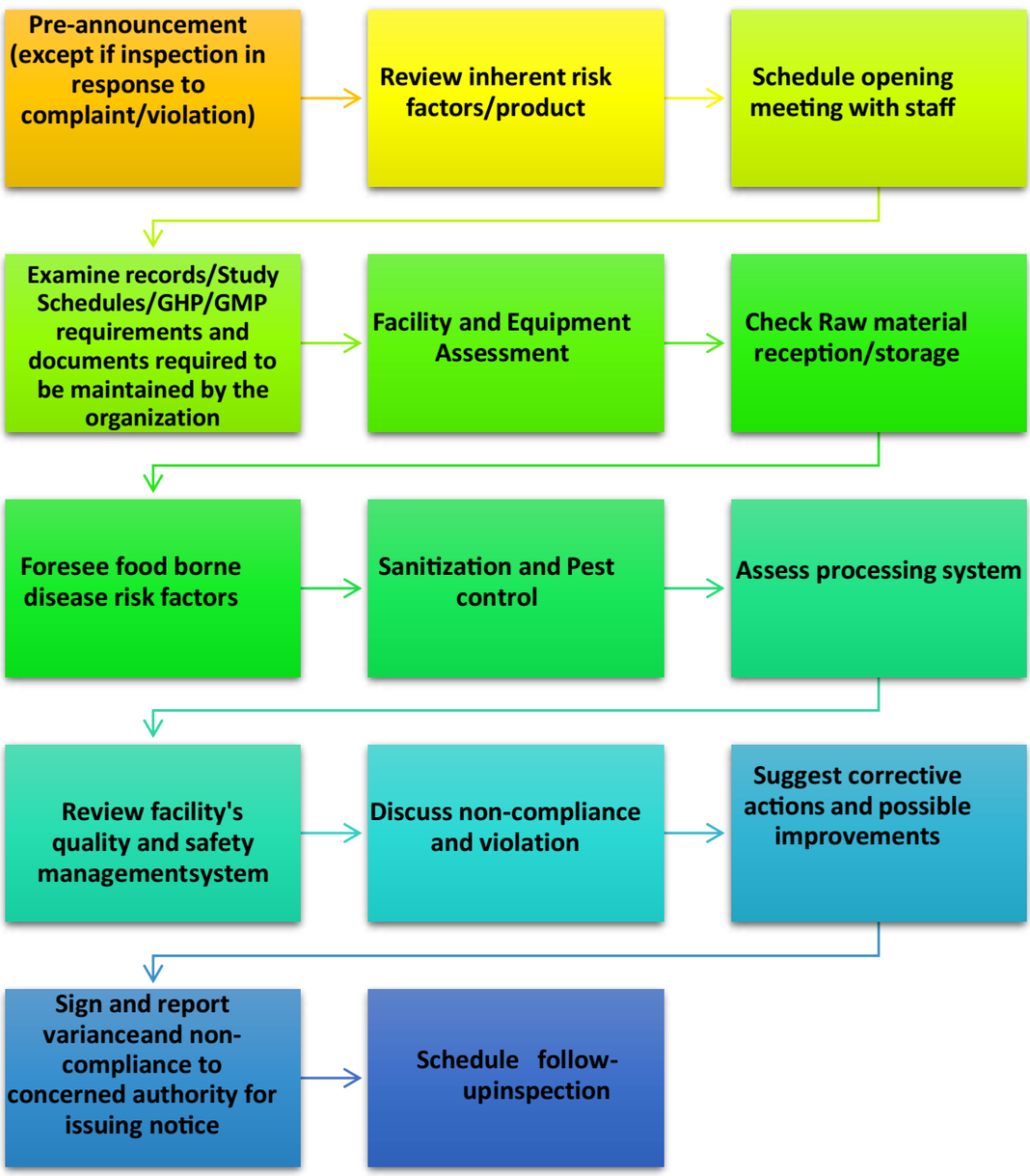


Fig 2.1.3 Standard Procedure of Inspection

2.1.4 Significance of Good Document Practices

Good Documentation is the key to Good Manufacturing Practices (GMP) compliance and ensures traceability of all progress, manufacturing, and testing activities. Documentation provides the direction for auditors to evaluate the overall quality of production within a company and the final produce. Good documentation provides accurate and relevant information of an organization with minimum discrepancy and variance. Following are the

essential requirement for maintaining good documentation of an organization.

1. Clear written procedures to prevent errors and permit tracing of activities performed
2. Designed in a proper format
3. Reviewed and updated time to time
4. Approved and signed by the authorized person for accuracy and relevant information
5. Storage of critical records must be secure, with access limited to authorized persons.

Following are the common types of documents maintained in production houses:

Fig 2.1.4 Types of Documents in Production Facility

Exercise

Answer the following questions:

1. Write a note on artisanal product.

2. Explain various factors relates to production facility setup.

3. Write a note on good documentation practices.

4. Explain FSSAI guidelines and regulations.

UNIT 2.2: Develop Recipes for Artisanal Production

Unit Objectives

At the end of this module, the participant will be able to:

1. Describe the procedure to develop new recipes for artisanal production.
2. Demonstrate how to calculate the estimated cost, final product cost and fix the unit price of the product.

2.2.1 Various Ingredients used in Different Recipes of Artisanal Baked Products

Even the simplest recipes require having a few basic supplies on hand, so here is a list.

Ingredients used in artisanal baked products	Details
All-purpose Flour & Other Flours	Available in kirana stores and supermarkets in branded packets and sold loose by the kilo. The act of skimming the bran and husk from wheat flour removes the fibre content and yields a fine, smooth flour that is used to make maida. Considering that maida is a key component in your recipe, using high-quality maida is essential.
Butter	Butter is what gives our delicate, buttery, flaky baked goods—such as cakes and pastries like shortcrust pastries—richness and texture. Salted butter can be used, even though unsalted butter is better for baking. When added to the dish, the salt found in the butter enhances the flavours to perfection.
Oil	Butter is frequently substituted with oil to increase the recipe's fat content. Because oil is light and contains eggs, it is utilised in cakes and sponges that don't want the weight of butter to weigh them down.
Castor Sugar	When compared to conventional sugar crystals, which don't melt easily and destroy the composition of the recipe, the superfine texture helps you get the desired texture needed for the recipe.
Brown Sugar	Brown sugar is essentially less refined sugar crystals that still have a molasses coating on them. It works well in tea cakes and cookies because of their earthy, rustic flavour and texture from the brown sugar.
Icing Sugar	Powdered sugar and a small amount of cornstarch are combined to make icing sugar. It also goes by the name confectioners sugar. Butter creams are made using icing sugar, which gives the frosting body and is frequently used to cookies to enhance their crisp-crunchy texture.
Cocoa powder	Despite having a bitter flavour, cocoa powder gives the bake flavour and colour. Available in two varieties, light cocoa powder and dark cocoa powder, the only distinction being the shade of the cocoa, utilise it in accordance with the recipe and the desired outcome.
Chocolate	Chocolate is an ingredient that used in cookies, cakes, pies, and tarts as chocolate chips, chunks, or melted chocolate. There are principally two types of chocolate: Compound and Couverture .

Thick Heavy Cream/ Cooking cream & Whipping Cream	To get the most flavour out of a dish that calls for cream, a rich, high-fat cooking cream is necessary. A dairy-based product containing 25% fat is cooking cream. A non-dairy whipping cream is one where the cream is primarily made of soy.
Milk	The liquid ingredient offers your recipe the ideal consistency, like cake batters do, or adds moisture to the food, like short crust pastry does. Whole milk should always be used for baking. For eggless recipes, milk can be used to wash breads and pies in place of eggs.
Yogurt/ Butter Milk	Yoghurt is used in place of eggs in a particular recipe to create an eggless version. The moist, tender baked goods are made with buttermilk and yoghurt.They improve the bakes' texture and give them a beautiful, velvety mouthfeel.
Condensed Milk	Whole milk, reduced and sweetened, Condensed milk, is absolutely thick and yummy, that is available in tins. It is used to sweetener recipes, as well as improvise on the texture.
Eggs	Natural raising agent, eggs not only add volume to the recipe, the yolks add richness to the recipe.
Flax meal egg replacer	This healthy replacement, ensures the recipe turns out just as well as it would with eggs. Flax seeds are ground long with water in a predetermined proportion, rested and used in the recipe.
Baking Powder and Baking Soda - Leavening Agents	They are both leavening agents, while baking soda is just baking soda by itself, baking powder has baking soda and cream of tartar mixed in it.
Salt	Salt is added to baking recipes, to enhance the other flavours present in the recipes.
Extracts/ Essences, Flavouring Agents & Spices	Various kinds of flavouring agents are used in baking, from, the most popular one being Vanilla Essence, and other agents like Extract, which is often a pure extract from the fresh ingredient. Other flavouring includes, fresh lemon zest or orange zest. Whole spices, lend great aroma to the dish, like cinnamon, star anise, nutmeg to name a few.

Table 2.2.1 Types of Documents in Production Facility

2.2.2 Ways to Upgrade the Existing Recipes and Developing New Ones

There are a few fundamental ratios that you should be aware of. For instance, the proportions of flour, fat, and eggs in cookies or a straightforward sponge cake. One cup of butter, two cups of sugar, three cups of flour, and four eggs are needed to make a 1:2:3:4 cake. A dash of salt, a cup of milk, and a spoonful of baking powder are added next. You now have a very basic cake that you can customise by adding melted chocolate, subbing some of the flour for cocoa powder, or adding flavour extracts, citrus oil, or orange or lemon zest. You can use almond meal in place of the flour and use brown sugar, fresh fruit, or white sugar. As a result, many distinct variations of the same recipe based on the same ratio are possible.

For simple cookies, pie dough, bread, scones, & muffins, there are ratios. Once you've mastered a handful of these as well as the fundamental methods for combining components, you can explore as much as you like. The ingredients, proportions, temperature, and order in which they are combined must all be correct while baking or constructing . A lot more spices, primarily fresh and whole, like cinnamon and nutmeg, are added in the majority of my baked goods.

2.2.3 Baking Science and Recipe Development

Although the ratios are a good place to start, you also need to understand other elements to ensure that your recipes turn out well. A crucial component is your leavening agent, baking soda, and baking power. Both of these contain the same basic ingredient, sodium bicarbonate, yet they are very different from one another.

Baking Soda

Baking soda's science is actually extremely straightforward and goes as follows: acid+base=bubbles (CO_2). Your base is baking soda, and your components provide the acid. Buttermilk, yoghurt, vinegar, lemon juice, molasses, applesauce, coffee, citrus, cream of tartar, and brown sugar are examples of common acidic baking ingredients. Baking soda will aid in the rising of your baked products as well as the browning process, giving cookies and other baked goods the desired golden tone.

The timing of the rise is yet another crucial aspect of baking soda to understand. This matters since it has an effect on how quickly you should put the recipe in the oven.

Baking Powder

In addition to sodium bicarbonate, cream of tartar, and occasionally corn starch, baking powder also contains cream of tartar. Single and double acting variants are both offered. Unlike baking soda, baking powder already contains an acid, thus the liquid does not need to be another one. Once the dough or batter is baked in the oven, a second rise will take place. This enables your recipe to sit out for a while before putting into the oven, if necessary.

Cocoa powder (Natural Versus Dutch)

Natural cocoa powder can be found in most grocery stores, but Dutch-processed cocoa can be more difficult to locate. Dutch cocoa doesn't pair well with baking soda since there isn't any acid in dutch cocoa for the baking soda to react with or pair with, and natural cocoa with baking powder could result in excess acid in your recipe.
Dutch cocoa = baking powder
Natural cocoa= baking soda

Few extra tips

Measuring and combining ingredients

How you measure your components and how you combine them are a couple of other crucial aspects of baking. Make sure to fluff the flour in the container with a fork or spoon before measuring it. Due to the flour's tendency to pack tightly after some time in the container, you may add significantly more flour than is necessary. Instead of scooping the measuring cup into the flour itself, scoop the flour with a spoon into the cup after it has been fluffed. As a result, packing the flour will be less likely. Overfill the measuring cup, then use a knife to remove the extra flour. If weight is specified in the recipe, a food scale is yet another excellent choice for precise measuring. After the liquid has been incorporated, put all of the dry ingredients in a different bowl. Pour the dry components into the bowl containing the wet ingredients, not the other way around, when adding the wet and dry ingredients. A difficult batter will probably result from adding wet ingredients before dry ones.

Baking temperatures

Cookies that are baked for a longer amount of time at a low temperature (like 350 degrees) tend to be crisper and thinner. Higher temperature (375–400 degrees) baking produces thicker, softer cookies.

Ratios and replacements
Flours and leaveners
1 teaspoon baking powder : 1 cup flour (110g)
1/4 teaspoon baking soda: 1 cup flour (110g)
1/4 tsp baking soda : 1 cup acid or 1 tsp acid
Replace 1/3 of flour in recipe with pulverized nuts (similar to almond meal)

Sugars
White sugar can be substituted for brown sugar to give cookies a chewier texture. The majority of cookies with at least 50% brown sugar or more should be removed when the edges are set but the centres still appear somewhat underdone since they firm up more quickly. A cookie that has more white sugar than brown sugar will be crisper.

Liquids
Can replace up to 1/4 of liquid, likely milk, for fruit juice

Eggs
Just FYI 1 egg is approximately 2 ounces
May replace egg for flax egg (1 tablespoon ground flax + 3 tablespoons water – sit 5 min to gel)
Eggs bond starch and protein in flour to help your recipe hold together. The protein also helps achieve a chewy cookie

Fat
May replace up to half the amount of fat in recipe at 1:1 ratio with yogurt, applesauce, mashed banana, pumpkin, or pureed avocado

Salt
Similar to eggs and brown sugar, salt can make cookies more chewy. You cannot substitute table salt for kosher salt. If your recipe calls for one teaspoon of salt, which, unless otherwise mentioned, indicates table salt, you should use two teaspoons of kosher salt instead of one. Use only 1 teaspoon of salt when a recipe asks for 2 teaspoons of kosher salt.

Recipe ratios
Quick bread/muffin- 2 part flour: 2 part liquid: 1 part egg: 1 part fat
Banana bread from basic quick bread recipe- reduce liquid in recipe by 2 oz and add 1 cup mashed
banana
Short bread Cookie- 1 part sugar, 2 part flour, 3 part fat
Drop Cookie- 1 part flour, 1 part sugar, 1/2 part fat, 1 egg (this is for 1 part equaling 8 oz)
Pancake batter- 4 ounces milk: 4 ounces flour: 1 egg: 1 ounce melted liquid fat: 1 teaspoon baking powder. Can replace 1/2 the amount of milk with yogurt or buttermilk
Corn muffins- replace 3/4 flour with cornmeal
Crepe- 1 cup liquid: 1 egg: 1/2 cup flour
Ganache- 1 part chocolate: 1 part cream
Carmel sauce- 1 part cream: 1 part sugar…then finish with a little butter
Toffee- 1 part butter: 1 part sugar

2.2.4 Practices to Formulate Recipes and Methodologies

It takes more than just perfecting a recipe to make a food product. In order for businesses to generate new food products, substantial planning, diligent effort, and comprehensive study are required. Developing defined goals and timelines that take the company's future orientation into account is essential before beginning a new development venture. Businesses produce new products in an effort to grow their client base, enter new markets, boost brand awareness, boost revenues, or acquire market share.

Thousands of new food products are released annually by both large and small businessesending on the degree of innovation and new technology, the time required to produce new food products might range from 6 months to 5 years. It typically takes less time to design a line extension that makes use of equipment that is already there in a manufacturing plant than it does to create a new product that requires a specialized processing line. In some supermarket categories, the failure rate of new items—defined as the proportion of products that are no longer on the shelves after five years—can reach as high as 90%.

While smaller businesses might not even have a research and development department, larger businesses may rely on a product development team that includes food scientists, food engineers, regulatory specialists, marketing experts, and purchasing gurus. In order to develop successful products, smaller businesses may rely extensively on external resources like universities and independent laboratories.

Idea Generation

Companies employ a variety of methods to come up with ideas for new products. With the addition of researcher input, marketing teams may be tasked with developing the main ideas. Consumer suggestions might also generate ideas. This step might not be necessary for many businesses, particularly those who thrive on recycling their rivals' items. Having a store brand item that is given that is really comparable to a name brand item is an illustration of this. Corporate idea generation might also include brainstorming meetings with representatives from all divisions. The main procedures in creating a new food product can be broken down into four phases after idea generation: screening, feasibility, test marketing, and commercialization. Complete idea generating by attending trade fairs, keeping up with new product releases by rival companies, reading research articles and industry journals, and keeping an eye on grocery shelves for information about popular ingredients and consumer preferences.

Feasibility

Regulations, technology, and financing are all aspects of a business's viability. By establishing an interdepartmental team, the resources will be accessible to address any early queries about attainability that may be raised at any point throughout the development process.

Market Research

You could be tempted to rush into production with your product idea in mind, but doing so can be a mistake if you don't first confirm it.

Product validation makes sure you're developing something consumers will pay for and prevents you from wasting time, money, and effort on a concept that won't take off. Your product idea validation can be done in a number of ways, such as:

- Sending out a survey online to gather feedback
- launching a fundraising effort
- Launching your idea to a very tiny segment of your target market in order to gain early

feedback is known as test marketing.

- Using google trends to investigate market demand
- Launching a product launch roadmap and using email opt-ins or pre-orders to evaluate interest
- Requesting first feedback on discussion boards like reddit

Regardless of how you choose to validate your idea, it is crucial to receive feedback on whether a sizable and objective audience would actually purchase your product. A word of caution: Don't give feedback from people who say they "certainly would buy" your hypothetical product too much weight. After all, you can't consider someone a customer until they make a purchase. You should also refrain from asking your family and friends for guidance (unless they have experience).

Ingredients

When selecting ingredients, it is important to take into account whether the product will be sold year-round or only during certain seasons. To verify quality and cost-effectiveness, product developers typically look at multiple suppliers of the same product. Larger businesses would need to locate many suppliers of the same product to meet demand. If more than one source is utilized, each provider must adhere to strict product criteria.

Processing

Whenever possible, businesses aim to manufacture newly created products using existing machinery. Projects to produce new products frequently focus on extending existing product lines by utilizing existing facilities and equipment because purchasing new equipment is a significant capital investment. The equipment that is accessible where a product will ultimately be manufactured should be known to product creators for this reason. Considering what the differences in the equipment that is available are and how they can be resolved to generate goods that are commercially comparable should be a priority if the product is going to be produced in more than one plant.

Facilities

It is important to take into account the processing facility. The water supply and sewage systems will need to be assessed if the company has recently bought a new facility. Consideration should be given to the internal conditions of the plant, such as temperature and relative humidity regulation. Without controls for these factors, facilities in hot, humid climates may need to adjust their operational procedures in order to produce quality food.

Packaging

The attraction of a product to a consumer, particularly when making a first purchase, is significantly influenced by its packaging. It is crucial to think about how consumers will perceive the packaging and whether it will represent the product's quality objectives, such as whether it is a luxury product of high quality or a generic grade. Marketing, product developers, and packaging engineers should think about what kinds of packaging materials their rivals are using and how to differentiate their own products from them.

Distribution

Frozen and chilled foods are products that demand unique distribution requirements. Organizations ought to take special distribution costs into account. The area where the product will be available in is another factor in distribution. Will the product be distributed locally or nationally? The packaging requirements may also be impacted by the delivery radius.

Shelf Life

A product's shelf life is how long it will maintain its perceived quality in the eyes of the consumer. Consideration of distribution routes should take into account a product's shelf life. Real-time or accelerated testing can be used to estimate shelf life.

Safety

The safety concerns posed by new products should be taken into account by product developers. The history of outbreaks and the safety hazards associated with specific product categories might provide information on risk factors that processors should be aware of. For instance, following a significant epidemic of salmonella in early 2009 that resulted in more than 400 illnesses and at least five fatalities, peanut butter makers are required to apply controls to screen for potential contamination. Some items are prone to the development of microbial pathogens and deterioration. Consumer safety can also be at risk from allergens and physical pollutants like metal shavings from processing equipment.

Finances

Understanding all production and marketing expenses is necessary before a food product is developed for retail sale. Before manufacturing, a thorough cost study should be conducted. Fixed costs and variable costs are the two categories of expenses to take into account. Annual fixed expenses are those that, regardless of the volume of production, won't fluctuate in any given year. These expenses cover things like machinery, structures, property taxes, and other expenses that are constant regardless of production variations. The cost of hired labor, raw materials, packaging, gasoline, energy, utilities, and other commodities required in production are examples of variable costs that fluctuate with the volume of output. Prior to test marketing and commercialization, variable costs should be thoroughly analyzed in order to establish a unit pricing that will allow the new product to turn a profit.

2.2.4 Artisan Bread

Also known as handmade bread

Artisan bread is a term that has no absolute definition but refers to a style of short shelf-life bread that is usually offered unpackaged (in baskets) and consumed immediately after baking for maximum freshness.

The term artisan bread can include hearth breads (those baked without pan), and sourdough breads.

Fig 2.2.2 Handmade Bread

Artisan breads are typically baked in hearth-style ovens, which use radiant heat as their primary means of heat transfer, as well as ovens with steam injection and exhaust systems. These bread goods typically have wide, open cells and a crusty texture. Additionally, they have a rustic appearance and may be scored or dusted with flour on top.

How are artisan breads made?

With the exception of enzymes used for dough strengthening and crumb softening, artisan breads are known for their lean formulation (low sugar and fat content), little to no usage of dough conditioners, and high or low moisture levels (depending on shape and spread desired by the baker).

The following are some ingredients available for the production of artisan bread and their usual levels in the formula:

Ingredient	Baker's %
Bread flour	100.0
Whole wheat flour	Any level / 100.0 for whole wheat bread
Rye flour (dark, medium or light)	20.0–40.0
Semolina flour	Any level (depending on particle size)
Cracked or crushed whole grains	Any level (depending on particle size)
Water	50.0–85.0
Compressed yeast (optional if using pre-ferments or sourdough)	0.1–3.0
Biga / poolish / sponge	15.0–50.0
Sourdough	15.0–50.0
Virgin olive oil (flavor and color)	1.0–2.0
Non-diastatic malt (color and flavor)	1.5–2.0
Sugar (refined, granular sucrose)	0.5–1.0
Salt (usually delayed during mixing)	1.5–2.0

Table 2.2.2 Ingredients for the production of artisan bread

UNIT 2.3: Selection of Vendors for Obtaining Materials

Key Learning Outcomes

At the end of this module, the trainees will be able to:

1. State the importance of identifying the equipment and materials to be procured before setting up a production facility.
2. Discuss the procedure to inspect the quality of the procured material and equipment.
3. Outline the applicability and capacity of various equipment used in artisanal production.
4. Discuss the key considerations in vendor management.
5. Discuss the standard procedure for reporting and documentation about the production facility

2.3.1 Select Vendors to Obtain Materials

Procurement process of material and equipment for production facility set-up

The procurement process of raw material and equipment plays a vital role in the set-up of the baked products facility. Without the procurement process, it would be impossible for the production facility to function correctly. Procurement management ensures that all equipment, materials, and services are appropriately acquired to process effectively and efficiently.

Organizations have to be cautious if there are issues in the materials and equipment received through the supply chain and procurement. Otherwise, it can lead to severe mishaps, particularly in the automobile industry. In this process, procurement, purchasing, and sourcing are interchanging tasks having separate functions as follows:

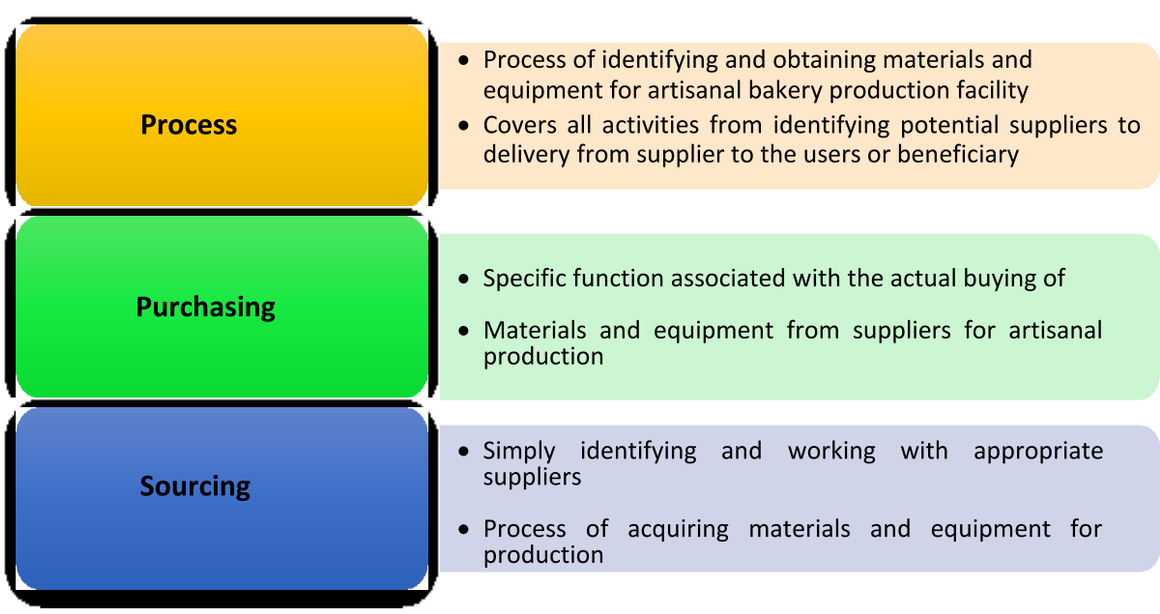


Fig 2.3.1 Understanding procurement, purchasing & sourcing for artisanal production facility

Procurement plays an important role in setting up a production facility comprising a process of identifying, short-listing, selecting, and acquiring suitable materials and equipment required for cheese production from a third-party vendor through a direct purchase, competitive bidding, or tendering procedure while ensuring timely delivery in the right quality and quantity.

The aim of procurement is to carry out its activities in such a way that the materials and equipment so procured are of:

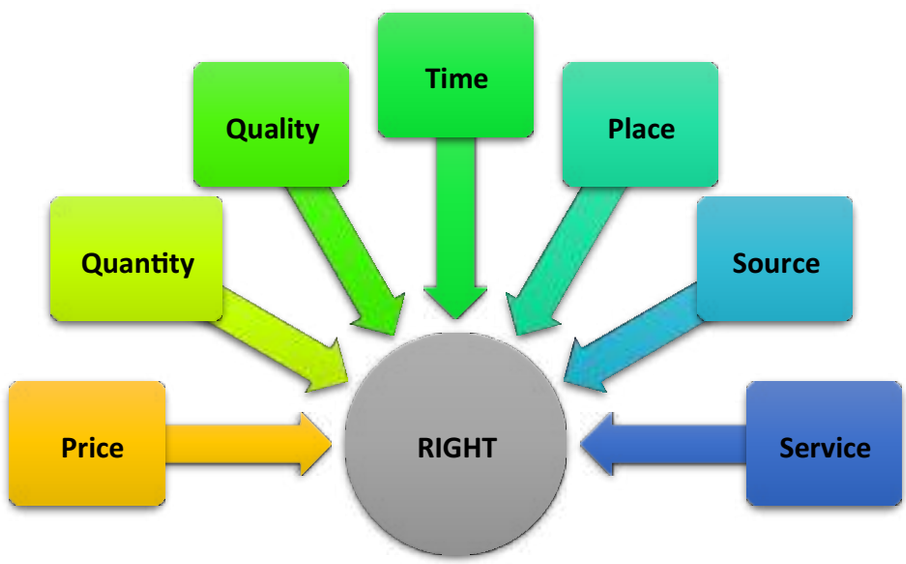


Fig 2.3.2 R's of Procurement

Procurement aims to have a reliable supply of materials. Other immediate goals are:

1. Organizing a reliable and uninterrupted flow of materials into the production facility.
2. Identifying suitable suppliers, working closely with them, and developing beneficial relationships.
3. Buying the suitable materials and ensuring that they have acceptable quality, arrive at the time and place needed, and meet any other requirements.
4. Negotiating reasonable prices and conditions.
5. Considering inventory policies, investment, standards, and readily available materials.
6. Moving materials rapidly through the supply chain, expediting deliveries when necessary.
7. Keeping abreast of conditions, including pending price increases, scarcities, new products, etc.

The procurement process has a series of common steps, which start with an employee identifying the correct quantity and quality of materials and machinery and end with its delivery. The procurement cycle includes:

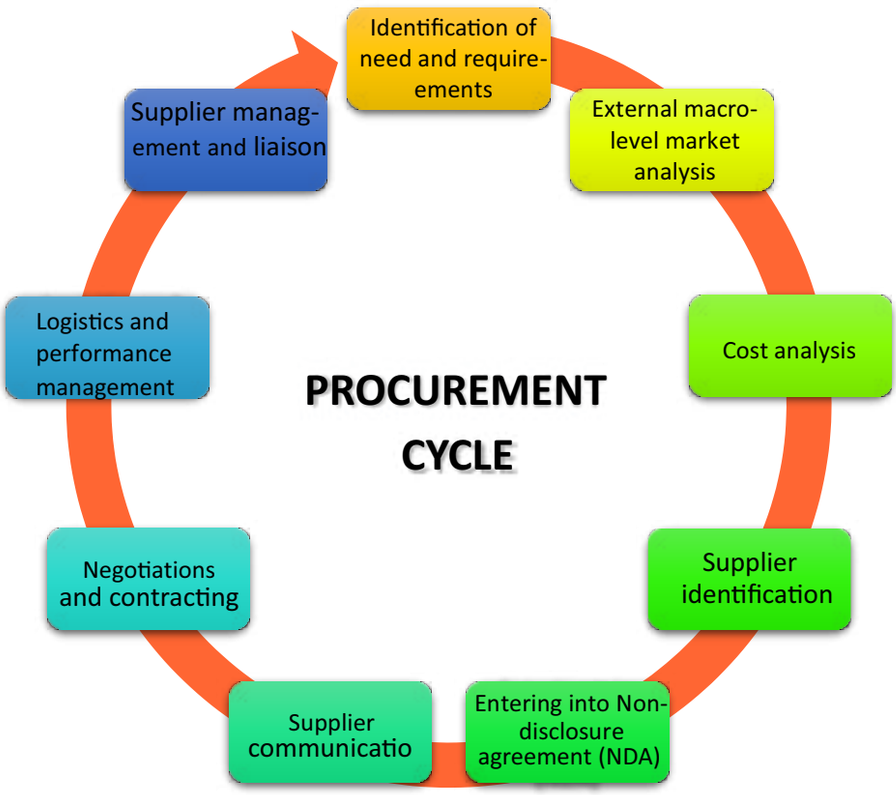


Fig 2.3.3 Procurement Cycle

A typical procurement process of materials and equipment for production facility set up involves the following steps:

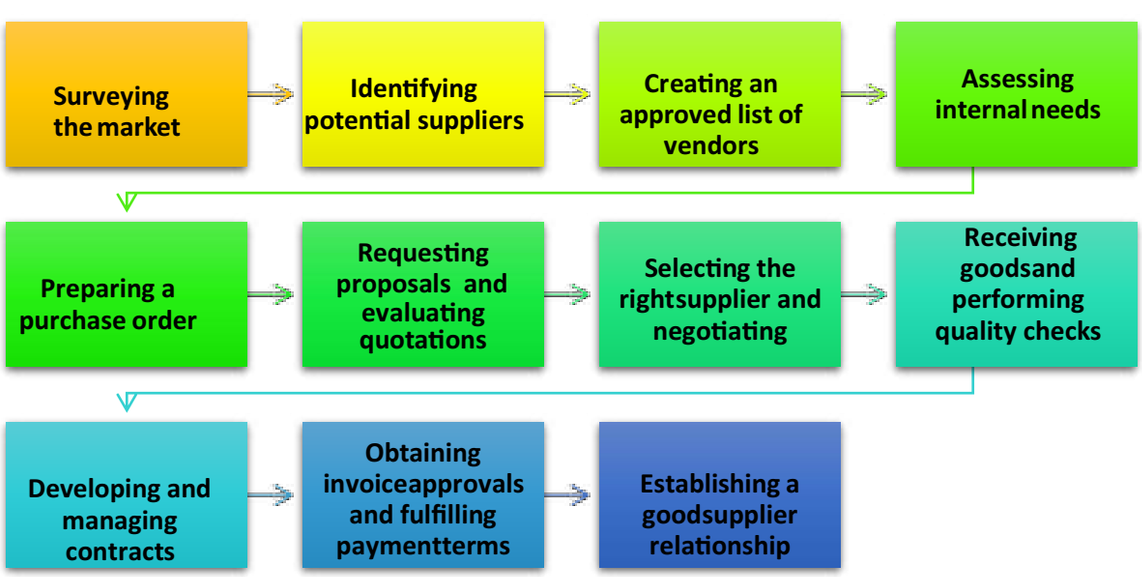


Fig 2.3.4 Procurement Process

Fig 2.3.5 Different types of machinery and equipment for artisanal bakery production

A variety of packaging materials are used in combination with each other to give the desired shelf-life . Other common packaging materials include:

1. Plastic combinations
2. Al-foil/paper laminates
3. Cellophane/paper combinations

Modified Atmosphere Packaging line system has contributed significantly in increasing the packaging speed and thus reducing the cost. However, cheaper combination packages and modern methods are in demand mainly as consumer packages with all the desirable properties.

2.3.2 Vendor Management

Vendor management defines the processes organizations use to manage their suppliers, also known as vendors. It is crucial to select the right vendor for a particular business need. Vendor management also helps manage different suppliers and vendors effectively and ensures the goods and services provided are delivered on time and to the expected standard. In addition, effective vendor management assists organizations build stronger relationships with their vendors, often leading to opportunities to negotiate better rates.

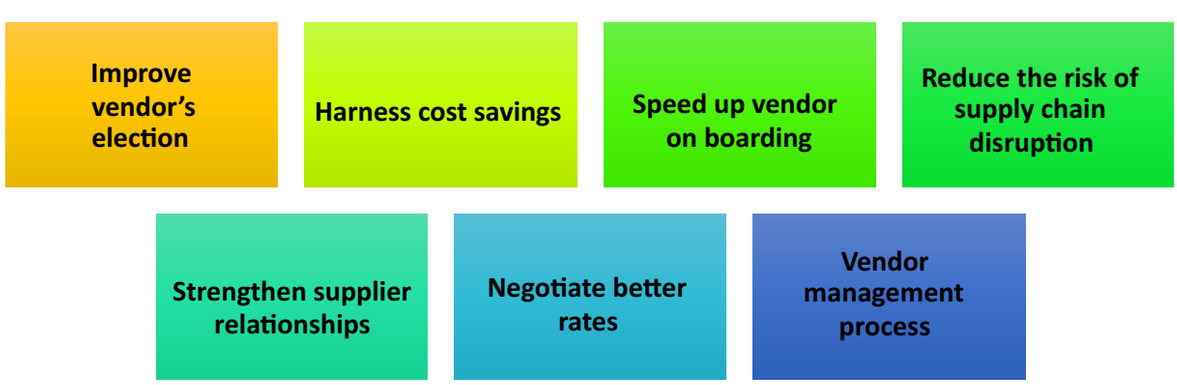


Fig.2.3.6 Benefits of vendor management

The vendor management process includes several critical activities explained in the following chart:

Selecting vendors

- It includes researching and sourcing suitable vendors and seeking quotes via requests
- For quotation (RFQs) and requests for proposal (RFPs), as well as short listing and selecting vendors.
- Organizational so evaluate other factors, such as a vendor's reputation, capacity and track record, as well as the vendor's a bi
- Lity to communicate effectively.

Contract negotiation

- The process consists of defining the goods or services that will be included, the start and end dates of the arrangements and all essential terms and conditions.
- It also pays attention in areas such as confidentiality and non-compete clauses.

Vendor on

- It gathers all the documentation and information needed to set the vendor up as an approved supplier to the company and ensure that the vendor is paid for the goods or services they have provided.
- The on boarding process also includes information such as relevant licenses held by the vendor, as well as tax forms and insurance details.

Monitoring vendor performance

- The organization will monitor and evaluate the performance of their vendors against
- Key performance indicators (KPIs) such as quality and volume of goods or delivery dates.

Monitoring and managing risk.

- Vendors should be monitored for risks that could impact the organization, such as the risk of compliance breaches, lawsuits, data security issues and loss of intellectual property.

Payment

- Ensuring vendors are paid onetime for the goods and services they provide, in line with the agreed terms.

Fig.2.3.7 Process of vendor management

2.3.3 Maintaining Records and Documentation for Artisanal Baked Products

Artisanal baked products goes through various processes and stages where it is required to monitor and record significant variables and data for quality production. Therefore, a step-by-step record of each method should be maintained while making artisanal baked products. The record sheet must include the following:

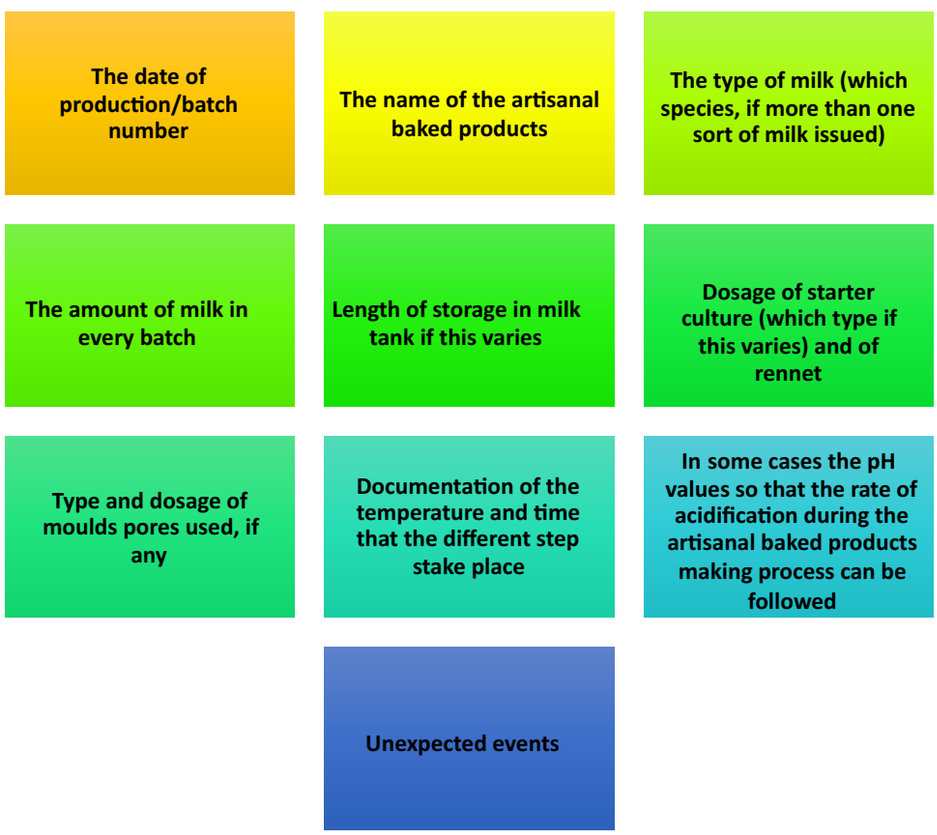


Fig 2.3.9 Features of record sheet for artisanal baked products production

Batch No. –		**Artisanal Baked Products**		**VAT#-**		**Production Date -**	
Milk		**Starter**		**Rennet**		**Mould Spores**	
Milk Type		Type		Type		Type	
Storage Duration		Dosage		Dosage		Dosage	
Total Amount							
pH		**Additives**		**Salt**		**Other Ingredients**	
Acidity rate		Amount		Amount		Amount	
Operation		**Time**	**Temp**	**Total Amount**	**pH**	**Comments**	
1.							
2..							

Table 2.3.1 Sample record sheet for artisanal baked products production

As discussed in the preceding module, for future reference, it is essential to maintain records of materials and other documents such as equipment manuals, manufacturers' instructions, etc. Maintaining records and documents ensures the traceability of all progress, manufacturing, and testing activities. Furthermore, it provides direction to auditors for evaluating the overall quality of cheese production. Good documentation provides accurate and relevant information about an organization with minimum discrepancy and variance. Good record keeping is the foundation of data integrity and requires managerial-level prioritization of data governance measures. The following figure explains the good manufacturing practices (GMP) and ISO 9001-2015 documentation standards:

Fig 2.3.10 GMP and ISO9001-2015 documentation standards

Exercise

Answer the following questions:

1. Explain the process of vendor management.

2. What do you understand by the procurement process?

3. List the equipment required for artisanal baked products production.

4. Write a note on GMP and ISO 9001 -2015 documentation standards

Fill in the blanks:

1. _____ensures traceability of all progress, manufacturing, and testing activities.
2. _____defines the processes that organizations use to manage their suppliers, who are also known as vendors.
3. _____ is done to protect the Artisanal baked products during storage and transportation.
4. _____plays an important role in setting up a production facility comprising a process of identifying, short listing, selecting, and acquiring suitable materials and equipment required for cheese production from a third-party

Unit 2.4 Perform Entrepreneurial Activities

Key Learning Outcomes

At the end of this module, the trainees will be able to:

1. Discuss your strengths and weaknesses and analyze the gaps to ensure continuous improvement.
2. Discuss the measures to utilize time effectively, achieving maximum productivity.
3. List the characteristics of innovative individuals
4. List the traits of effective time managers
5. Discuss tips for stress management
6. Discuss how to manage an enterprise
7. Describe how to plan effective strategies for solving problems and improving the work culture within the team.
8. List the various types of digital marketing techniques.
9. Discuss the types and importance of e-commerce in promoting businesses.
10. List the various types of online banking services being used widely.
11. List the elements of a proposal to attract future business opportunities and prospective clients.
12. Explain how to conduct entrepreneurial programs to identify business opportunities, generate employment and increase clientele.
13. Understand the make-in-India campaign

2.4.1 Personal Strength and Value System

As per the World Health Organization (WHO), health is a "State of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". This means being healthy does not simply mean not being unhealthy – you also need to be at peace emotionally and feel fit physically. For example, you cannot say you are healthy simply because you do not have any physical ailments like a cold or cough. It would help to consider whether you feel calm, relaxed and happy.

Common Health issues

Some common health issues are:

- Allergies
- Asthma
- Skin Disorders
- Depression and Anxiety
- Diabetes
- Cough,Cold,Sore Throat
- Difficulty Sleeping
- Obesity

Tips to prevent health issues

Preventing ill health is always better than curing a disease or sickness. You can stay healthy by:

- Eating healthy foods like fruits, vegetables and nuts
- Drinking enough water everyday
- Not smoking or drinking alcohol
- Exercising for at least 30 minutes a day,4-5 times a week

- Taking vaccinations when required
- Practicing yoga exercises and meditation

What is hygiene?

As per the World Health Organization (WHO), “Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases”. In other words, hygiene means ensuring that you do whatever is required to keep your surroundings clean to reduce the chances of spreading germs and diseases.

For instance, think about the kitchen in your home. Good hygiene means ensuring that the kitchen is always spick and span, the food is put away, dishes are washed, and dustbins are not over flowing with garbage. Doing all this will reduce the chances of attracting pests like rats or cockroaches and prevent the growth of fungus and other bacteria, which could spread disease.

What are habits?

A habit is a behavior that is repeated frequently. All of us have good habits and bad habits. Remember John Dryden's phrase: “We first make our habits, and then our habits make us”. This is why it is vital to make good habits a way of life and consciously avoid practicing bad habits.

Some good habits that you should make part of your daily routine are:

- Always having a positive attitude Making exercise a part of your daily routine
- Reading motivational and inspirational stories
- miling! Make it a habit to smile as often as possible
- Making time for family and friends Going to be dearly and waking up early
- Some bad habits that you should quit immediately are:
- Skipping breakfast
- Snacking frequently, even when you are not hungry
- Overeating fattening and sugary food
- Smoking, drinking alcohol and doing drugs
- Worrying about unimportant issues

Every employer must ensure that his workplace follows the highest possible safety protocol. When seeing up a business, owners must make it a point to:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Designate emergency exits and ensure they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Ensure regular building inspections are conducted
- Get expert advice on workplace safety and follow it

Non-negotiable employee safety habits

Every employer must ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it appoint to:

- Immediately report unsafe conditions to a supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to a supervisor
- Wear the correct protective equipment when required

- Learn how to use equipment provided for safety purposes correctly
- Beware of and avoid actions that could endanger other people
- Take rest breaks during the day and sometime off from work during the week

2.4.2 Self - Analysis - Attitude, Achievement and Motivation

To truly achieve your full potential, you need to take a deep look inside yourself and discover what kind of person you are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow and will also help you to identify areas within yourself that need to be further developed, changed or eliminated. You can better understand yourself by looking deeply at what motivates you, your attitude, and your strengths and weaknesses.

What is motivation?

Simply put, motivation is your reason for acting or behaving in a particular manner. It is essential to understand that not everyone is motivated by the same desires many deferent things inspire people. We can understand this better by looking at Maslow's Hierarchy of Needs.

Famous American psychologist Abraham Maslow wanted to understand what motivates people. He believed that people have five types of needs, ranging from fundamental needs (called physiological needs) to more critical needs required for self-growth (called self-actualization needs). Between the physiological and self-actualization needs are three other needs: safety, belongingness, love, and esteem. These needs are usually shown as a pyramid with five levels known as Maslow's Hierarchy of Needs

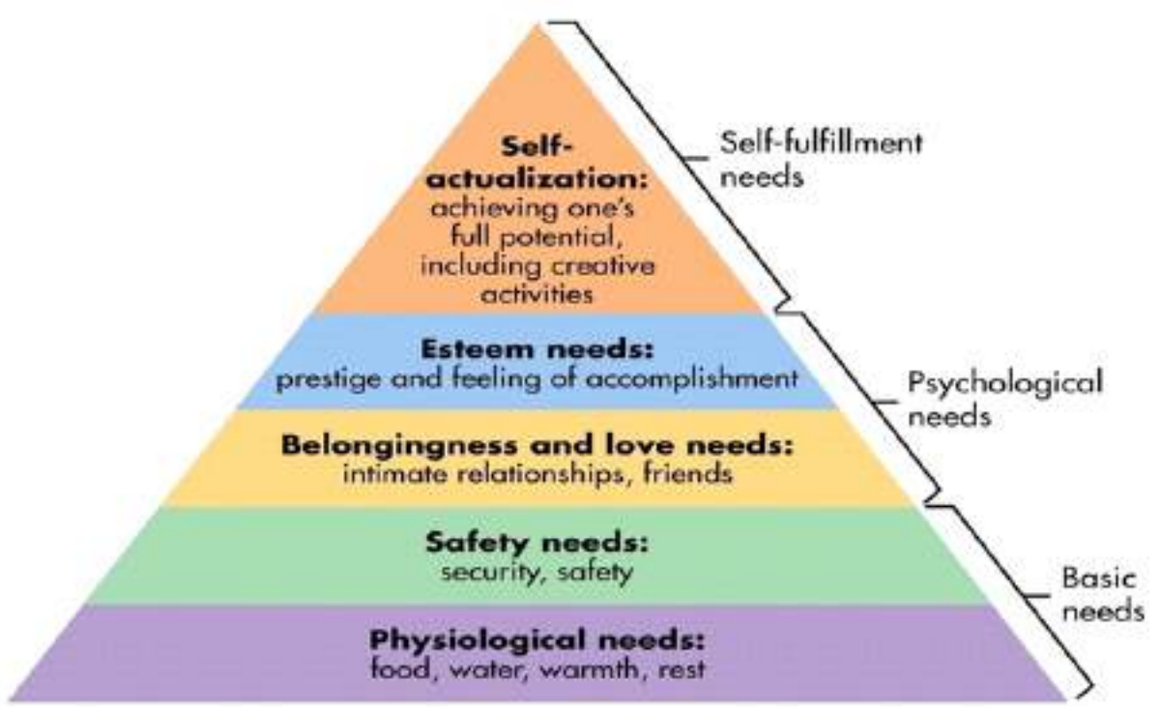


Fig.2.4.1 Maslow's hierarchy needs

As you can see from the pyramid, the lowest level depicts the most basic needs. Maslow believed that our behavior is motivated by our basic needs until those needs are met. Once they are fulfilled, we move to the next level and are motivated by the next level of needs. Let's understand this better with an example.

Rupa comes from an impoverished family. She never has enough food, water, warmth or rest. According to Maslow, until Rupa is sure that she will get these basic needs, she will not even think about the next level of needs her safety needs. But, once Rupa is confident that her basic needs will be met, she will move to the next level, and her behavior will then be motivated by her need for security and safety. Once these new needs are met, Rupa will move to the next level again and be inspired by her need for relationships and friends. Once this need is satisfied, Rupa will then focus on the fourth level of needs–her esteem needs, after which she will move up to the fifth and last level of conditions–the desire to achieve her full potential.

Understanding achievement motivation

We now know people are motivated by basic, psychological and self-fulfillment needs. However, certain people are also inspired by the achievement of highly challenging accomplishments. This is known as Achievement Motivation or 'need for achievement'.The level of motivation achievement in a person differs from individual to individual. Entrepreneurs must have a high achievement motivation – a deep desire to accomplish something meaningful and unique. It is equally important that they hire people who are also highly motivated by challenges and success.

What motivates you?

What are the things that motivate you? List down five things that inspire you.
Remember to answer honestly!

I am motivated by the following :-

Characteristics of an entrepreneur with achievement motivation:
Entrepreneurs with achievement motivation can be described as follows:

- Unafraid to take risks for personal accomplishment
- Love being challenged
- Future-oriented
- Flexible and adaptive
- Value negative feedback more than positive feedback

Think about it:
How many of these traits do you have?

- Very persistent when it comes to achieving goals
- Extremely courageous
- Highly creative and innovative
- Restless-constantly looking to gain more
- Feel personally responsible for solving problems
- Can you think of entrepreneurs who display these traits?

What is attitude?
Now that we understand why motivation is so crucial for self-analysis let's look at our attitude's role in better understanding ourselves. Attitude can be described as your tendency (positive or negative) to think and feel about someone or something. Attitude is the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy.

In other words:"The only disability in life is a bad attitude."When you start a business, you will encounter various emotions, from difficult times and failures to good times and successes. Your attitude will see you through the tough times and guide you towards success. Philosophy is also infectious. It effects everyone around you, from your customers to your employees to your investors. A positive attitude helps build confidence in the workplace, while a negative attitude is likely to result in the demotivation of your people.

How to cultivate a positive attitude?
The excellent news is attitude is a choice. So it is possible to improve, control and change our attitude if we decide we want to! The following tips help foster a positive mindset:

- Remember that you control your attitude , not the other way aroundDevote at least 15 minutes a day towards reading , watching or listening to something positive
- Avoid negative people who only complain , and stop complaining yourselfExpand your vocabulary with positive words and delete negative phrases from your mind
- Be appreciative and focus on what's good in yourself , in your life , and others
- Stop thinking of yourself as a victim and start being proactive
- Imagine yourself succeeding and achieving your goals

What are your strengths and weaknesses?
Another way to analyze yourself is by honestly identifying your strengths and weaknesses. This will help you use your powers to your best advantage and reduce your liabilities.

Note down all your strengths and weaknesses in the two columns below. Remember to be honest with yourself!

2.4.3 Time Management

Time management is organizing your time and deciding how to allocate your time between different activities. Good time management is the difference between working smart (getting more done in less time) and working hard (working for more time to get more done).
Benefits of time management

Effective time management leads to efficient work output, even when faced with tight deadlines and high-pressure situations. On the other hand, not managing your time effectivel. This results in efficient output and increases stress and anxiety.

Benefits of time management

- Time management can lead to huge benefits like:
- Greater productivity
- Better professional reputation
- Higher chances for career advancement
- Higher efficiency
- Reduced stress
- More significant opportunities to achieve goals

Not managing time effectively can result in undesirable consequences like:

- Missing deadlines
- Substandard work quality
- Stalled career
- Inefficient work output
- Poor professional reputation
- Increase in stress and anxiety

Traits of effective time managers

Some traits of effective time managers are:

- They begin projects early
- They set daily objectives
- They modify plans , if required, to achieve better results
- They are flexible and open-minded
- They inform people in advance if their help is required
- They know how to say no
- They break tasks in to steps with specific deadlines
- They continually review long- term goals
- They think of alternate solutions if and when required
- They ask for help when required
- They create back up plan

Effective time management techniques

You can manage your time better by practicing specific time management techniques. Some helpful tips are:

Plan out yourday, as well as plan for interruptions. Give yourself at least 30 minutes to figure out your time plan. In your project, schedule sometime for interruptions.

Put a “Do Not Disturb” sign when you have to complete a certain amount of work.

2.4.4 Anger Management

Anger management is the process of:

Learning to recognize the signs that you, or someone else, is becoming angry.

Taking the best course of action to calm down the situation in a positive way anger management does not means up pressing anger.

Importance of anger management
Anger is a perfectly normal human emotion. When managed the right way, anger can be considered a healthy emotion. However, if it is not kept in check, anger can make us misbehave and lead to us saying or doing things that we will likely regret later. Extreme anger can:

Hurt you physically: It leads to heart disease, diabetes, a weakened immune system, insomnia, and high blood pressure.

Hurt you mentally: It can cloud your thinking and lead to stress, depression and mental health issues.

Hurt your career: It can alienate your colleagues, bosses, and clients and lead to the loss of respect.

Hurt your relationships: It makes it hard for your family and friends to trust you, be honest, and feel comfortable around you.

This is why anger management, or managing anger appropriately, is so important.

Anger management strategies
Here are some strategies that can help you control your anger:

Strategy 1: Relaxation
Something as simple as breathing deeply and looking at relaxing images works wonders in calming down angry feelings.

Try this simple breathing exercise:

- Take a deep breath from your diaphragm(don't breathe from your chest)
- Visualize your breath coming up from your stomach.
- Keep repeating a calming word like 'relax' or 'take it easy' (remember to keep breathing deeply while repeating the comment)

Picture a relaxing moment (this can be from your memory or your imagination). Follow this relaxation technique daily, especially when you realize you' restarting to feel angry.

Strategy 2: Cognitive restructuring
Cognitive restructuring means changing how you think. Anger can make you curse, swear, exaggerate and act very dramatically. When this happens ,force yourself to replace angry thoughts with more logical ones. For instance, instead of thinking, 'Everything is ruined,' change your mindset and tell yourself, 'It's not the end of the world and getting angry won't solve this'.

Strategy 3: Problem-solving

Getting angry about a problem you cannot control is a natural response. Sometimes, try as you may; there may not be a solution to the difficulty you are faced with. In such cases, stop focusing on solving the problem and instead focus on handling and facing the problem. Remind yourself that you will do your best to deal with the situation but will not blame yourself if you don't get the desired solution.

Strategy 4:Better communication

When angry, it is straightforward to jump to inaccurate conclusions. In this case, you need to force yourself to stop reacting and think carefully about what you want to say before saying it. Avoid telling the first thing that enters your head. Force yourself to listen carefully to what the other person is saying. Then think about the conversation before responding

Strategy 5:Changing your environment

If you find that your environment is the cause of your anger, try and give yourself a break from your surroundings .Make an active decision to schedule some personal time for yourself, especially on hectic and stressful days. Having even a brief amount of quiet or alone time will help calm you down.

- Tips for Anger Management
- The following tips will help you keep your anger in check:
- Take some time to collect your thoughts before you speak out in anger
- ·Express the reason for your anger in an assertive but non-confrontational manner once you have calmed down
- Do some form of physical exercise, like running or walking briskly when you feel angry.
- Make short breaks part of your daily routine, especially during stressful days
- Focus on how to solve a problem that's making you angry rather than focusing on the fact that the problem is making you angry

2.4.5 Stress Management

We say we are 'stressed' when we feel overloaded and unsure of our ability to deal with the pressures placed on us. Anything that challenges or threatens our well-being can be defined as stress. It is important to note that focus can be good and evil. While good pressure keeps us going, negative stress undermines our mental and physical health. This is why it is so essential to managing negative stress effectively.

Causes of Stress Internal Causes:

- Constant worry
- Rigid thinking
- Unrealistic expectations
- Pessimism
- Negative self-talk
- All-in or all-out attitude

External causes

- Major life changes
- Difficulties with relationships
- Having too much to do
- Challenges at work or in school
- Financial difficulties
- Worrying about one's children and family

2.4.6 E-commerce

E-commerce is buying or selling goods and services or transmitting money or data electronically on the internet. E-Commerce is the short form for" electronic commerce".

Examples of E-commerce

1. Online shopping
2. Online auctions
3. Online ticketing
4. Electronic banking
5. Electronic payment

Types of E-commerce

E-commerce can be classified based on the types of participants in the transaction. The main types of e-commerce are:

1. **BUSINESS to BUSINESS(B2B)** –Both the transacting parties are businesses
2. **BUSINESS to CONSUMER(B2C)** – Businesses sell electronically to end-consumers
3. **CONSUMER to CONSUMER(C2C)** – Consumers come together to buy, sell or trade items to other consumers
4. **CONSUMER-to-BUSINESS(C2B)** –Consumers make products or services available for purchase to companies looking for precisely those services or products
5. **BUSINESS-to-ADMINISTRATION(B2A)** - Online transactions conducted between companies and public administration
6. **CONSUMER-to-ADMINISTRATION(C2A)** - Online transactions conducted between individuals and public administration

Benefits of E-commerce

Three-commerce business provides some benefits for retailers and customers.

- Establishes an online presence. Reduces operational costs by removing over head costs
- Increases brand awareness through the use of good key words
- Increases sales by removing geographical and time constraints

Benefits for customers:

- Offers a more comprehensive range of choice than any physical store
- Enables goods and services to be purchased from remote locations
- Allows consumers to perform price comparisons

Digital India campaign

Prime Minister Narendra Modi launched the Digital India campaign in 2015 with the objective of offering every citizen of India access to digital services, knowledge and information. The campaign aims to improve the country's online infrastructure and increase internet connectivity, thus boosting the-commerce industry.

Currently, most online transactions come from tier 2 and tier 3 cities. Once the Digital India campaign is in place, the government will deliver services through mobile connectivity, which will help provide internet to remote corners of the country.

This will help thee-commerce market to enter India's tier4 towns and rural areas

E-commerce activity
Choose a product or service that you want to sell online. Write a brief note explaining how you will use existing e-commerce platforms, or create a new e-commerce platform, to sell your product or service.

2.4.7 Money Matters

We all know that the future is unpredictable. You never know what will happen tomorrow, next week or next year. That's why saving money steadily through the years is so important. Saving cash will help improve your financial situation over time. But more importantly, knowing that you have money stashed away for a new emergency will give you peace of mind. Saving money also opens the door to many more options and possibilities.

Benefits of saving
In calculating the habit of saving leads to a vast number of benefits. Saving helps you:

Become financially independent - When you have enough money saved up to feel secure, you can start making your choices, from taking a vacation whenever you want to switch careers or starting your own business.

Invest in yourself through education -Through saving, you can earn enough to pay up for courses that will add to your professional experience and ultimately result in higher-paying jobs. Get out of debt –Once you have saved enough as a reserve fund, you can use your savings to pay off debts like loans or bills accumulated overtime.

Be prepared for SURPRISE EXPENSES – Having money saved enables you to pay for unforeseen expenses like sudden car or house repairs without feeling financially stressed

Pay for EMERGENCIES -Saving helps you deal with emergencies like sudden health issues or emergency trips without feeling financially burdened.

Afford large PURCHASES and achieve primary GOALS -Saving diligently makes it possible to place down payments towards major purchases and goals, like buying a home or a car.

Retire - The money you have saved over the years will keep you comfortable when you no longer have the income you would get from your job.

In India, banks offer four main types of bank accounts. These are:
- Current Accounts
- Savings Accounts
- Recurring Deposit Accounts
- Fixed Deposit Accounts

Current accounts
Current accounts offer the most liquid deposits and, thus, are best suited for business people and companies. As these accounts are not meant for investments and savings, there is no limit on the number or amount of transactions that can be made on any given day. Current account holders are not paid any interest on the amounts held in their accounts. They are charged for certain services offered on such statements.

Saving accounts
Savings accounts promote savings and are the number one choice for salaried individuals, pensioners and students. While there is no restriction on the number and amount of deposits made, there are usually restrictions on the number and amount of withdrawals. Savings account holders are paid interest on their savings.

Recurring deposit accounts
Recurring Deposit accounts, also called RD accounts, are the accounts of choice for those who want to save an amount every month but cannot invest a large sum at once. Account holders deposit a small, fixed amount monthly for a pre-determined period (minimum 6 months).Defaulting on a monthly payment results in the account holder being charged a penalty amount. The total amount is repaid with interest at the end of the specified period.
Fixed deposit accounts

Fixed Deposit accounts, also called FD accounts, are ideal for those wishing to deposit their savings for the long term in return for a high-interest rate. The rate of interest offered depends on the amount deposited and the period, and also differs from bank to bank. In the case of an FD, a certain amount of money is deposited by the account holder for a fixed period. The funds can be withdrawn when the period expires. If necessary, the depositor can break the fixed deposit prematurely. However, this usually attracts a penalty amount which also differs from bank to bank.

Step1: Fill in the account opening form
- This form requires you to provide the following information:
- Personal details (name, address, phone number, date of birth, gender, occupation, address)
- Method of receiving your account statement(hardcopy/email)
- Details of your initial deposit(cash/cheque)
- Manner of operating your account(online/mobile banking /traditional via cheque, slip books Ensure that you sign wherever required on the form.

Step2: Affix your photograph
Stick a recent photograph of yourself in the allotted space on the form.

Step3: Provide your know-your-customer (KYC) details
KYC is a process that helps banks verify the identity and address of their customers. To open an account, every individual must submit certain approved documents concerning photo identity(ID)and address proof. Some Officially Valid Documents(OVDs)are:
- PassportDriving License
- Voters' Identity Card
- PAN Card
- UIDAI(Aadhaar)Card

Step 4:Submit all your documents
Submit the completed Account Opening Form and KYC documents. Then wait until the forms are processed, and your account has been opened!

2.4.7 Online Banking, NEFT, RTGS, etc.

Internet or online banking allows account holders to access their accounts from a laptop. In this way, instructions can be issued. Account holders must use their unique customer ID number and password to access an account.

Internet banking can be used to:

- Find out an account balance
- Transfer amounts from one account to another
- Arrange for the issuance of a cheque
- Instruct payments to be made
- Request for a cheque book
- Request for a statement of accounts
- Make a fixed deposit

Electronic fund transfer

Electronic fund transfer is a convenient way of transferring money from the comfort of one's home, using integrated banking tools like the internet and mobile banking. Transferring funds via an electronic gateway is highly convenient. With the help of electronic banking, you can choose to:

- Transfer funds into your accounts in the same bank
- Transfer funds into different accounts in the same bank
- Transfer funds into accounts in different banks, using NEFT
- Transfer funds into other bank accounts using RTGS
- Transfer funds into various accounts using IMPSss

NEFT

NEFT stands for National Electronic Funds Transfer. This money transfer system allows you to electronically transfer funds from your respective bank accounts to any other account, either in the same bank or belonging to any other bank. Individuals, firms and corporate organizations can use NEFT to transfer funds between accounts. To transfer funds via NEFT, two things are required:

- A transferring bank
- A destination bank

Before transferring funds through NEFT, you must register the beneficiary receiving the funds. To complete this registration, you will require the following information:

- Recipient's name
- Recipient's bank name
- Recipient's account number
- The recipient's bank's IFSC code

RTGS

RTGS stands for Real Time Gross Settlement. This real-time funds transfer system enables you to transfer funds from one bank to another, in real-time or on a gross basis. The transferred amount is immediately deducted from the account of one bank and instantly credited to the other bank's performance. The Reserve Bank of India maintains the RTGS payment gateway. The transactions between banks are made electronically. Individuals, companies and firms can use RTGS to transfer large sums of money.

Before remitting funds through RTGS, you must add the beneficiary and his bank account details via your online banking account. To complete this registration, you will require the

- Name of the beneficiary
- Beneficiary's account number
- Beneficiary's bank address
- Beneficiary's IFSC code

IMPS

IMPS stands for Immediate Payment Service. This real-time, inter-bank, electronic funds transfer system transfers money instantly within banks across India. IMPS enables users to make instant electronic transfer payments using mobile phones through both Mobile Banking and SMS. It can also be used through ATMs and online banking. IMPS is available 24 hours a day and 7 days a week.

The system features a secure transfer gateway and immediately confirms orders that have been fulfilled.

- Register for IMPS with your bank
- Receive a Mobile Money Identifier(MMID)from the bank
- Receive a M P I N from the bank. To transfer money through IMPS, you need to:
- Once you have both, you can login or request an SMS to share a particular
- amount with a beneficiary.
- For the beneficiary to receive the transferred money, he must:
- Link his mobile number with his respective account
- Receive the MMID from the bank
- To initiate a money transfer through IMPS, you will need to enter the following information:
- The beneficiary's mobile number
- The transfer amount
- The beneficiary's MMID
- Your MPIN

As soon as money has been deducted from your account and credited into the beneficiary's account, you will be sent a confirmation SMS with a transaction reference number for future reference.

	NEFT	RTGS	IMPS
Settlement	Done in batches	Real-time	Real-time
Full form	National Electronic Fund Transfer	Real Time Gross Settlement	Real Time Gross Settlement
Timings on Monday–Friday	8:00 am–6:30 pm	9:00 am–4:30 pm	24x7
Timings on Saturday	8:00 am–1:00 pm	9:00am–1:30 pm	24x7
The minimum amount of money transfer limit	`1	`2lacs	`1
The maximum amount of money transfer limit	`10 lacs	`10 lacs per day	`2 lacs
Maximum charges as per RBI	Upto 10,000 –`2.5 above 10,000–1 lac –`5 above 1 – 2 lacs– `15 above2–5 lacs–`25 above 5–10 lacs–`25	Above2–5lacs– `25 above 5–10 lacs– `50	Upto 10,000 – `5 above 10,000 – 1 lac –`5 above 1 – 2 lacs– `15

Table 2.4.1 Differences between NEFT, RTGS & IMPS

2.4.8 Understanding Entrepreneurship

Entrepreneurs and entrepreneurship
Anyone determined to start a business, no matter the risk, is an entrepreneur. Entrepreneurs run their start-ups, take responsibility for the financial risks and use creativity, innovation and vast reserves of self-motivation to achieve success. They dream big and are determined to do whatever it takes to turn their idea into a viable offering. An entrepreneur aims to create an enterprise. The process of creating this enterprise is known as entrepreneurship.

Importance of entrepreneurship
Entrepreneurship is essential for the following reasons:
- It results in the creation of new organizations
- It brings creativity into the marketplace
- It leads to improved standards of living
- It helps develop the economy of a country

Characteristics of a good Entrepreneur: All successful entrepreneurs have specific features. They all are :
- Extremely passionate about their work
- Confident in themselves
- Disciplined and dedicated
- Motivated and driven
- Highly creative
- Visionaries
- Open-minded
- Decisive

Entrepreneurs also tend to:
- Have a high-risk tolerance
- Thoroughly plan everything
- Manage their money wisely
- Make their customers their priority
- Understand their offering and their market in detail
- Ask for advice from experts when required
- Know when to cut their losses

Examples of famous entrepreneurs
Some famous entrepreneurs are:
- Dhirubhai Ambani (Reliance)
- Dr.Karsanbhai Patel (Nirma)
- Azim Premji(Wipro)
- Anil Agarwal (Vedanta Resources)

Types of enterprises
As an entrepreneur in India, you can own and run any of the following types of enterprises:

Sole Proprietorship- In a sole proprietorship, a single individual owns, manages and controls the enterprise. This type of business is the easiest to form concerning legal formalities. The company and the owner have no separate legal existence. All profit belongs to the proprietor, as do all the losses. The liability of the entrepreneur is unlimited.

Partnership - Two or more people form a partnership firm. The owners of the enterprise are called partners. All the partners must sign a partnership deed. The firm and its partners have no separate legal existence. The partners share the profits. Concerning losses, the liability of the partners is unlimited. A firm has a limited life span and must be dissolved when anyone of the partners dies, retires, claims bankruptcy or goes insane.

Limited Liability Partnership(LLP) - In a Limited Liability Partnership or LLP, the firm's partners enjoy perpetual existence and the advantage of limited liability. Each partner's liability is limited to their agreed contribution to the LLP. The partnership and its partners have a separate legal existence.

2.4.9 Leadership & Teamwork

Leadership means setting an example for others to follow. A good example means not asking someone to do something you wouldn't willingly want to do yourself. Leadership is about figuring out what to do to win as a team and company.

Leaders believe in doing the right things. They also believe in helping others to do the right things. An effective leader is someone who:

- Creates an inspiring vision of the future.
- Motivates and inspires his team to pursue that vision.
- Leadership Qualities That All Entrepreneurs Need- Building a successful enterprise is only possible if the entrepreneur possesses excellent leadership qualities. Some critical leadership skills that every entrepreneur must have are:
- Pragmatism - This means having the ability to highlight all obstacles and challenges to resolve issues and reduce risks.
- Humility –This means admitting mistakes often and early and taking responsibility for your actions quickly. Mistakes should be viewed as challenges to overcome, not opportunities to point blame.
- Flexibility - A good leader must be very flexible and quickly adapt to change. It is equally critical to know when to adjust and when not to.
- Authenticity -This means showing both your strengths and your weaknesses. It means being human and showing others that you are human.
- Reinvention –This means refreshing or changing your leadership style when necessary. To do this, it's essential to learn where your leadership gaps lie and find out what resources are required to close them.
- Awareness – This means taking the time to recognize how others view you. It means understanding how your presence affects those around you.

Benefits of effective leadership

Effective leadership results in numerous benefits. Outstanding leadership leads to the leader successfully:

- Gaining the loyalty and commitment of the team members
- Motivating the team to work towards achieving the company's goals and objectives
- Building morale and instilling confidence in the team members
- Fostering mutual understanding and team-spirit among team members
- Convincing team members about the need to change when a situation requires adaptability

Team work and teams
Team work occurs when the people in a workplace combine their skills to pursue a common goal. Effective teams are individuals who work together to achieve this common goal. A great team holds itself accountable for the result.

Importance of team work in entrepreneurial success
For an entrepreneurial leader, building an effective team is critical to the success of a venture. An entrepreneur must ensure that the team he makes possesses certain crucial qualities, traits and characteristics. An effective squad has:

- **Unity of purpose**: All team members should clearly understand and be equally committed to the team's purpose, vision and goals.
- **Excellent communication skills**: Team members should be able to express their concerns, ask questions, and use diagrams and charts to convey complex information.
- **The ability to collaborate**: Every member should feel entitled to provide regular feedback on new ideas.
- **Initiative**: The team should consist of proactive individuals. The members should be enthusiastic about developing new ideas, improving existing ideas, and conducting research.
- **Visionary members**:The team should have the ability to anticipate problems and act on these potential problems before they turn into real issues.
- **Excellent adaptability skills**: The team must believe that change is a positive force. Change should be seen as the chance to improve and try new things.
- **Excellent organizational skills**: The team should have the ability to develop standard work processes, balance responsibilities, properly plan projects, and set in place methods to measure progress and ROI.

2.4.10 Effective Communication Skills

Listening is the ability to receive and understand messages during the process of communication correctly. Listening is critical for effective communication. Without effective listening skills, messages can easily be misunderstood. This results in a communication breakdown and can lead to the sender and the receiver of the news becoming frustrated or irritated. It's important to note that listening is not the same as hearing. Hearing just refers to sounds that you hear. Listening is a whole lot more than that.

To listen, one requires focus. It means paying attentioan to the story and focusing on how it is relayed, how language and voice are used, and even how the speaker uses their body language. The ability to listen depends on how effectively one can perceive and understand verbal and non-verbal cues.

How to listen effectively?
To listen effectively, you should:
- Stop talking
- Stop interrupting
- Focus entirely on what is being said
- Nod and use encouraging words and gestures
- Be open-minded
- Think about the speaker's perspective
- Be very patient

- Pay attention to the tone that is being used
- Pay attention to the speaker's gestures, facial expressions and eye movements
- Do not try and rush the person
- Not let the speaker's mannerisms or habits irritate or distract you

1. The importance of speaking effectively

How successfully a message gets conveyed depends entirely on how effectively you can get it through. An effective speaker enunciates properly, pronounces words correctly, chooses the right words and speaks at an easily understandable pace. Besides this, the words spoken loud and to match the gestures, tone and body language. What you say and how you say it results in numerous perceptions. A person who speaks hesitantly may be perceived as having low self-esteem or lacking knowledge of the discussed topic. Those with a quiet voice may very well be labeled as shy. And those who speak in commanding tones with high levels of clarity are usually considered highly confidential. This makes speaking a very critical communication skill.How to speak effectively?

To speak effectively, you should:

- In corporate body language in your speech like eye contact, smiling, nodding, gesturing etc.
- Build a draft of your speech before actually making your speech.
- Ensure that all your emotions and feelings are under control.
- Pronounce your words distinctly with the correct pitch and intensity. Your speech should be crystal clear at all times.
- Use a pleasant and natural tone when speaking. Your audience should not feel like you are putting on an accent or being unnatural.
- Use precise words to drive your message home. Ambiguity should be avoided at all costs.
- Ensure that your speech has a logical flow.
- Be brief .Don't add any unnecessary information.
- Make a conscious effort to avoid irritating mannerisms like fidgeting, twitching etc.
- Choose your words carefully and use simple words that most of the audience will have no difficulty understanding.
- Use visual aids like slides or a white board.
- Speak slowly so that your audience can easily understand what you're saying. However, be careful not to speak too slowly because this can come across as stiff, unprepared or even condescending.
- Remember to pause at the right moments.

2.4.11 Problem - Solving and Negotiation Skills

1. As per The Concise Oxford Dictionary (1995), the problem is “A doubtful or difficult matter requiring absolution” All issues contain two elements:
    1. Goals
    2. Obstacles

The aim of problem-solving is to recognize the obstacles and remove them to achieve the goals.

How to solve problems?

Solving a problem requires a level of rational thinking. Here are some logical
Steps to follow when faced with an issue:
Step1: Identify the problem

Step2: Study the problem in detail
Step3: List all possible solutions
Step4: Select the best solution
Step5: Implement the chosen solution
Step6: Check that the problem has been solved

1. Essential traits for problem-solving

- Highly developed problem-solving skills are critical for business owners and their employees. The following personality traits play a significant role in how effectively problems are solved: Being open-minded
- Not panicking
- Asking the right questions Having a positive attitude
- Being proactive
- Focusing on the right problem

How to assess for problem- solving skills?
As an entrepreneur, it would be a good idea to assess potential candidates' problem-solving skills before hiring them. Some ways to evaluate this skill are through:

- Application forms: Ask for proof of the candidate's problem-solving skills in the application form.
- Psychometric tests: Give potential candidates logical reasoning and critical thinking tests and see how they fare.
- Interviews: Create hypothetical problematic situations, raise ethical questions, and see how the candidates respond.
- Technical questions: Give candidates examples of real-life problems and evaluate their thought processes.

What is negotiation?
Negotiation is a method used to settle differences. Negotiation aims to resolve differences through a compromise or agreement while avoiding disputesgoalongto between people. Good negotiation skills help satisfy both parties and develop strong relationships

Why Negotiate?
Starting a business requires many, many negotiations. Some negotiations are small, while others are critical enough to make or break a startup. Negotiation also plays a significant role in the work place. As an entrepreneur, you need to know not only know how to negotiate yourself but also how to train employees in the art of negotiation.

Take a look at some steps to help you negotiate:

Step 1: Pre-Negotiation Preparation	Agree on where to meet to discuss the problem, decide who will be present and set a time limit for the discussion.
Step 2: Discuss the Problem	This involves asking questions, listening to the other side, putting your views forward and clarifying doubts.
Step 3: Clarify the Objective	Ensure that both parties want to solve the same problem and reach the same goal.
Step 4: Aim for a Win-Win Outcome	Try your best to be open-minded when negotiating. Compromise and offer alternate solutions to reach an outcome where both parties win.
Step 5:Clearly Define the Agreement	When an agreement has been reached, the details should be crystal clear to both sides, with no scope for misunderstandings.
Step 6: Implement the Agreed Upon Solution	Agree on a course of action to set the solution In motion.

Table 2.4.2 Steps to help you negotiate

2.4.12 Entrepreneurs and opportunities

The entrepreneurial ways searches for change, responds to it and exploits it as an opportunity. Peter Drucker The ability to identify business opportunities is an essential characteristic of an entrepreneur.

What is an opportunity?
The word opportunity suggests a good chance or a favorable situation do something offered by circumstances.

A business opportunity means a good or favorable change available to run a specific given environment business at a given point in time.

Common questions faced by entrepreneurs
A critical question that all entrepreneurs face is how to find the right business opportunity for them. Some common questions that entrepreneurs constantly think about are:

- Should the new enterprise introduce a new product or service based on an unmet need?
- Should the new enterprises elect an existing product or service from one market and offer it in another where it may not be available?
- Should the enterprise be based on a tried and tested formula that has worked else where?

Therefore, entrepreneurs must learn how to identify new and existing business opportunities and evaluate their chances of success.

When is an idea an opportunity?
An idea is an opportunity when :

- It creates or adds value to a customer
- It solves a significant problem, removes a pain pointer meets a demand
- Has robust market and profit margin?
- Is a good fit with the founder and management team at the right time and place

Factors to consider to looking for an opportunity

Consider the following when looking for business opportunities:

- Economic trends
- Changes in funding
- Changing relationships between vendors, partners and suppliers
- Market trend
- Changes in political support
- A shift in the target audience

Ways to identify new business opportunities

- Identify Market In efficiencies: When looking at a market, consider what inefficiencies are present in the market. Think about ways to correct these inefficiencies
- Remove Key Hassles : Rather than create a new product or service, you can innovatively improve the product, service or process
- Create Something New: Think about how you can create a new experience for customers based on existing business models
- Pick a Growing Sector/Industry: Research and find out which sectors or industries are growing and think about what opportunities you can tap in the same
- Think About Product Differentiation: If you already have a product in mind, think about ways to set it apart from the existing ones

Ways to identify business opportunities within your business

SWOT analysis

An excellent way to identify opportunities inside your business is by creating a SWOT analysis. The acronym SWOT stands for strengths, weaknesses, opportunities and threats.

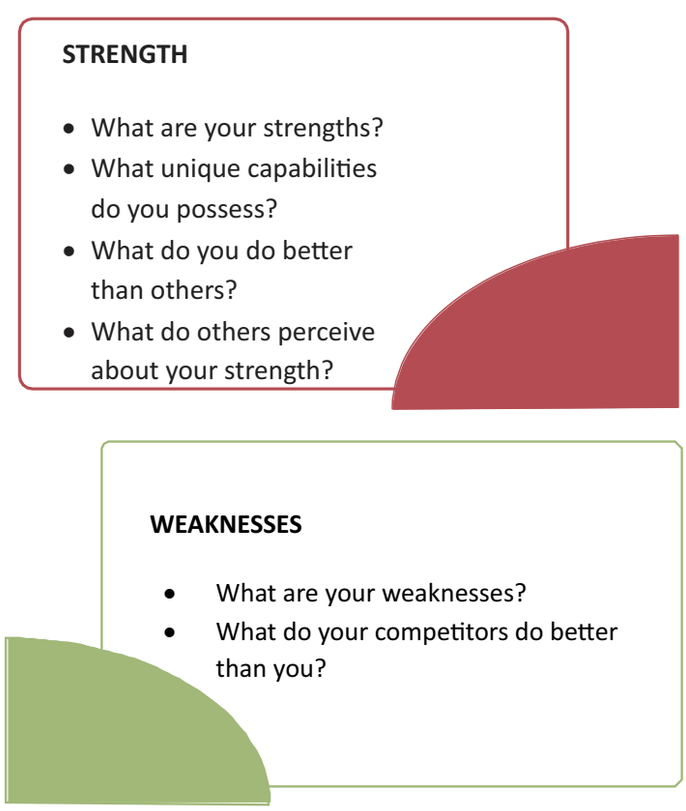


Fig.2.4.2 SWOT analysis

Consider the following when looking for business opportunities:
By looking at yourself and your competitors using the SWOT framework, you can uncover opportunities to exploit, manage, and eliminate threats that could derail your success.

- Establishing your USP
- Establish your USP and position yourself as different from your competitors.
- Identify why customers should buy from you and promote that reason.

Opportunity analysis

Once you have identified an opportunity, you need to analyze it. To explore an option, you must:

- Focus on the idea
- Focus on the market of the idea
- Talk to industry leaders in the same space as the idea
- Talk to players in the same room as the idea

2.4.13 Entrepreneurship Support Eco-System

An entrepreneur is a person who:

- Does not work for an employee
- Runs a small enterprise
- Assumes all the risks and rewards of the enterprise, idea, good or service

There are four main types of entrepreneurs:

- **The Traditional Entrepreneur** – This type of entrepreneur usually has some skill–they can be a carpenter, mechanic, cook etc. They have businesses that have been around for numerous years, like restaurants, shops and carpenters. Typically, they gain plenty of experience in a particular industry before beginning their business in a similar field.
- **The Growth Potential Entrepreneur** -This type of entrepreneur desires to start an enterprise that will grow, win many customers and make lots of money. Their ultimate aim is to sell their enterprise for a nice profit eventually. Such entrepreneurs usually have a science or technical background.
- **The Project- Oriented Entrepreneur** –This type of entrepreneur generally has a background in the arts or psychology. Their enterprises tend to focus on something they are very passionate about.
- **The Lifestyle Entrepreneur** –This type of entrepreneur has usually worked as a teacher or a secretary. They are more interested in selling something that people will enjoy rather than making lots of money.

Characteristics of an entrepreneur:

Successful entrepreneurs have the following characteristics:

- They are highly motivated
- They are creative and persuasive
- They are mentally prepared to handle every task
- They have excellent business skills–they know how to evaluate their cash flow, sales
- They are willing to take significant risks
- They are very proactive –this means they are willing to do the work themselves rather than wait for someone else to do it
- They have a vision–they can see the big picture
- They are flexible and open-minded
- They are good at making decisions

Entrepreneur success stories

Dhiru Bhai Ambani:

Dhiru Bhai Ambani began his entrepreneurial career by selling “bhajias” to pilgrims in Mount Girnar on weekends as a clerk in an oil company. At 16, he moved to Yemen, where he worked as a gas-station attendant, and He returned to India with Rs. 50,000 and started a textile trading company. Reliance became the first Indian company to raise money in global markets and the first Indian company to feature in Forbes 500 list.

Dr Karsanbhai Pate:

Karsan Bhai Patel made detergent powder in the backyard of his house. He sold his product door-to-door and offered a money-back guarantee with every pack sold.He charged Rs.3 per kg when sold. Nirma, which became a detergent then, was Rs.13 perk. Dr Patel eventually started a new segment in the Indian domestic detergent market

The Entrepreneurial Process

Stage 1: Idea Generation. The entrepreneurial process begins with the idea that the entrepreneur has thought of. The idea is a problem that has the potential to be solved.
Stage2:Germination or Recognition. In this stage, a possible solution to the identified problem is considered.
Stage3:Preparation or Rationalization. The problem is studied further, and research is done to discover how others have tried to solve the same problem.
Stage 4: Incubation or Fantasizing. This stage involves creative thinking to come up with more ideas. Less thought is given to the problem areas.
Stage5:Feasibility Study: The next step is creating a feasibility study to determine if the idea will make a profit and if it should be seen.
Stage6:Illumination or Realization. This is when all rocky area ssuddenly become clear. Entrepreneur feels confident that their idea has merit .
Stage7:Verification or Validation.In this final stage, the idea is verified to see if it works an disfunctional.

Introduction to the entrepreneurship ecosystem
The entrepreneurship support ecosystem signifies the collective and complete nature of entrepreneurship. New companies emerge and flourish not only because of the courageous, visionary entrepreneurs who launch them, but they thrive as they are set in an environment or'ecosystem'made of private and public participants. These players nurture and sustain the new ventures, facilitating the entrepreneurs'efforts.

An entrepreneurship ecosystem comprises the following six domains:

- **Favorable Culture**: This includes elements such as tolerance of risk and errors, valuable networking and positive social standing of the entrepreneur
- **Facilitating Policies & Leadership**: This includes regulatory framework incentives and the existence of public research institutes
- **Financing Options**: Angel financing, venture capitalists and micro-loans would be good examples of this is human capital.Human Capital refers to trained and untrained labour, entrepreneurs and entrepreneurship training programmers, etc.
- **Conducive Markets for Products & Services**: This refers to the existence or scope of the presence of a market for the product/service
- **Institutional & Infrastructural Support**: This includes legal and financing advisers, telecommunications, digital and transportation infrastructure, and entrepreneurship networking programmers.

These domains indicate whether there is a robust entrepreneurship support eco system and what actions the government should take to encourage this ecosystem further. The six fields and their various elements have been graphically depicted.

Every entrepreneurship support ecosystem is unique, and all ecosystem elements are interdependent. Although the above features broadly describe every region's entrepreneurship ecosystem, each ecosystem results from the hundred factors interacting in highly complex and particular ways.

Entrepreneurship ecosystems eventually become (essentially) self-sustaining. When the six domains are resilient enough, they are mutually beneficial. At this point, government involvement can and should be significantly minimized. Public leaders do not need to invest a lot to sustain the ecosystem. The entrepreneurship ecosystem incentives must be formulated to be self-liquidating, hence focusing on the sustainability of the environment.

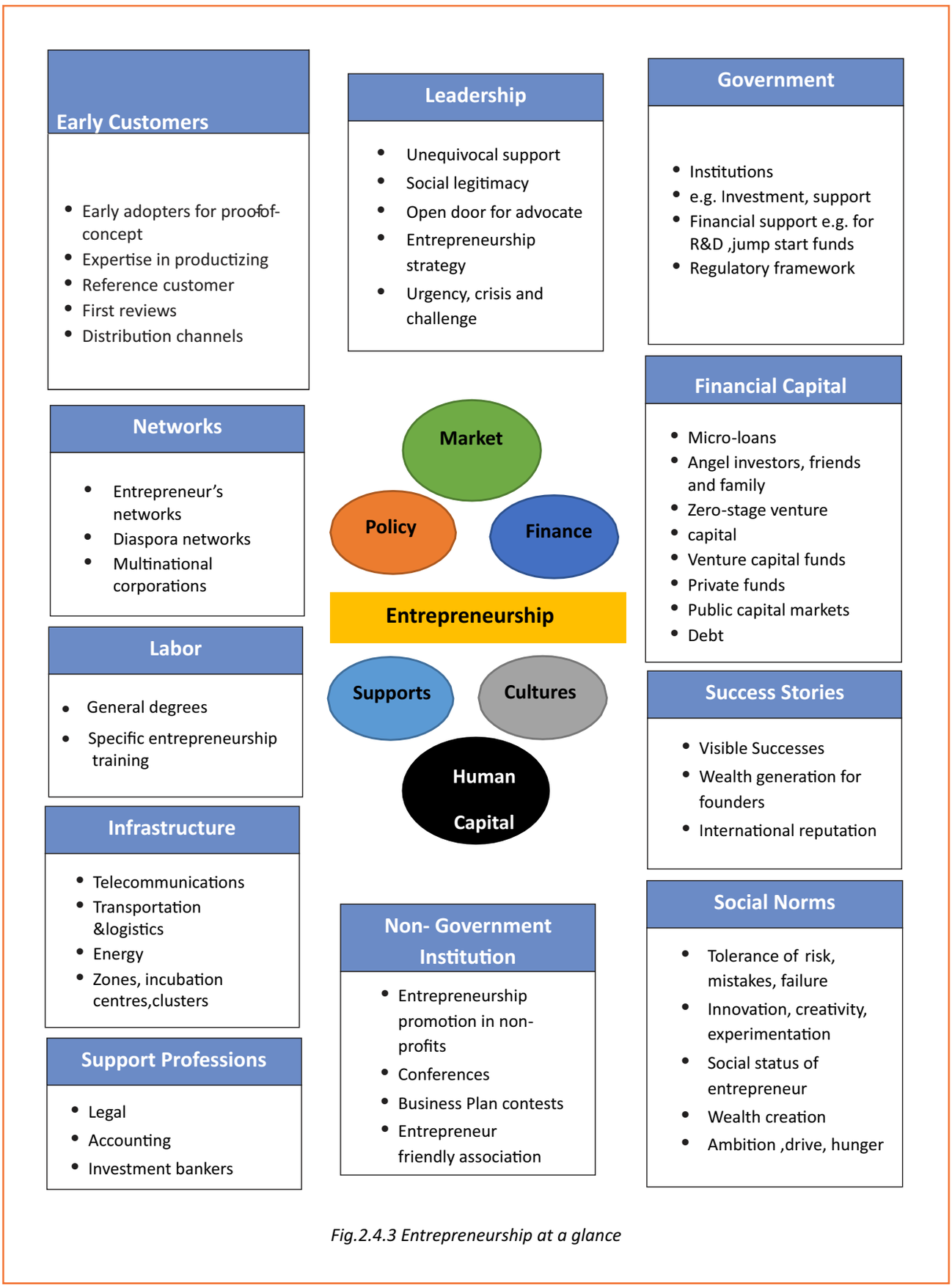


Fig.2.4.3 Entrepreneurship at a glance

Make in India campaign

Every entrepreneur has specific needs .Some of their essential needs are:

- To easily get loans
- To easily find investors
- To get tax exemptions
- To easily access resources and good infrastructure
- To enjoy a procedure that is free of hassles and is quick
- To be able to partner with other firms easily

The Make in India campaign, launched by Prime Minister Modi, aims to satisfy all these needs of young, aspiring entrepreneurs. Its objective is to:

- Make investment easy
- Support new ideas
- Enhance skill development
- Safeguard the visions of entrepreneurs
- Create state-of-the-art facilities for manufacturing goods

Key schemes to promote entrepreneurs

The government offers many schemes to support entrepreneurs. These schemes are run by various Ministries/Departments of the Government of India to support First Generation Entrepreneurs. Take a look at a few key strategies to promote entrepreneurship:

Name of the scheme

- Pradhan Mantri MUDRA Yojana-Micro Units Development and Refinance Agency (MUDRA),
- STAND UP INDIA
- Prime Minister Employment Generation Programme(PMEGP)
- International Cooperation
- Performance and CreditRating
- Marketing Assistance Scheme
- Reimbursement of Registration Fee for Bar Coding
- Enable Participation of MSMEs in State/District level Trade Fairs and Provide Funding Support
- Capital Subsidy Support on Credit forTechnology gradation
- Credit Guarantee Fund for Micro and Small Enterprise(CGFMSE)
- Reimbursement of Certification Fees for Acquiring ISO Standards
- Agricultural Marketing
- Small Agricultural Marketing
- Mega Food Park
- Adivasi Mahila Sashaktikaran Yojana

Pradhan Mantri mudra Yojana - Micro Units Development and Refinance Agency (MUDRA)Description Under the aegis support of Pradhan Mantri MUDRA Yojana, MUDRA has already created its initial products/schemes. The interventions have been named 'Shishu', 'Kishor', and 'Tarun' to signify the stage of growth/development and funding needs of the beneficiary micro unit entrepreneur and also provide a reference point for the next phase of graduation/growth to look forward to:

a. Shishu: Covering loans up to Rs.50,000/-

b. Kishor:Covering loans aboveRs.50,000/-and upto Rs.5lakh

c. Tarun: Covering loans above Rs.5lakhs to Rs.10lakh

Who can apply?
Any Indian citizen who has a business plan for a non-farm sector income-generating activity such as processing, trading or service sector and whose credit need is less than Rs.10 Lakhs can approach either a Bank, MFI, or NBFC for availing of MUDRA loans under Pradhan Mantri Mudra Yojana(PMMY).

Stand up India
The objective of the Stand up India scheme is to facilitate bank loans between Rs.10 lakhs and Rs.1 crore to atleast one Schedule Caste(SC)or Scheduled Tribe(ST) borrower and atleast one-woman

Borrower per bank branch for a Green field enterprise. This enterprise maybe in manufacturing, services or the trading sector. In the case of non-Individual enterprises, at least 51% of the shareholding and controlling stake should beheld by either an SC/ST or Woman Entrepreneur.

Who can apply?
ST, SC & Women

Prime minister employment generation programme (PMEGP) description
The Scheme is implemented by Khadi and Village Industries Commission (KVIC) as then odal Agency at National level. At the State level, the Scheme is implemented through State KVIC Directorates, State Khadi and Village Industries Boards (KVIBs), District Industries Centres (DICs),and banks. The Government subsidy under the Scheme is routed by KVIC through identified banks for eventual distribution to the beneficiaries/entrepreneurs in their bank accounts.

Nature of assistance
The maximum cost of the project/unit admissible under the manufacturing sector is Rs.25 lakhs, and under the business/service sectoris Rs.10 lakhs. Levels of funding under PMEGP

Categories of beneficiaries under	Beneficiary's	Rate of Subsidy
Area (location of project/unit)		**Urban-Rural**
General Category	10%	**15%**
Special (including SC/ST/OBC/Minorities/Women, Ex	05%	**25%**
Service members, Physically handicapped, NER, Hill and Border Areas, etc.		**35%**

Table 2.4.3 Levels of funding under PMEGP

The balance amount of the total project cost will be provided by Banks as a term loan as well as working capital.

Who can apply?

Any individual above 18 years of age. Atleast VIII standard pass for projects costing above Rs.10 lakhs in the manufacturing sector and above Rs.5 lakhs in the business/service sector. Only new projects are considered for sanction under PMEGP. Self Help Groups (including those belonging to BPL provided that they have not availed benefits under any other Scheme), Institutions registered under Societies Registration Act, 1860; Production Co-operative Societies, and Charitable Trusts are also eligible. Existing Units (under PMRY, REGP or any other scheme of the Government of India or State Government)and the units that have already availed of Government Subsidy under any different Government of India or State Government are NOT eligible.

International cooperation description

The Scheme would cover the following activities:

- Deputation of MSME business delegations to other countries for exploring new areas of technology infusion/up gradation, facilitating joint ventures, improving the market of MSMEs products, foreign collaborations, etc.
- Participation by Indian MSMEs in international exhibitions, trade fairs ,and buyer-seller meets in foreign countries as well as in India, in which there is global participation
- Holding international conferences and seminars on topics and themes of interest to the MSME

Nature of assistance

IC Scheme provides financial assistance towards the air fare and space rent of entrepreneurs. Service is provided based on size and the type of enterprise.

Who can apply?

- State/Central Government Organisations;
- Industry/Enterprise Associations; and
- Registered Societies/Trusts and Organisations associated with the promotion and development of MSMEs

Performance and credit rating for micro and small enterprises description

The scheme aims to create awareness amongst micro & small enterprises about the strengths and weaknesses of their operations and their credit worthiness.

Nature of assistance

Turn Over	The fee to be reimbursed by the Ministry of MSME
Upto Rs.50 lacs	75% of the fee charged by the rating agency is subject to a ceiling o Rs.15,000/-
Above Rs.50 lacs to Rs.200 lacs	75% of the fee charged by the rating agency is subject to a Ceiling of Rs.30,0001/-
Above Rs.200 lacs	75 % of the fee charged by the rating agency is subject to a Ceiling of Rs.40,000/-

Table 2.4.4 Performance and Credit Rating for Micro and Small Enterprises

Who can apply?
Any enterprise registered in India as a micro or small enterprise is eligible to apply.

Marketing assistance scheme description
- Assistance is provided for the following activities:
- Organizing exhibitions abroad and participating in international exhibitions/trade fairs
- Co-sponsoring exhibitions organized by other organizations/industry associations/ agencies
- Organizing buyer-sellermeets,intensive campaigns and marketing promotion events

Nature of assistance
Financial assistance of up to 95% of entrepreneurs' airfare and space rent. Service is provided based on size and the type of enterprise. Financial aid forco-sponsoring would be limited to 40% of the net expenditure, subject to the maximum amount of Rs.5lakhs.

Who can apply?
MSMEs, Industry Associations and other organizations related to the MSME sector.
- Reimbursement of Registration Fee for Bar Coding Description the financial assistance is provided towards 75% reimbursement of a one-time registration fee and 75% of the annual recurring fee for the first three years paid by MSEs to GS1 India for using bar coding.

Nature of assistance
Funding support for reimbursement of 75% of one-time and recurring barcode registration fees.

Who can apply?
All MSMEs with EM registration.

Enabling participation of MSMEs in state/district level trade fairs and providing funding support
Description
Provide a marketing platform to manufacturing MSMEs by enabling their participation in state/district level exhibitions organized by state/district authorities/associations.

Nature of assistance
1. Free registration for participating in trade fairs
2. Note: The selection of participants will be made by the MSME-DIs post the application submission.
3. Reimburse 50% of the to and fro actual fare by shortest distance/direct train(limited to ACII-tier class) from the nearest railway station /bus fare to the place of exhibition and 50% space rental charges for MSMEs (General category entrepreneurs).
4. For Women/SC/ST entrepreneurs & entrepreneurs from the North Eastern Region Govt. of India will reimburse 80% of the items listed above in Point(2).
5. Note:The total reimbursement will be max. Rs. 30,000/-per unit for the SC/ ST/ Women/ Physically
6. Disabled entrepreneurs, while for the other units, the max. The limit will be Rs. 20,000/- per person per MSME unit.

Note: The participant must submit follow-up proofs post attending the event to claim reimbursement. After logging in online under the section "My Applications" or directly contacting a DI office, explanations can be proposed.

Who can apply?
All MSMEs with EM registration

Capital subsidy support on credit for technology gradation description
MSMEs can get a capital subsidy(~15%)on credit for technology gradation.

Nature of assistance
Financial assistance for availing of credit and loans.

Who can apply?
Banks and financial institutions can apply to DC-MSME to avail of support
MSMEs need to directly contact the respective banks for getting credit and capital subsidy

How to apply?
If you are a financial institution, click on the "Apply Now" button or else you can also directly contact the Office of DC-MSME. You can view the contact details of the Office of DC-MSME. If you are an MSME, contact the respective banks/financial institutions listed in the scheme guidelines.

Provision of collateral-free credit for MSMEs
Description
Banks and financial institutions are provided funding assistance under this scheme so that they can, inturn, lend collateral-free credit to MSMEs.

Nature of assistance
Funding support to banks and financial institutions for lending collateral-free credit to MSMEs.

Who can apply?
Banks and financial institutions can apply to the office of DC-MSME/MSME-DIs for availing of the support. MSMEs need to directly contact the respective banks for getting credit.

Reimbursement of certification fees for acquiring ISO standards
ISO9000/ISO14001 Certification Reimbursement.

Description
The GoI assistance will be provided for a one-time reimbursement of expenditure to such MSME manufacturing units which acquire ISO18000/ISO22000/ISO 27000 certification.

Nature of assistance
Reimbursement of expenditure incurred on acquiring ISO standards.

Who can apply?
MSMEs with EM registration.

Agricultural marketing description
A capital investment subsidy for construction/renovation of rural go-downs. Creation of scientific storage capacity and prevention of distress sale.

Nature of assistance
Subsidy @ 25% to farmers and 15% of the project cost to companies.

Who can apply?
NGOs,SHGs,companies,and co-operatives.

Small agricultural marketing description
Business development description provides venture capital assistance in the form of equity and arrange straining and visits of Agri-preneurs.

Farmers agriculture business consortium
Business development description provides venture capital assistance in the form of equity and arrange straining and visits of Agri-preneurs.

Nature of assistance
Financial assistance with a ceiling of Rs. 5 lakhs.

Who can apply?
Individuals, farmers, producer groups, partnership/propriety firms, SGHs, Agri-preneurs, etc.

Mega food park description
Mechanism links agricultural production and market to maximize value addition, enhance farmers' income, and create rural employment.

Nature of assistance
One-time capital grant of 50% of project cost with a limit of Rs. 50 crores.

Who can apply?
Farmers, farmer groups, SHGs.
Adivasi mahila sashakikaran yojana description
Concessional scheme for the economic development of ST women.

Nature of assistance
Term loan at concessional rates up to 90%of the scheme's cost.

Who can apply?
Scheduled Tribes Women

2.4.14 Risk Appetite & Resilience: Entrepreneurship and Risk

Entrepreneurs are inherently risk-takers. They are path-makers, not path-takers. Unlike a standard, Cautious person, an entrepreneur would not think twice about taking a chance on himself and his idea.

Quitting his job (their sole income)An entrepreneur is aware that while pursuing his dreams, assumptions can be proven wrong, and unforeseen events may arise. He knows that success is still not guaranteed after dealing with numerous problems. Entrepreneurship is synonymous with the ability to take risks. This ability, called risk- appetite, is an entrepreneurial trait that is partly genetic and partly acquired.

What is risk appetite?

Risk appetite is the extent to which a company is equipped to take risks to achieve its objectives. Essentially, it refers to the balance struck by the company between possible profits and the hazards caused by environmental changes (economic ecosystem, policies, etc.). Taking on more risk may lead to higher rewards but have a high probability of losses. However, being too conservative may go against the company as it can miss out on good opportunities to grow and reach its objectives. The levels of risk appetite can be broadly categorized as “low”, “medium”, and “high.” The company's entrepreneur(s) have to evaluate all potential alternatives and select the option most likely to succeed. Companies have varying levels of risk appetites for different objectives.

The levels depend on the following:

- The type of industry
- Market pressures
- Company objectives

For example, a startup with a revolutionary concept will have a very high-risk appetite. The start up can afford short- term failures before it achieves longer-term success. This type of appetite will not remain constant and will be adjusted to account for the company's present circumstances.

Entrepreneurship and resilience

Entrepreneurs are characterized by a set of qualities known as resilience.These qualities play a huge role in the early stages of developing an enterprise.Risk resilience is a unique character as it is believed to protect entrepreneurs against the threat of challenges and changes in the business environment.

What is entrepreneurial resilience?

Resilience describes individuals who can overcome setbacks related to their life and career aspirations. Are silent person is someone capable of easily and quickly recover from setbacks. For the entrepreneur, resilience is a critical trait.

Entrepreneurial resilience can be enhanced in the following ways:

- By developing a professional network of coaches and mentors
- Accepting that change is a part of life
- By viewing obstacles as something that can be overcome
-

Characteristics of are silient entrepreneur

The characteristics required to make an entrepreneur resilient enough to go the whole way in their business enterprise are:

- A solid internal sense of control
- Ability to diversify and expand
- Strong social connections
- Survivor attitude
- Skill to learn from setbacks
- Cash-flow conscious habits
- Ability to look at the bigger picture
- Attention to detail
-

Understanding success and failures in entrepreneurship

Shyam is a famous entrepreneur known for his success story. But what most people don't know is that Shyam failed numerous times before his enterprise became a success. Read his interview to get an idea of what entrepreneurship is about from an entrepreneur who has tried and succeeded.

Interviewer -Shyam,I have heard that entrepreneurs are significant risk-takers who are never afraid off ailing. Is this true?
Shyam - Haha, no, of course, it's not true! Most people believe that entrepreneurs need to be fearlessly enthusiastic.But the truth is,fear is a very usual and valid human reaction, especially when planning to start your own business! My biggest fear was the fear of failing. The reality is entrepreneurs fail as much as they succeed.The trick is not to allow the fear of failing to stop you from going ahead with your plans. Remember, failures are lessons for future success!

Interviewer-What, according to you, is why entrepreneurs fail?
Shyam -Well, there is no single reason why entrepreneurs fail. An entrepreneur can fail due to numerous reasons.You could die because you have allowed your fear of failure to defeat you.You could forget because you are unwilling to delegate (distribute) work. The saying goes, "You can do any thing, but not everything!"You could fail because you gave up too quickly–may be you were not persistent enough. You could die because you were focusing your energy on small, insignificant tasks and ignoring the most critical studies. Other reasons for failing are partnering with the wrong people, not being able to sell your product to the right customers at the right time at the right price... and many more reasons!

Interviewer –As an entrepreneur, how do you feel failure should be looked at?
Shyam –I believe we should consider failure an asset rather than something negative. The way I see it, if you have an idea, you should try to make it work, even if there is a chance that you will fail. That's because not trying is a failure right there, anyway! And failure is not the worst thing that can happen. I think having regrets because of not trying and wondering 'what if 'is far worse than trying and failing.

Interviewer –How did you feel when you failed for the first time ?
Shyam -I was utterly heartbroken! It was a harrowing experience. But the good news is you do recover from the failure. And with every subsequent loss, the recovery process gets a lot easier. That's because you start to see each failure more as a lesson that will eventually help you succeed rather than as an obstacle you cannot overcome. You will begin to realize that failure has many benefits.

Interviewer –Can you tell us about some of the benefits of failing?
Shyam -One of the benefits I have personally experienced from failing is that the failure made me see things in a new light. It gave me answers that I didn't have before.Failure can make you a lot stronger.It also helps keep you region control.

Interviewer -What advice would you give entrepreneurs who are about to start their enterprises?
Shyam -I would tell them to do their research and ensure that their product is something customers want.I'dask them to pick their partners and employees wisely and cautiously. I'd tell them it's essential to push and market your product as aggressively as possible. I would warn them that starting an enterprise is very expensive and that they should be prepared for a situation where they run out of money. I would tell them to create long-term goals and put a plan in action to achieve that goals. I would say to them to build a truly unique product.Be very careful and ensure that you are not copying another startup. Lastly,I'd tell them that it's essential that they find the right investors.

Interviewer -That's some constructive advice, Shyam! I'm sure this will help all entrepreneurs to be more prepared before they begin their journey! Thank you for all your insight!

2.4.15 Market Study/the 4 P's of Marketing

Market research is the process of gathering, analyzing and interpreting market information on a product or service being sold in that market.It also includes information on the following:

- Past, present and prospective customers
- Customer characteristics and spending habits
- The location and needs of the target market
- The overall industry
- Relevant competitors

Market research involves two types of data:

1. Primary information. This is research collected by yourself or by someone hired by you.
2. Secondary information. This is research that already exists and is out there for you to find

Primary research

Primary research can be of two types:

1. Exploratory –This is open-ended and usually involves detailed, unstructured interviews
2. Specific -This is precise and involves structured, formal interviews. Conducting specific research is more expensive than conducting exploratory research.

Secondary research

Secondary research uses outside information. Some familiar secondary sources are:

- Public sources are usually accessible and have a lot of good information. Examples are government departments, business departments of public libraries etc.
- Commercial sources -This Offers valuable information but usually require a fee to be paid. Examples are research and trade associations, banks and other financial institutions etc.
- Educational institutions -These offer a wealth of information. Examples are colleges,universities,technical institutes etc.

The 4Ps of marketing

The 4Ps of marketing is Product, Price, Promotion and Place.Let's look at each of these 4Ps in detail.

Product – A product can be:

- A tangible good
- An intangible service

Whatever your product is, you must clearly understand what you are offering and its unique characteristics before you begin the marketing process. Some questions to ask yourself are:

- What does the customer want from the product/service?
- What needs does it satisfy?
- Are there anymore features that can be added?
- Does it have any expensive and unnecessary features?
- How will customers use it?
- Whats should it be called?
- How is it different from similar products?
- How much will it cost to produce?
- Can it be sold at a profit?

Price - Once all the Product elements have been established, the Price factor needs to be considered. The Price of a Product will depend on several factors, such as profit margins, supply, demand and marketing strategy.

Some questions to ask yourself are:

1. What is the value of the product/service to customers?
2. Do local products/services have established price points?
3. Is the customer price sensitive?
4. Should discounts be offered?
5. How is your cost compared to that of your competitors?

Promotion - Once you are particular about your Product and price, the next step is to look at ways to promote it. Some critical elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.

Some questions to ask yourself are:

1. Where should you promote your product or service?
2. What is the best medium to use to reach your target audience?
3. When would be the best time to advance your development?
4. How are your competitors promoting their products?

Place

According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, and at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

Some questions to ask yourself are:

a. Will your product or service be looked for in a physical store, online or both?
b. What should you do to access the most appropriate distribution channels?
c. Will you require a sales force?
d. Where are your competitors offering their products or services?
e. Should you following your competitors' footsteps?
f. Should you do something different from your competitors?

Importance of an IDEA

Ideas are the foundation of progress. An idea can be small or ground-breaking, easy to accomplish, or complicated to implement. Whatever the case, the fact that it is an idea gives it merit. Without ideas, nothing is possible. Most people are afraid to speak out their ideas for fear of ridicule. However, if an entrepreneur wants to remain competitive and innovative, you need to bring her ideas out into the light. Some ways to do this are by:

1. Establishing a culture of brainstorming where you invite all interested parties to contribute.
2. Discussing ideas out loud so that people can add their thoughts, views, and opinions to them.
3. Being open-minded and not limiting your ideas, even if the picture who have seems ridiculous.
4. Not discarding ideas that you don't work on immediately, but instead making a note of them and shelving them so they can be revisited at a later date.

2.4.16 Business Entity Concept: Basic Business Terminology

If you aim to start and run a business, you must have a good understanding of fundamental business terms. Every entrepreneur should be well-versed in the following terms:

1. **Accounting** – A systematic method of recording and reporting financial transactions
2. **Accounts payable** –Money owed by a company to its creditors
3. **Accounts Receivable** –The amount a company is owed by its clients
4. **Assets** –The value of everything a company owns and uses to conduct its business
5. **Balance Sheet** -A snapshot of a company's assets, liabilities and owner's equity at a given moment
6. **Bottom Line** –The total amount a firm has earned or lost at the end of a month
7. **Business** –An organization that operates to make a profit
8. **Business to Business(B2B)** –A business that sells goods or services to another business
9. **Business to Consumer(B2C)** –A company that sells goods or services directly to the end user
10. **Capital** -The money a business has in its accounts, assets and investments. The two main types of capital are debt and equity
11. **Cash Flow** –The overall movement of funds through a business each month, including income **and expenses**
12. **Cash Flow Statement** –A statement showing the money that entered and exited a business during a specific period
13. **Contract** –A formal agreement to do work for pay
14. **Depreciation** –The degrading value of an asset over time
15. **Expense** –The costs that a business incurs through its operations
16. **Finance** –The management and allocation of money and other assets
17. **Financial Report** –A comprehensive account of a business' transactions and expenses
18. **Fixed Cost** –A one-time expense
19. n**come Statement(Profit and Loss Statement)** –Shows the profitability of a business during a period
20. **Liabilities** –The value of what a business owes to someone else
21. **Marketing** –The process of promoting, selling and distributing a productor service
22. **Net Income/Profit** –Revenues minus expenses
23. **Net Worth** –The total value of a business
24. **Pay back Period** –The amount of time it takes to recover the initial investment of a business
25. **Profit Margin** –The ratio of profit divided by revenue, displayed as a percentage
26. Return on Investment (ROI) –The amount of money a business gets as a return from an investment
27. **Revenue** –The total amount of income before expenses are subtracted
28. **Sales Prospect** –A potential customer
29. **Supplier** –A provider of supplies to a business
30. **Target Market** –A specific group of customers at which a company's products and services are aimed
31. **Valuation** –An estimate of the overall worth of the business
32. **Variable Cost** -Expenses that change in proportion to the activity of a business
33. **Working Capital** -Calculated as current assets minus current liabilities

Business Transactions –There are three types of business transactions. These are:

- **Simple Transactions–**Usually a single transaction between a vendor and a customer. For example: Buying a cup of coffee.

- **Complex Transactions**–These transactions go through many events before they can be completed. For example: Buying a house.
- **On going transactions**–These transactions usually require a contract, for example, a contract with a vendor

Basic accounting formulas
Look at some critical accounting formulas every entrepreneur needs to know.

The Accounting Equation is the value of everything a company owns and uses to conduct its business.

Formula: Assets=Liability + Owner's Equity
Net Income: This is the profit of the company.

Formula: Net Income=Revenues– Expenses
Break-Even Point: This is the point at which the company will not make a profit or a loss. The total cost and total revenues are equal.

Formula: Break-Even=Fixed Costs/Sales Price–Variable Cost per Unit
Cash Ratio: This tells us about the liquidity of a company.

Formula: Cash Ratio=Cash/Current Liabilities
Profit Margin: This is shown as a percentage. It shows the percentage of sales left after the business pays all the expenses.

Formula: Profit Margin=Net Income/Sales
Debt-to-Equity Ratio: This ratio shows how much equity and debt a company uses to finance its assets and whether the shareholder equity can fulfill obligations to creditors if the business starts making a loss.

Formula :Debt-to-Equity Ratio=Total Liabilities/Total Equity
Cost of Goods Sold: This is the total of all prices used to create a product or service.

Formula: Cost of Goods Sold=Cost of Materials/Inventory–Cost of Outputs
Return on Investment(ROI):This is usually shown as a percentage. It calculates the profits of an investment as a percentage of the original cost.

Formula: ROI= Net Profit/Total Investment *100
Simple Interest: This is money you can earn by initially investing some money(the principal).

Formula:
A =P(1+rt); R=r*100
Where:
A = Total Accrued Amount (principal + interest) P =Principal Amount
I=Interest Amount,
r = Rate of Interest per year in decimal; r =R/100
t=Period involved in months or years

Annual Compound Interest: The calculates the addition of interest to the principal sum of a loan or deposit.

1. Formula:
A=P(1 +r/n)^nt
Where: A= the future value of the investment/ loan, including interest
P= the principal investment amount (the initial depositor loan amount), r = the annual interest rate(decimal)
n = the number of times that interest is compounded per year t= the number of years the money is invested or borrowed for.

2.4.17 CRM and Networking

What is CRM
CRM stands for Customer Relationship Management. Originally the expression Customer Relationship Management meant managing one's relationship with customers. However, today it refers to IT systems and software designed to help companies manage their relationships.

The need for CRM
The better a company can manage its relationships with its customers, the higher the chances of the company's success. Success in retaining existing customers and expanding the enterprise is paramount for any entrepreneur. This is why daily IT systems that focus on addressing customer problems are increasingly demanding.

Customer needs change over time, and technology can make understanding what customers want easier. This insight helps companies to be more responsive to the needs of their customers. It enables them to modify their business operations when required so that their customers are always served in the best manner possible. Simply put, CRM helps companies recognize the value of their clients and enables them to capitalize on improved customer relations.

Benefits of CRM
CRM has several significant benefits:
It helps improve relations with existing customers, which can lead to the following:
- Increased sales
- Identification of customer needs
- Cross-selling of products
- It results in better marketing of one's products or services
- It enhances customer satisfaction and retention
- It improves profitability by identifying and focusing on the most profitable customers

What is networking?
In business, networking means leveraging your business and personal connections to bring in a regular supply of new business. This marketing method is effective as well as low cost.It is a great way to develop sales opportunities and contacts. Networking can be based on referrals and introductions or via phone, email and social and business networking websites.

The need for networking
Networking is an essential personal skill for business people, but it is even more important for entrepreneurs. The process of networking has its roots in relationship building. Networking improves communication and a more substantial presence in the entrepreneurial ecosystem. This helps build strong relationships with other entrepreneurs. Business networking events

held across the globe play a huge role in connecting like-minded entrepreneurs who share the same fundamental beliefs in communication, exchanging ideas and converting ideas into realities. Such networking events also play a crucial role in connecting entrepreneurs with potential investors. Entrepreneurs may have vastly different experiences and backgrounds, but they all have a common goal in mind–they all seek connection, inspiration, advice, opportunities and mentors. Networking offers them a platform to do just that.

Benefits of networking

Networking offers numerous benefits for entrepreneurs. Some of the significant benefits are:

- Getting high-quality leads
- Increased business opportunities
- Good source of relevant connections
- Advice from like-minded entrepreneurs
- Gaining visibility and raising your profile
- Meeting positive and enthusiastic people Increases self-confidence
- Satisfaction from helping others
- Building strong and lasting friendships

2.4.18 Business Plan: Why Set Goals?

Setting goals is essential because it gives you long-term vision and short-term motivation. Plan scan be short-term, medium-term and long-term.

Short-Term Goals

- These are specific goals for the immediate future.
- Example -Repairing a machine that has failed.

Medium-Term Goals

- These goals are built on your short-term goals
- They do not need to be as specific as your short-term goals
- Example –Arranging for a service contract to ensure your machines don't fail again.

Long-Term Goals

- These goals require time and planning
- They usually take a year or more to achieve

Example - Planning your expenses so you can buy new machinery.

Why Create a Business Plan?

A business plan is a tool for understanding how your business is put together. It can monitor progress, foster accountability and control the business's fate. It usually offers a 3-5-year projection and outlines the plan the company intends to follow to grow its revenues. A business plan is also an essential tool for investors. A business plan typically comprises eight elements.

Elements of a business plan

Executive Summary - The executive summary follows the title page. The resume should clearly state your desires as a business owner in a straightforward and businesslike way. It is an overview of your business and your plans. Ideally, this should not be more than 1-2 pages.

Your Executive Summary should include the following:

- The Mission Statement: Explain what your business is all about

Example: Nike's Mission Statement Nike's mission statement is "To bring inspiration and Innovation to every athlete in the world."

- Company Information: Provide information like when your business was formed, the names and roles of the founders, the number of employees, your business location(s) etc.
- Growth Highlights: Mention examples of company growth. Use graphs and charts where possible.
- Your Products/Services: Describe the products or services provided
- Financial Information: Provide details on current bank and investors
- Summarize plans: Describe where you see your business in the future

Business Description - The second section of your business plan needs to provide a detailed review of the different elements of your business. This will help potential investors to correctly understand your business goal and the uniqueness of your offering.

Your Business Description should include the following:

- A description of the nature of your business
- The market needs that you are aiming to satisfy
- How do your products and services meet these need
- The specific consumers and organizations that you intend to serve
- Your specific competitive advantages

Market analysis - Themarketanalysissectionusuallyfollowsthebusinessdescription.This section aims to showcase your industry and market knowledge. This is also where you should lay down your research findings and conclusions.

Your Market Analysis should include the following:

- Your industry description and outlook
- Information on your target market
- The needs and demographics of your target audience
- The size of your target market
- The amount of market share you want to capture
- Your pricing structures
- Your competitive analysis
- Any regulatory requirements

Organization &management – This section should come immediately after the market analysis. Your organization & management section should include the following:

- Your company's organizational structure
- Details of your company's ownership
- Details of your management team
- Qualifications of your board of directors
- Detailed descriptions of each division/department and its function
- The salary and benefits package that you offer your people

Service or product line - The next section is the service or product line section. This is where you describe your service or product and stress its benefits to potential and current customers. Explain in detail why your product of choice will fulfil the needs of your target audience.

Your Service or Product Line section should include the following:

- A description of your product/service
- A description of your product or service's life cycle
- A list of any copyright or patent filings
- A description of any R&D activities that you are involved in or planning

Marketing &sales - Once the Service or Product Line section of your plan has been completed, you should start on the description of the marketing and sales management strategy for your business. Your Marketing section should include the following methods:

- **Market penetration strategy** - This strategy focuses on selling your existing products or services in existing markets to increase your market share
- **Growth strategy** - This strategy focuses on increasing the amount of market share, even if it reduces earnings in the short-term
- **Channels of distribution strategy** - These can be wholesalers, retailers, distributors and even the internet
- **Communication strategy** - These can be written strategies (e-mail, text, chat), oral strategies (phone calls, video chats, face-to-face conversations), non-verbal strategies (body language, facial expressions, tone of voice) and visual strategies (signs, web pages, illustrations).
- Your Sales section should include the following information:
- A Sales force strategy: This strategy focuses on increasing the revenue of the enterprise
- A breakdown of your sales activities: This means detailing how you intend to sell your products or services – will you sell it offline or online, how many units do you want to sell, what price do you plan to sell each, etc.

Funding request – This section is specifically for those who require funding for their venture. The Funding Request section should include the following information:

- How much funding do you currently require
- How much funding you will need over the next five years. This will depend on your long-term goals
- The type of funding you want and how you plan to use it. Do you want funds that can be used only for a specific purpose or financing that can be used for any requirement?
- Strategic plans for the future. This will involve detailing your long-term goals – what these plans are and how much money you will require to put these plans in motions
- Historical and prospective financial information. This can be done by creating and maintaining all your financial records from the moment your enterprise started to the present day. Documents required for this are your balance sheet which contains details of your company's assets and liabilities, your income statement, which lists your company's revenues, expenses and net income for the year; your tax returns(usually for the last three years) and your cash flow budget which lists the cash that came in, the money that went out and stated whether you had a cash deficit (negative balance) or surplus(positive balance)at the end of each month.

Financial Planning - Before building your enterprise, you need to plan your finances. Take a look at the steps for financial planning:

Step 1 -Create a financial plan. This should include your goals, strategies and timelines for accomplishing these goals.
Step2 –Organize all your important financial documents. Maintain a file to hold your investment details, bank statements, tax papers, credit card bills, insurance papers, and other financial records.
Step 3 -Calculate your net worth. This means figuring out what you own (assets like your house, bank accounts, investments etc.) and then subtracting what you owe (liabilities like loans, pending credit card amounts etc.). The part you are left with is your net worth.
Step 4 -Make a spending plan. This man writes down in detail where your money will come from and where it will go.
Step 5 -Build an emergency fund. A good emergency fund contains enough money to cover at least 6months'expenses.
Step 6 -Set up your insurance. Insurance provides long-term financial security and protects you against risk.

Risk management
As an entrepreneur, you must evaluate the risks involved with the type of enterprise
You want to start before you begin your company. Once you have identified

Potential risks, you can take steps to reduce them. Some ways to manage risks are:

- Research similar businesses and find out about their risks and how they were minimized
- Evaluate current market trends and find out if the public is well receiving similar products or services that launched a while ago
- Think about whether you have the required expertise to launch your product or service
- Examine your finances and see if you have enough income to start your enterprise

2.4.19 Procedure and Formalities for Bank Finance: the need for Bank Finance

For entrepreneurs, one of the most difficult challenges faced involves securing funds for startups. With numerous funding options available, entrepreneurs must closely examine which funding methodology works best. In India, banks are one of the largest funders of startups, offering funding thousands of startups every year.

What information should entrepreneurs offer bank for funding?
When approaching a bank, entrepreneurs must clearly understand the different criteria that banks use to screen, rate and process loan applications. Entrepreneurs must also be aware of the importance of providing banks with accurate and correct information. It is now easier than ever for financial institutions to track any default behavior of loan applicants. Entrepreneurs looking for funding from banks must provide banks with information relating to their general credentials ,financial situation and guarantees or collaterals that can be offered.

General credentials

This is where you, as an entrepreneur, provide the bank with background information on yourself. Such information includes:

- Letter(s) of Introduction: This letter should be written by a respected business person who knows you well enough to introduce you. This letter aims to set across your achievements and vouch for your character and integrity
- Your Profile: This is your resume. You need to give the bank a good idea of your educational achievements, professional training, qualifications, employment record and achievements
- Business Brochure: A business brochure typically provides information on company products, clients, how long the business has been running, etc.
- Bank and Other References: If you have an account with another bank, providing those bank references is a good idea
- Proof of Company Ownership or Registration: In some cases, you may need to provide the bank with proof of company ownership and registration. A list of assets and liabilities may also be required

Financial situation

Banks will expect current financial information on your enterprise. The standard financial reports you should be prepared with are:

- Balance Sheet
- Cash-Flow Statement
- Business Plan
- Profit-and-Loss Account
- Projected Sales and Revenues
- Feasibility Study

Guarantees or collaterals

Usually, banks will refuse to grant you a loan without security. You can offer assets the bank can seize and sell off if you do not repay the loan. Fixed assets like machinery, equipment, vehicles etc.,are also considered security for loans.

The Lending Criteria of Banks

Your funding request will have a higher chance of success if you can satisfy the following lending criteria:

- Good cash flow
- Adequate shareholders' funds
- Adequate security
- Experience in business
- Good Reputation

The procedure

To apply for funding, the following procedure will need to be followed.

- Submit your application form and all other required documents to the bank.
- The bank will carefully assess your credit worthiness and assign ratings by analyzing your business information concerning parameters like management, financial, operational and industry information, as well as past loan performance.
- The bank will decide whether or not you should be given funding.

2.4.20 Enterprise Management - an Overview: How to manage your Enterprise?

To manage your enterprise effectively, you need to look at many different aspects, from working the day-to-day activities to figuring out how to handle a large-scale event. Let's take a look at some simple steps to manage your company effectively.

Step 1 : Use your leadership skills and ask for advice when required - Let's take the example of Ramu, an entrepreneur who has recently started his enterprise. Ramu has good leadership skills–he is honest, communicates well, and knows how to delegate work. These leadership skills help Ramu in the management of his enterprise. However, sometimes Ramu comes across situations he is unsure how to handle. What should Ramu do in this case? One solution is for him to find a more experienced manager who is willing toment or him. Another solution is for Ramu to use his networking skills to connect with managers from other organizations who can advise him on handling such situations.

Step 2 : Divide your work amongst others –realize that you cannot handle everything yourself - Even the most skilled manager in the world will be unable to manage every single task that an enterprise demands. An intelligent manager must realize that the key to managing his enterprise lies individing all his work among those around him. This is known as delegation. However, delegating is not enough. A manager must charge effectively if he wants to see results. This is important because delegating, when done incorrectly, can result in you creating even more work for yourself. To empower effectively, you can start by making two lists. One list should contain the things you know you need to handle yourself.

The second list should contain the things you are confident canbe given to others to manage and handle. Besides incorrect delegation, another issue that may arise is over-delegation. This means giving away too many of your tasks to others.Theproblem with this is the more tasks you delegate, the more time you will spend tracking and monitoring the work progress of those you have handed the functions. This will leave you with very little time to finish your work.

Step 3: Hire the right people for the job – Hiring the right people goes along way towards effectively managing your enterprise. To hire the best people for the job, you must be very careful with your interview process. You should ask potential candidates the right questions and evaluate their answers carefully. Carrying out background checks is always a good practice. Running a credit check is also a good idea, especially if the people you are planning to hire will handle your money. Create a detailed job description for each role you want to fill and ensure that all candidates have a clear and correct understanding of the job description. You should also have an employee manual in place, where you put down every expectation from your employees. All these actions will help ensure that the right people are approached to run your enterprise.

Step 4: Motivate your employees and train them well - Your enterprise can only be managed effectively if your employees are motivated to work hard for your enterprise. Part of being inspired involves your employees believing in the vision and mission of your enterprise and genuinely wanting to make efforts towards pursuing the same. You can motivate your employees with recognition, bonuses and rewards for achievements. You can also encourage them by telling them how their efforts have led to the company's success. This will help them feel pride and give them a sense of responsibility, increasing their motivation. Besides motivating your people, your employees should be constantly trained in new practices and

technologies. Remember, training is not a one-time effort. It is a consistent effort that needs to be carried out regularly.

Step 5 : Train your people to handle your customers well - Your employees need to be well-versed in the art of customer management. This means they should understand their customers' wants and how to satisfy their needs. To truly understand this, they need to see how you deal effectively with customers. This is called leading by example. Show them how you sincerely listen to your clients and the efforts you put into understanding their requirements. Let them listen to the questions you ask your clients, so they know which questions are appropriate.

Step 6: Market your enterprise electively - Also, hire a marketing agency if you feel you need help in this area. Now that you know what is required to run your enterprise effectively put these steps into play and see how much easier managing your enterprise becomes!

Question to ask your self before considering entrepreneurship

- Why am I starting a business?
- What problem am I solving?
- Have others attempted to solve this problem before? Did they succeed or fail?
- Do I have a mentor or industry expert that I can call on?
- Who is my ideal customer?
- Who are my competitors?
- What makes my business idea different from other business ideas?
- What are the key features of my product or service?
- Have I done a SWOT analysis?
- What is the market size that will buy my product or service?
- To test the market, what would it take to build a minimum viable product?
- How much money do I need to get started?
- Will I need to get a loan?
- How soon will my products or services be available?
- When will I break even or make a profit?
- How will those who invest in my idea make a profit?
- How should I set up the legal structure of my business?
- What taxes will I need to pay?
- What kind of insurance will I need?
- Have I reached out to potential customers for feedback

Exercise

Answer the following questions:

1. What do you understand by stress management?

2. Explain types of e-commerce.

3. Write a short note on Digital India Campaign.

4. Explain different types of bank accounts.

5. Write a short letter on online banking.

6. Write a brief message on negotiation.

7. Explain SWOT analysis.

8. Who is an entrepreneur? Explain different types of entrepreneurs.

9. Describe the make in India campaign.

10. Write the full form of:

B2B	B2C	ROI	CRM
NEFT	IMPS	PMMY	RTGS

Notes

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

3. Prepare for the Production of Baked Products in Artisan Bakeries and Patisseries

FIC/N5002

Key Learning Objectives

At the end of this module, the trainees will be able to:

1. Describe the basics of baking science
2. Identify the different types of bakery products to be manufactured
3. List the raw materials, packaged materials, tools and equipment required for artisanal Production
4. Describe how to carry out tests such as biological, chemical and physical tests and organoleptic evaluation
5. Explain the elements of the production plan for producing the desired bakery products
6. Recall the process of fermentation, mixing, baking, molding, cutting, slicing, etc.

UNIT 3.1: Basics of Baking Science

Unit Objectives

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

1. Understanding the use and role of raw ingredients in the process of baking
2. FSSAI regulations to be followed for manufacturing of bakery products

3.1.1 Introduction to Basics of Baking Science

In any baking recipe, every ingredient has a purpose. For example, flour gives the structure to a cake, eggs bind the ingredients, baking powder and baking soda make it rise, fats like butter and oil make it less chewy, and sugar sweetens and keeps it moist.

Blending, folding, sifting, and stirring ensure the ingredients are properly combined. Cutting also combines elements, providing the final product bakes up flaky. Beating, creaming, kneading, and whipping incorporate air into the batter. The air pockets give the baked good its final texture after baking.

Baking science is a field of study that seeks to understand and more easily manipulate the scientific aspects of baking in a kitchen. This typically involves understanding how heat can change a dish and the chemical components of baking several different foods. In many ways, baking is simply a form of chemistry that results in edible results rather than other chemical solutions or creations. Baking science allows bakers and chefs to understand better how baking turn's base ingredients into a product far greater than the sum of its parts.

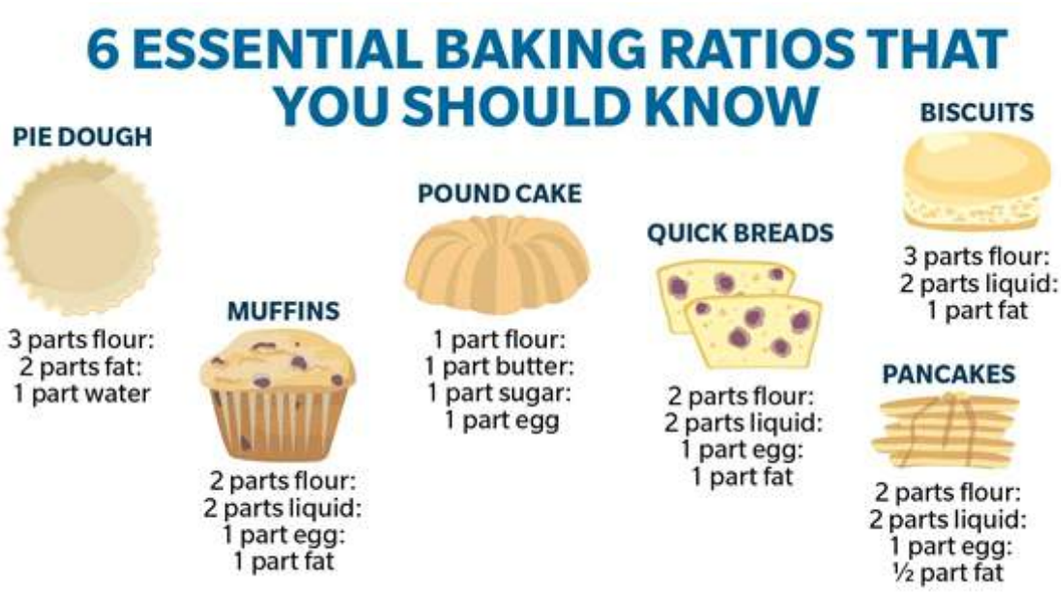


Fig 3.1.1 Essential Baking Ratios

One of the essential aspects of baking science understands how heat is applied to foods and how that application changes food at a base level. This extends beyond baking science, as heat application is equally crucial concerning other forms of cooking. From wet heat, such as boiling, frying, and steaming, to dry heat, such as baking and grilling, not all types of heat are the same, and the effects they have on a dish can vary greatly. This baking science is often evident when bread is baked using humidity and dry heat or frying or boiling doughnuts and bagels.

Baking science is a distinct field of culinary inquiry regarding the ingredients commonly used in baking and how those ingredients work together. For example, flour and water are two of the most common ingredients in baking bread and a leavening agent. How these components work together controls the type of bread produced. For example, when used in a proper ratio to other ingredients, flour makes flour makes gluten that forms strong but elastic bonds within a dough or batter.

Baking is a science. Almost all baking recipes call for flour, eggs, fat, sugar, and a leavening agent (baking soda or powder) and follow a standard sequence of steps. If you follow all the instructions precisely, your end product is always the same. That is what science is about, accuracy in its methods and results that can be reproduced consistently.

Baking is one of the oldest cooking methods, dating back thousands of years. Baking can be used to create a variety of items. Bread, biscuits, cakes, muffins, buns, pizza bases, pies, tarts, crackers, brownies, cupcakes, and so on are among the most prevalent.

With the addition of other ingredients and a different way of preparation, the primary ingredients in all baked goods stay the same.

Ingredients used in baking and their purposes:

Fig 3.1.2 The picture shows ingredients used in baking

Ingredient	Description
Flour	The most critical element in bread production. It provides the bread's structural underpinning by containing gluten, which gives it the strength to hold its shape when baking.
Yeast	A leavened that is used in the baking of bread. Yeast reacts with sugar in the water to produce carbon dioxide, which causes the bread to rise. Compressed or fresh yeast and dry yeast are the two types of yeast.
Sugar	Sugar is provided as a food source for yeast and a taste enhancer. It also aids in crust browning.
Salt	Salt not only improves or enhances the flavour of the bread but also inhibits yeast growth, preventing the dough from rising too quickly.
Liquid	Liquid such as water, milk, and juice is needed to hydrate and bind the flour, develop the gluten, and dissolve the yeast.
Egg	It is added to make bread tender, rich in flavour, and golden brown. In addition, it acts as an aeration medium.
Fats & oils	Oil, butter, margarine, or shortening is added to enrich the dough and keep it soft. It gives the bread a moist crumb with a soft crust.
Other ingredients	Dried fruits, nuts, cheese, and flavourings' make the product more flavourful.

Table 3.1.1 The table shows ingredients and description used in baking

Some bakery items that contribute to a healthier lifestyle and, as a result, have varying food ingredient additions:

- Whole wheat bakery products
- Multigrain bakery products
- High-fiber bakery products
- Sugar-free bakery products (Saccharine, Aspartame, Acesulfame Potassium, or Sucralose)
- Organic bakery products

UNIT 3.2: Procurement Storage & Handling of Raw Materials

Unit Objectives

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

1. FSSAI regulations to be followed for manufacturing of bakery products
2. Procurement and Storage of Raw Materials

3.2.1 Introduction

Due to urbanization, bakery products have become essential food items for most of India's population, leading to the growing demand for handy products at reasonable prices. Moreover, as consumer awareness of health issues grows, so does the need for higher nutritional quality.

The number of products available is likewise expanding. Bakery items have been popular among all demographics, regardless of age or economic status. Bakery products come in a variety of shapes and sizes.

- Segments by type of products: Sliced bread, Pav, burger buns, pizza base, exotic bread, cakes, biscuits etc.
- Segments by ingredients of products: White bread, Brown bread, Fruit bread, Nutritional Bread etc.

Bakery Products Regulations as per FSSAI Guideline

Biscuits- Including wafer biscuits shall be made from maida, vanaspati or refined edible oil or table butter or desi butter or margarine or ghee or their mixture containing any one or more of the following ingredients, namely:-

Edible common salt, butter, milk powder, cereals and their products, cheese cocoa, coffee extract, edible desiccated coconut, dextrose, fruit and fruits products, dry fruit and nuts, egg, edible vegetable products, ginger, gluten groundnut flour, milk and milk products, honey, liquid glucose, malt products, edible oilseeds, flour and meals, spices and condiments, edible starches such as potato starch and edible flours, sugar and sugar products, invert sugar, jaggery, protein concentrates, oligofructose (max 15%) vinegar and other nutrients and vitamins:

BREAD, whether sold as white bread or wheat bread or fancy or fruity bread or bun or masala bread or milk bread or of any other name, shall mean the product prepared from a mixture of wheat atta, maida, water, salt, yeast or other fermentative medium containing one or more of the following ingredients, namely:- Condensed milk, milk powder (whole or skimmed), whey, curd, gluten, sugar, gur or jaggery, khan sari, honey, liquid glucose, malt products, edible starches and flour, edible groundnut flour, edible soya flour, protein concentrates and isolates, vanaspati, margarine or refined edible oil of suitable type or butter or ghee or their mixture, albumin, lime water, lysine, vitamins, spices and condiments or their extracts, fruit and fruit product (Candied and crystallized or glazed), nuts, nut products, oligofructose (max 15%) and vinegar

Procurement of raw material

While procuring and receiving the raw material, the food handler shall ensure that:

Fig 3.2.1 Procurement of Raw Material

A) Eggs

- Please make sure the eggshells are not cracked when they arrive. Broken eggs should be discarded.
- Keep eggs in the refrigerator until they are needed. Then, use the current batch of eggs and replenish the stocks daily if you need to store eggs at room temperature.
- After using the restroom, thoroughly wash your hands, utensils, and surfaces using a sanitizing solution and water.
- To avoid cross-contamination, handle eggs before touching any other food.
- Pool the number of eggs you need immediately before utilizing them if you break them for future use (also known as pooling).

- To avoid cross-contamination, prepare raw eggs from other foods, mainly cooked/ready-to-eat foods.
- To avoid food cross-contamination, wash or clean all eggs before using.

B). Dry Ingredients like Wheat Flour, Sugar and Cocoa Powder

- During procurement, conduct a visual examination to guarantee that the raw materials are free of foreign materials such as stone, glass, hair, jute thread, etc. Appropriate test sieves can help with this.
- To avoid cross-contamination, raw materials should be stored in a room with the proper humidity and temperature. In addition, the storage area should be separate from non-food products.

C). Ready-to-eat products containing lightly-cooked or uncooked eggs (e.g. mayonnaise, cream, icing, mousse, butter)

- Make only as much as is needed in tiny batches. Estimate demand to avoid overproduction and storage.
- When possible, substitute liquid egg or egg powder for shell eggs.
- When preparing/handling ready-to-eat items, use excellent personal hygiene standards.
- Chill the completed items in sealed containers at 4°C or below in the chiller. Ensure they are on different shelves from raw foods (including shell eggs).
- Remove tiny batches of what you need from the chiller. Reduce the number of times products are left out of the chiller. After using the products, please place them in the refrigerator as soon as possible.

D) Raw material storage - refrigerated and non-refrigerated

After receiving and accepting the raw material, there comes the need for storage. The storage facilities shall be designed and constructed to avoid cross-contamination during storage, permit adequate maintenance and cleaning, and avoid pest access and accumulation. A cold storage facility shall be provided for food that requires storing below 5°C.While designing the storage room, segregation shall be there for raw, processed, packaging, rejected, returned or recalled food items, allergen material & distinguishably marked and secured products (hardware & cleaning chemicals). The storage area for raw food shall be separate from the site of work-in-progress, processed, baked and packaged products. Also, containers made of non-toxic materials shall be provided for storing raw materials, work-in-progress and finished/ready-to-serve products. All raw materials, food ingredients, food additives and packaging materials are to be kept 6 feet off the floor and 18feet off the wall; to enhance accessibility and adequate maintenance and cleaning and avoid any pest harborage.

1. Pallets should be cleaned regularly to keep them free of cobwebs, dust, dirt, etc. It should also be inspected periodically for any repair/ replacement if required.
2. The best practice is to avoid wooden pallets and to use plastic pallets. In case wooden Pallets are used, care should be taken to

- Carry fumigation every 6 months
- Periodic cleaning, inspection and maintenance
- Record keeping

3. Wrappers & Trays, before going to Production, are to be kept under fumigation and ozonisation.
4. All wrapper rolls are to be shrink-wrapped.
5. Proper segregation shall be provided for storing non-food chemicals, raw, processed, rejected, recalled, returned and re-cycled materials in a separate designated area to avoid any possibility of cross-contamination.
6. All materials are to be appropriately labeled for proper identification.
7. Adopt a First-Expired First-Out (FEFO)/First-In-First-Out (FIFO) approach for all raw materials, ingredients, work-in-progress, processed/ cooked and packaged food products.
8. Do not use materials beyond their expiry date.
9. Store materials at appropriate temperatures. Monitor and record temperatures of the chiller and freezer daily.
10. As possible, store raw materials away from ready-to-eat ingredients; in a separate chiller. Always store ready-to-eat materials/components above raw materials/ingredients in covered containers.
11. All raw materials, food additives and ingredients shall be stored separately from printed packaging materials, stationery, hardware and cleaning materials/ chemicals.

a. To guarantee easy and adequate cleaning, all raw materials should be
- Stored off the floor and the walls.
- Insect and rodent infestations, as well as adulteration, are not permitted.
- Free of contamination from outside sources, such as birds, moisture, mould, etc.

b. Refrigerated products, such as chocolate and eggs, should be kept at the correct temperature.

c. If bulk floor handling and storage are used.
- Hose connections, both within and outside the plant, should be appropriately protected from rats, clean, and in good repair.
- If the bulk tank has dust collectors or ventilation bags on top, it should be clean and free of insects.
- If the system has inspection ports, they should be cleanable/covered and free of contamination.
- Sifting-related tailings should be free of pollution.

d. Fumigation must be done regularly.
- The fumigation method should be approved (for example, using the approved fumigant Aluminum phosphate).
- It is advised that fumigation be done at least once a year.
- A qualified and knowledgeable third party should carry it out.
- After fumigation, the area should be inspected to ensure that no fumigant residue remains.

e. All raw material storage containers must be kept covered.

f. The FIFO (First In, First Out) system should be used to release raw materials from the store.

g. Expired materials should be disposed of rather than used in the production process.

h. Food colors and additives should be used within the FSS Act 2006's safe limitations.

Notes

UNIT 3.3: Standards, Policies and Procedures of Production of Bread and Biscuits:

Unit Objectives

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

1. Standard policies and procedures to be followed while baking
2. Manufacturing techniques of bakery products
3. How to carry out the flour quality analysis test

3.3.1 Standard Policies and Procedures to be followed while baking

Baking is a food cooking method that uses prolonged dry heat by convection rather than thermal radiation. Heat is gradually transferred "from the surface of cakes, cookies and bread to their centre. As heat travels through, it transforms batters and dough into baked goods with a firm, dry crust and a softer centre". Bakery products have become essential food items for most of the population. The present-day consumer looks for new bakery products, better appeal, taste and convenience from bakery foods. The bakery industry also has a vital role in popularizing wheat in the non-wheat-consuming region of the World. The image below shows the manufacturing process of bread and biscuits.

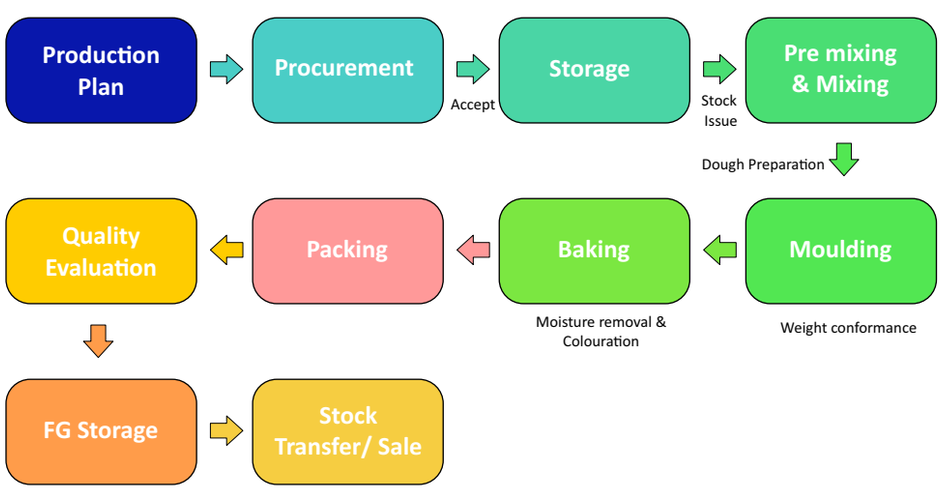


Fig 3.3.1 Manufacturing Process

Key Points to Be Taken Care Of While Undertaking the Manufacturing Process

- All food-contact equipment, such as dough mixers, conveyors, rounder's, dough dividers, racks, proofing equipment, oven, rollers, slicers, sifters, and other similar items, should be clean and in good working order.
- There should be no filth, dust, or evidence of rodent or insect activity on equipment or surroundings.
- All equipment should have a smooth edge and be free of paint flaking or spot welding.

- Inspection cleaning ports on flour conveyor systems must be easily accessible.
- Conveyor systems should be free of pest activity;
- Proofing equipment should be free of evidence of insects or rodents;
- The temperature and humidity of proofing equipment, ovens, and cooling areas should be maintained;
- Baking pans or storage bins should be clean;
- Equipment should be cleaned before use;
- Utensils such as spoons, beaters, pans, bowls, trays, spatulas, and others
- Washing facilities for utensils and equipment should be clean and adequate and stored in a dedicated area.
- To avoid cross-contamination, cleaning chemicals and compounds should be labeled and kept apart from food.
- Weighing techniques should be precise to verify that the reported quantity of contents is met.
- High-temperature cut-off devices should be installed on all high-temperature equipment to switch off the fuel or power source if the top safe limit is exceeded.
- Spilt powders or liquids, trash, and other items that may attract or harbor pests, rodents, or microorganisms should be removed from the working area and the outside premises.
- Personal Protective Equipment:
  1) A fine dust mask should be worn for silo cleaning and other dusty tasks.
  2) When working with ovens, heat safety gloves should be used.

3.3.2 Manufacturing Techniques

Premixing

- Flour should be sieved through a minimum of 32 mesh, and the sieve should be cleaned regularly.
- Evils should be discarded if they are discovered.
- A cleaning mechanism should be in place regularly to minimize cross-contamination and dust creation and ensure the safe collection of undesired items such as dust, filth, and foreign objects.
- Good Practices, such as vacuuming and collecting debris with hypochlorite, can be utilized
- Sugar should be passed through a magnetic grill before usage, and the magnetic grill should be cleaned regularly.
- Sugar bags must contain external contaminants such as dust, dirt, rice bran, etc.
- Dirty or pest-infested egg trays should be avoided.
- Broken eggshells should be kept in plastic bags and discarded at regular intervals.
- Before using, ozonised water should be used to wash fruit cutting.
- Before using, potassium sorbate should be well dissolved in water. Only use sorbate that has been freshly produced.

Mixing

- The mixing room must be clean and dry, with no spills.
- Remove all grease and old batter from all mixing utensils. This is ensured through the use of pre-washing.

- Wash mixing bowls, beaters, and scrappers in hot water at least once every 24 hours.
- Add egg whisk to mix only through the filter. The filter should be cleaned with hot water for each shift and then swabbed with a hypochlorite solution. When not in use, the filter should be dipped in a 500ppm Sodium Hypochlorite solution.
- Cleaning the mixing room floor with hot water and then washing with hypochlorite solution

Air Handling Unit

- The pre-slab and oven rooms should have an air-handling apparatus installed. Pre-slab room > oven room > pre-slab room > oven room > oven room > oven room > oven room > oven room > oven room > oven room >
- Air is blasted through micro filters inside the oven and Pre-slab room — first via a 20-micron filter, then a 10-micron filter, and finally a 5 mm filter for the oven chamber.
- The air is also routed through a Heap filter for the pre-slab room.
- Water is used to clean the 20 and 10-micron filters, and forced air is used to clean the 5-micron filter at least once every two weeks or as needed.
- When the Hepa filter becomes clogged or non-functional, it is replaced.

Baking

- Make sure the baking area is clean and dry. This room must be cleaned with 500ppm sodium hypochlorite solution once per shift.
- The baking room's ozonised must be maintained at a rate of 5gm per hour.
- Every day, clean the cake cooling carts with a 500 PPM hypochlorite solution.

Cooling

A). Room temperature cooling of cakes at ambient room

- This room should be clean and dry, and the floor should be mopped at least once per shift with a 500ppm hypochlorite solution.
- After baking, bar cakes should be placed in an ambient room immediately.
- Positive pressure in the ambient room must be maintained;
- The rooms ozonised must be held at a rate of 2 gms per hour;
- UV lights must be turned on while the cakes are cooling. Personnel access to this room will be restricted.
- Workers unloading cakes should wash their hands with a disinfectant solution.

B). Forced cooling in-slab cooling room

- This chamber must be kept clean and dry, with weekly sanitization using a 500ppm hypochlorite solution.
- When chilling cakes, UV lights should always be turned on. This room's access should be restricted, and the temperature should be between 8 and 100 Ce. The same must be recognized and documented.

Packaging and Storage of Finished Product

- Only food-grade packaging material (printed or unprinted) should be used for wrapping and packing food items. The food-grade certificate/declaration should be checked in the COA during the receipt of the materials.
- Packaging materials should be stored in a sanitary environment in a room designated for

- that purpose.
- The Food Labeling Act requires that all products be labeled.
- The products should be stored in the rooms allocated for storage under the required temperature and humidity conditions as soon as possible after packaging and accurate labeling.
- The temperature and relative humidity of the storage area should be kept at the optimum needed levels.
- All products should be dispatched using the FIFO mechanism.
- The temperature of cake slabs when packing out from the Slab cooling room should be between 14 and 190°C.
- The packing room temperature should be between 22 and 24°C.
- Packers should wear sterile gloves when handling naked cakes. In addition, all packers must use disinfectant solutions as needed.
- Slicer blades and conveyor belts must be sterilized with isopropyl alcohol at least three times every shift.
- Contact components of packing machines must be disinfected with a 500 ppm hypochlorite solution.
- During packaging, UV light should be applied to PVC trays, cakes, and wrappers.
- Metal detectors should be checked with probes before each start of the packing machine.
- Before packing, a uniform sorbate spray should be applied to the top surface of the bare bar cakes.
- The air in the sorbate spray line is filtered by an Ultra filter unit, which the Supplier inspects and replaces as needed.
- Slicing/Packing of Bread and Confectionery Products
- Place baked goods on clean racks and trays to cool. Baked goods should be covered as much as possible while cooling.
- Remove any crumbles that remain after the products have been sliced.
- Pack the products in clean packaging.
- Control samples must be retained in a designated location; samples must be rechecked under unique conditions, such as customer complaints.
- Finished items must meet FSSAI Regulations.
- Despatch and Loading
- The loading of items should be done in separate rooms, and there should be no despatch work done in garages.
- The loading room should have enough ventilation, including cross-ventilation.
- Retail and Display
- Ensure that products are kept in clean display cases that are always covered.
- Ensure products are kept at the right temperature (cakes containing fresh cream, for example, should be kept in chiller display units at 4°C or lower).
- Do not keep perishable fillings on display for more than 4 hours at room temperature. Instead, adopt a first-come, first-served strategy when displaying things for sale.
- A product timestamp will alert consumers about the "consume-by" date.

3.3.3 Flour Quality Analysis

A. Moisture Content

Essential first step for flour analysis. It indicates the quality of flour, e.g. Lowered moisture content of wheat flour will have lesser chances of spoilage during storage. Moisture content is also used as an indicator of profitability. Millers add more water before milling to get more profit by selling flour on a weight basis.

Apparatus

1. Wiley Laboratory Mill, an intermediate model, is equipped with an 18 or 20-mesh screen or any other mill that will grind to the same degree of fineness without exposure to the atmosphere and appreciable heating.
2. Oven (either gravity-convection or mechanical convection). Capable of being maintained at 130°C (+1°) and provided with good ventilation. The thermometer shall be so situated in the oven that the tip of the bulb is level with the top of moisture dishes but not directly over any word.
3. Moisture dishes have diameter of 55 mm. and a height of 15 mm. They should be of heavy-gauge aluminum with slightly tapered sides and 4 provided with tightly fitting slop-in covers. Before using, dry for 1 hr. at 130°C, calm in a desiccator, and obtain the tare weight.
4. Airtight desiccator containing activated alumina.
5. Balance, accurate to at least 1 mg.

Method

1. Grind a 30 to 40-g sample in the mill, leaving the minimum possible amount. Mix rapidly with a spoon or spatula and immediately transfer a 5g portion to tared moisture dishes. Cover and weigh dishes at once. Subtract tare weight. And record the importance of the sample. Dismantle and clean the mill between pieces.
2. Uncover dishes and place them with covers beneath the shelf of the oven. Insert the frame in the range at the level of the thermometer bulb. Heat for exactly 60 min. After the stove recovers its temperature of 130°C.
3. Remove the shelf and dishes from the oven, cover rapidly (using rubber finger insulators), and transfer to the desiccator as quickly as possible. Weigh dishes after they reach room temp. (45-60 min, usually). Determine loss in weight as moisture (see equation 1). Replicate determination must check within 0.2% moisture.

Calculation

$$\text{Moisture (\%)} = \frac{(A - B)}{(A - C)} \times 100$$

Where, A = wt. of flour + Aluminium dish before drying

B = wt. of flour + Aluminium dish after drying

C = wt. of aluminium dish

B. Ash content

Indicates mineral content of flour. It also indicates milling performance by calculating the bran content present in milled flour. For example, white flour has lower ash content and whole wheat flour have a higher ash content due to more bran.

General method

Weigh 10 g of the sample into a weighed silica dish. Incinerate it over a burner or in the muffle. Keep the word in a muffle furnace maintained at 550-600°C until light grey ash results or to a constant weight, relax in a desiccator and weight.

Rapid method

Reagent:

Alcoholic Magnesium Acetate Solution

Dissolve 15 g Magnesium Acetate Tetra Hydrate (Mg (C2H3O2) 4 H2O) in alcohol and makeup to 1 liter.

Determination

Weight 10 g of flour into a weighed silica dish. Add 10 ml. of the reagent. Let the mixture stand for about 2 minutes. Evaporate the excess alcohol in a water bath and keep it in a muffle furnace maintained at 750°C-850°C for 30-45 minutes. Remove the dish, calm it in a desiccator and weigh it. Determine the blank on 10 ml of the solution. Deduct blank from ash. Acid insoluble ash

Acid insoluble ash

Boil ash was obtained in method 1 with 25 ml HCl (1: 2.5) for 5 minutes in a water bath, covering the dish with a watch glass. Filter through ashless filter paper (No. 40). Wash the residue with water until free of acid. Ignite at 600°C for 20 min, cool and weight.

Calculation

$$Ash = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

Where W1 = Wt. of silica dish

W2 = Wt. of silica dish + sample

W3 = Wt. of silica dish + ash

$$\text{Acid insoluble ash } (\%) = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

Where W4 = Wt. of silica dish + acid insoluble ash

C. Protein Content

Most important specification for flour as it defines flour quality for the final product. Water absorption and dough strength depend on the protein content of flour.Low protein content(8-10%)is preferred for cookie cakes,where as high protein flour goes for bread, crackers, and tortilla products.

Method

1. Place 1g sample in the digestion flask. Add 0.7g HgO or 0.65g metallic Hg, 15g powdered K2SO4 or anhydrous Na2SO4, and 25 ml H2SO4.
2. Place the flask in an inclined position and heat gently until frothing ceases. If necessary, add a small amount of paraffin to reduce frothing. Boil until the solution becomes clear.
3. Cool to 25°C and add 200ml distilled water. Then add 25 ml of sulfide or thio sulfate solution and mix to precipitate Hg. Also, add a few Zn granules to avoid bumping, tilt the flask and add NaOH without agitation.
4. Immediately connect the flask to the distilling bulb on the condenser and with the tip of the condenser immersed in standard acid and 5-7 drops indicator in the receiver. Rotate the flask to mix contents, and then heat until all NH3 has been distilled.
5. Remove the receiver, wash the tip of the condenser and titrate standard excess acid in distillate with common NaOH solution. Correct for blank determination on the reagent.

Calculation

% Nitrogen (N) = [(ml standard acid normality acid) – (ml standard NaOH normality NaOH)] × 1.4007/g sample

Multiple % N by 5.7 to get % protein.

D. Falling Number

The FN of flour is related to the amount and activity of cereal enzymeα-amylase, which is present in wheat after harvesting. Wheat kernels with high moisture levels usually exhibit high levels of α-amylase. Too much enzyme activity gives a lesser falling number, which offers sticky dough and a rigid crumb structure. In contrast, tool

Essenzyme activity gives a higher falling number and tighter dough, leading to less volume and a dry crumb structure. In India, the acceptable falling number range is 250-280 secs.

E. Sedimentation

The sedimentation test provides information on the protein quantity and the quality of ground wheat and flour samples. Positive correlations were observed between sedimentation volume and gluten strength or loaf volume attributes. Therefore, the sedimentation test is used as a screening tool in wheat breeding and milling applications.

F. Gluten Analysis

Gluten quality and quality are significant indicators of flour characteristics. It is majored by instruments like Glutomaticor washing dough balls in water which wash out the starch and

water-soluble protein. The remaining wet gluten gives gluten quantity, and other dampgluten passes through the centrifugal machine. Vital gluten remains on the sieve providing gluten quality. In the end, gluten is dried and weighed to find our dry gluten% of flour.

G. Farinograph

Farinograph instrument is used to mix the dough, which is attached to a graph machine where the curve indicates absorption, arrival time, stability time, peak time, departure time, and mixing tolerance index. The results also predict dough development mixing requirements, over-mixing tolerance, and dough consistency.

H. Extensograph

The stenograph determines the resistance and extensibility of dough by measuring the force required to stretch the dough with a hook until it breaks. Extensograph results oppose extension extensibility and are an under the curve. Results from the stenograph test help determine flour's gluten strength and bread-making characteristics.

I. Alveograph

The alveograph determines the gluten strength of dough by measuring the force required to blow and break a bubble of dough. The results include P Value, L Value, and W Value. A more substantial dough requires more force to blow and break the bubble (higher P value). A giant bubble means the dough can stretch to a fragile membrane before breaking. A significant drop indicates the dough's greater extensibility: its ability to try before breaking (L value). A giant bubble requires more force and will have a more significant area under the curve (W value).

J. Amylograph

The amylograph test measures flour starch properties and enzyme activity, which results from sprout damage (alpha-amylase enzyme activity).As indicated by high enzyme activity, sprouting in wheat produces sticky dough that can cause problems during processing and result in poor color and soft texture products. Both the amylograph and the rapid visco analysis measure starch viscosity properties. The amylograph is more commonly used throughout the World. The amylograph analyses viscosity by measuring the resistance of flour-and-water slurry to the stirring action of pins or paddles. The starch granules swell when the slurry is heated, and the slurry becomes a paste. A thicker slurry has more resistance to the pins during stirring and higher peak viscosity. Generally, a more viscous slurry indicates less enzyme activity and makes better products.

UNIT 3.4: Process of Baking Bread, Cake and Biscuits

Unit Objectives

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

1. Understanding the process of Bread, Cake and Biscuit manufacturing.
2. Understanding baking processes like Premixing, Mixing, Air handling unit, Baking Cooling
3. Recall the fermentation, mixing, baking, and moulding, cutting, slicing, etc. and Slicing/packing of bread and confectionery products.
4. Understanding the production process by referring to process flow charts, formulation charts, etc.

3.4.1 Baking Process

Bakery items are traditional and play an essential role in food processing. Bakery products have become a popular snack for individuals of all social strata. India's bakery industry is divided into bread, biscuits, and cakes. Bakery is no longer limited to bread, biscuits, cakes, and pastries as it was once thought and is now classed according to state-of-the-art technologies. Pastries, Danish pastries, croissants, rusk, pizzas, pancakes, crispbread, bread Sticks, kulchas, crackers, garlic bread, fruit bread, focaccia, buns and Pav, ciabatta, French baguette, and rye bread, among others, are becoming increasingly popular.

Bread is a portion of real food made by baking flour and water dough. The goal of the bread-making process is straightforward: to turn wheat flour and other materials into a light, airy, and tasty food. The oldest processed food is undoubtedly bread. Bread results from wetting (hydrating) flour and subjecting it to the energy of mixing to form a cohesive mass of dough. This cohesive material is referred to as 'gluten' by bakers and once formed into a dough. It has the potential to trap gases during resting (fermentation and proofing) and baking, allowing the mass to expand and become a softer, lighter, and more appealing dish following the final heat processing. Bread can be classified by its type and ingredients, and these are:

- Sliced Bread
- Pav and buns
- Rusk
- Burgers
- White Bread
- Brown Bread
- Fruit-based bread
- Nutritional Bread

Essential Ingredients and their Function

To make bread, you will need the following items. Sugar, soy flour, oil, gluten, bread improver, and other substances such as sugar, soy flour oil, gluten, bread improver, and others have been used to improve the sensory and shelf life of the food. Table 1.3.1 lists the materials used in bread production and their functions.

Material Name	Production and their functions
Refined wheat flour	Wheat should be refined. Flour aids in the formation of the structure; it is unusual among cereal flours in that when mixed with water, the insoluble protein (gluten in and gliadin) transforms to gluten, forming elastic dough that holds and expands with leavening gases.
Water	Water aids in the creation of smooth, homogenous dough. In addition, it aids in the development of gluten and the formation of a crust during baking.
Yeast	With the development of a network of bubbles entrapped in the gluten matrix, yeast aids in the rising of the dough. In addition, it aids in synthesizing alcohols and acids, which contribute to the scent and flavor of the product.
Salt	Salt gives the bread flavor while also toughening the gluten and controlling the fermentation process
Sugar	Sugar serves as a yeast food, sweetens the bread, and contributes to the crust's color.
Fats/oils	Fat/oils aid the dough's machinability and the finished product's physical features.
Enzymes	Amylase aids in th e delay of bread staleness.
Improvers	Potassium bromate, for example, improves the volume of bread by stabilizing the dough.
Preservatives	Calcium propionate and potassium sorbate are preservatives that help to prevent microbial infection.

Fig 3.4.1 Function Ingredient for bread

White bread

Ingredients:

- Oven temp: 400 F - 200 C
- 1 tsp (5 gm) sugar
- Lukewarm water to knead the dough (too hot will kill the yeast)
- 1 tsp dry yeast or 10 gm compressed (Frozen) yeast
- 2 cups (240 gm) flour (maida)
- Salt to taste
- 1 tsp oil
- Greased loaf tin (about 20cm /8
- 1 egg, slightly beaten with 1 Tbsp (15 g) milk and 1/4 tsp salt

Method:

- Dissolve sugar in 1/2 cup lukewarm water (should be body temperature, i.e. when put on the wrist, it should not feel warm or cold).
- Sprinkle dry yeast over it or blend the frozen yeast into the water. Leave this solution in a draught-free place to froth. It should take about 10 minutes. If it does not, your yeast is ineffective, so change your packet.
- Sieve the flour, add salt and rub in the oil. Make a well in the centre of the flour; pour the yeast mixture and some water into it. Start mixing the flour and liquid, adding liquid little by little till smooth and soft.

- Knead the dough on a floured surface for at least 10 minutes--fold the dough towards yourself, then push down and away with the heels of the palms. Continue till the dough feels firm and elastic and no longer sticky.
- Place dough in a deep vessel, well dusted with flour, and cover the dish with cling film or a thick, damp cloth. Keep in a draught-free place to rise.
- When the dough rises (about an hour in warm weather and 2-3 hours in the cooler climate, and about 45 minutes if using the friendly water technique), punch it and knead a little before leaving it to rise again. The second rise will take a much shorter time. To test the dough, press lightly into it with a finger, and it will be done if the impression fills up soon.
- After the second rising, roll the dough out flat, about 1/4 cm (1/8") thick, and then roll it like a scroll. Fold the two ends of the roll towards each other, making them meet in the centre. Place the dough in the tin, folded side down. The dough should not fill more than half the tin.
- Brush with egg mixture and leave to rise once again. When the dough doubles (about 15 minutes), bake in a preheated oven, placing a bowl of hot water at the bottom (to humidify the baking atmosphere). Bake for about 30-40 minutes, or until brown and the loaf leaves the sides of the tin. Remove from the oven and place inverted on a wire rack to cool if you want a soft top, put it on a thick cloth like a folded towel instead of the frame.

3.4.2 Formulation and Method of Bread Baking

Baking is a rigorous science that necessitates exact measurements and accuracy. Because most baked goods are created from the same fundamental ingredients: wheat, liquid, fat, sugar, salt, and so on, accuracy is essential.

The quantity of each component in the formula is often the difference between baked goods. You will end up with a different or unsatisfactory product if the proportions are off. The bakers' percentage allows you to adjust a formula's yield without affecting the final product's quality. A baker's percentage denotes that each ingredient in the recipe is a particular percentage of the total flour weight.

Bakers' percentage = $W\ to\ f\ ingredient\ Total\ wt.\ of\ flour$ × 100 Formula percentage = $Wt\ of\ ingredient\ Total\ wt\ of\ ingredient$ × 100

Bakers' Percentage = $Wt\ of\ ingredient\ /Total\ wt.of\ flour$ × 100

Formula percentage = $W\ f\ ingredient/\ Total\ wt\ of\ ingredient$ × 100

There are three different methods for bread making, and their difference is shown in the table below

1. Long Fermentation Process: This is a traditional method for manufacturing bread. The dough is fermented for a long time to develop the dough. The following are the methods that were employed in this process:

- Dough that does not need to be refrigerated
- Dough that does not need fermentation.
- Delayed salt method
- Sponge and dough method

2. Mechanical Dough Development Technique: In this process, intense mechanical mixing is performed briefly to develop the dough. A unique type of mixer is used to accomplish this process.

- Do-Maker procedure
- Chorley wood bread process

3. Activated dough development: Enzymes, oxidizing agents, reducing agents, and other additions were utilized to develop the dough in a short period chemically.

METHOD	PROCESS
Straight Dough	According to the recipe, all components are combined, and the dough is fermented according to the instructions.
Delayed Salt Method	All ingredients are incorporated into the dough except salt, fat, emulsifier, and preservatives. Once the appropriate fermentation hours have passed, salt, fat, emulsifier, and preservatives are added to the mix and blended to maintain consistency.
No Time Dough	In one step, all ingredients are combined according to the recipe. This approach necessitates a significantly more significant amount of yeast than the other procedures. As a result, the dough temperature is slightly higher than in the straight dough procedure.
Sponge and Dough Method	This method involves the preparation of SPONGE – essentially, a portion of flour (50 percent), yeast, and sugar (part) are combined in a mixer and fermented for 45 minutes in a fermentation environment (270 C/75 % relative humidity). After fermentation, the sponge is returned to the mixer and combined with the remaining ingredients and water to form a consistent elastic dough.
Do-Maker Bread Process	The DO-Maker continuous mixer is used to mechanically develop the dough to shorten fermentation time and obtain the desired dough quality.
Chorleywood Bread Process	The Flour Milling and Baking Research Association created this technology based in Chorleywood, Hertfordshire. The difference between this technique and bulk fermentation or sponge batter processes is that the dough is developed using spe cially built high-speed, high-powered equipment capable of delivering much energy. In addition, for optimal dough consistency, the dough's temperature must be managed during the mixing step.
Activated Dough Development	This allowed small bakers to keep us ing their old low-speed mixers while avoiding mass fermentation without investing in the new high -speed mixers designed to develop the mechanical dough. Instead, enzymes, oxidizing agents, reducing agents, and other additives were utilized to create the do ugh chemically in a short amount of time. The dough grows in the mixer as the specific ingredients, including an improver containing L -cysteine hydrochloride, are incorporated.

Fig 3.4.2 Method of Bread Baking

Bread Production

Bread production operations must be carefully planned on the excellent quality of the finished product. These are the various steps in bread processing which are shown in figure

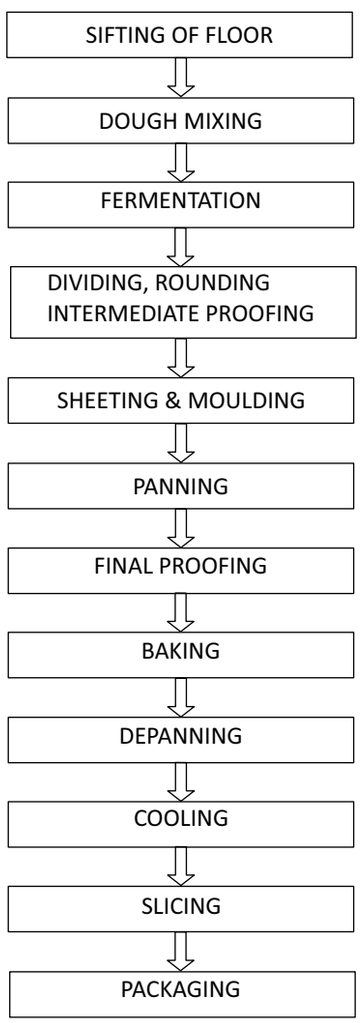


Fig 3.4.3 Function Ingredient for bread

Mixing

The mixing stage is the first in the dough processing process. "Getting the dough out in the driest condition possible, with as high an absorption as feasible, and at the same time of suitable consistency, so it will machine properly," says the mixer operator.

- To ensure that the component is evenly distributed.
- To thoroughly moisten all dry materials.
- To create gluten that is suitable for proper handling and gas retention.
- Incorporation of air bubbles into the dough to give gas bubble nuclei for the carbon dioxide produced by yeast fermentation, as well as oxygen for oxidation and yeast activity

The dough's temperature should be taken immediately after it has been mixed. The most critical criterion for maintaining the quality of the finished product is dough temperature, which may be regulated by water temperature using the friction factor.

Dough Fermentation

Dough fermentation refers to all of the physical and chemical changes yeast causes in the dough. Aeration and alterations to the dough's elasticity and extensibility are examples of physical changes. In addition, the yeast creates alcohol, carbon dioxide, heat, hydrogen peroxide, and other chemicals. These compounds are responsible for fermented foods' distinct flavor and dough rheology alteration. The ideal temperature and Rh range for yeast activity are 32 to 40°C and 80-85 percent, respectively.

During fermentation, the following changes occur:

- Production of CO2
- Increase in dough temperature
- Changes in dough consistency. The dough becomes pliable, elastic, and extendable.
- Dough rheology
- PH reduction

Baking of Dough

Under heat, the dough piece is converted into a light, porous product during the baking process, which is the final and most essential step in bread preparation. Many complicated physical, chemical, and biological events occur throughout baking. During the baking process, the following changes occur:

- Yeast activity
- Crust creation
- Starch gelatinisation
- Gluten coagulation
- Enzyme activity
- Oven-spring
- Reaction of Browning

The bread type and loaf size determine the exact temperature needed. Typically, the oven temperature should be set so that the loaves begin to "brown" approximately twelve minutes after being placed in the oven. The oven temperature should be kept between 220-2500 C. It is critical to keep an eye on the oven's temperature when making bread. The protein will quickly coagulate (form a crust) on its outside surface if the stove is scorching. This shell will prevent heat from efficiently transferring within the bread. As a result, the bread will shatter more than usual when the gas expands in the inside portion of the bread, and the crust is non-stretchable. As a result, the crust will darken, and the bread may not be appropriately baked from the inside. In addition, because the early crust creation prevents the bread from rising fully, the volume will be tiny, and the shape will be poor, owing to uneven expansion.

In contrast, if the oven is too cold, protein coagulation will be delayed, and yeast will be active for longer, resulting in an excessive amount of bread. In addition, due to the lack of temperature, the bread will have to be cooked for extended periods, resulting in more moisture evaporation than is required. The result will be crumbly and stale sooner.

Bread Quality Control Points

The following factors have an impact on bread quality:

- Ingredient quality
- Suitability of bread improvers and additives
- Formulation
- Dough mixing, consistency, and temperature
- Clean and hygienic dough handling during make-up
- Accurate dividing, rounding, and winter-proofing
- Proper moulding and panning
- Fermentation time, temperature, Rh, and dough development
- Temperature and humidity control in baking
- Cooling
- Slicer operations

Assessment of Bread Quality

The following factors must be considered while evaluating bread quality:

- Dimensions of the product
- External quality qualities of bread
- Crust properties
- Volume
- Color

Internal bread quality qualities include

- Crumb size, number, and distribution
- Crumb color
- Texture/eating quality of flavor
- Crumb softness; and crumb hardness

3.4.3 Cake Processing

The essential steps in preparing a cake are weighing the ingredients, mixing them, and baking them. The cakes are divided into categories based on the blending process and the components used. Foam cake, batter cake, and chiffon cake are examples of cake types.

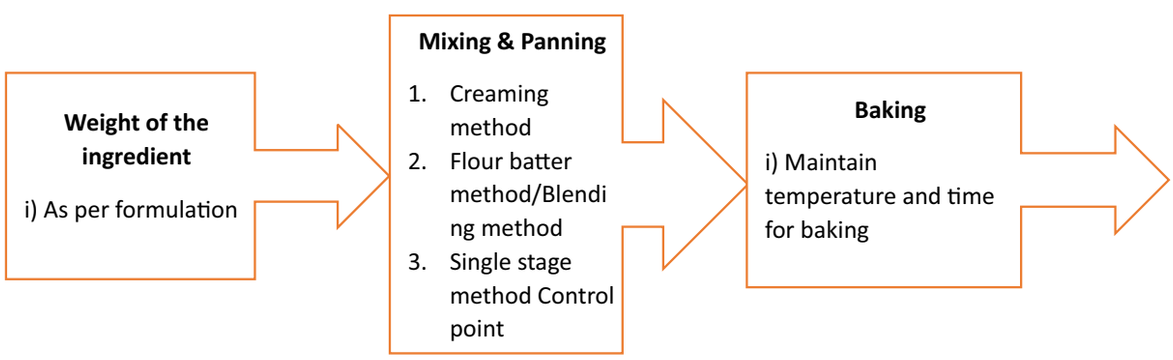


Fig 3.4.4 Process of cake making

Stage 1: Formulation and Balancing

A cake's basic requirements are that it has an attractive appearance, has a thin crust, is light, even in texture, and is enjoyable to eat. The fruits in a fruit cake should be distributed appropriately throughout the crumb. Each ingredient in a cake has a specific purpose. The outcome of a cake made using haphazard proportions of ingredients will change from day to today. As a result, to produce a consistently high-quality product, all elements must be employed in a balanced formulation. The ingredients used in cake preparation are classified based on their functions:

- The Toughness adds structure and form to the product and give it shape. Flour and egg will be among them.
- The Softeners — make the cake's texture softer. Sugar, fat, and milk should all be included.
- The Moisteners — add moisture to the batter and help it maintain its consistency. Milk, egg, and liquid sweeteners such as golden syrup should be included.
- The Driers -- are the elements in the batter that absorb excess moisture. Flour, milk powder, and cocoa powder should all be included.
- The challenge with balancing is that some substances have many functions. Eggs are a moistening agent as well as a toughening agent. Milk is a moistener, whereas milk powder is a dehydrator. Formula balancing aims to match the moisteners, driers, toughness, and softeners. Three simple rules govern formula balancing:
  1.The weight of the fat should not exceed the importance of the egg (fat egg)
  2.The weight of the fat should not exceed the weight of the sugar (fat sugar)
  3.The weight of the sugar should not exceed the importance of the whole liquid (sugar liquid)

Practical Activity:

Ingredients for cake:

- 3 cups all-purpose flour
- 4 egg
- 2 teaspoon baking soda
- 2 teaspoon vanilla essence
- 1 1/2 cups powdered sugar
- 1 cup butter
- 1 cup milk

Method:

Step 1 Cream together butter-sugar and then blend with beaten eggs

Making a homemade sponge cake was never so easy. Begin by mixing sugar and butter. Whisk well until light and fluffy with a manual whisker or a fork. Once done, add the beaten eggs and blend well. Beat further so that the mixture turns white and creamy.

Step 2 Combine flour mix and beaten eggs

Sift together the all-purpose flour and baking soda. It is done to distribute the baking soda in flour evenly. Gradually add this to the egg mixture. If required, add a little milk and mix till the batter is fluffy and soft. You may not add the whole milk if you feel the consistency of your cake is fine and it pours down like canned condensed milk. Add vanilla essence and blend well. Vanilla essence is vital to camouflage the smell of eggs and to make the cake taste delicious.

Step 3 Bake the cake at your convenience

Take a baking tin to cook the cake and grease it well using butter or cooking spray. Then, sprinkle some maida or all-purpose flour on it. It will prevent the cake from sticking to the base. You can also line it with butter paper so it can be taken out quickly when the cake is baked. Pour the prepared cake batter into the prepared tin and place it on a stand in a pressure cooker. Do not add water to the range, and ensure that the container does not touch the cooker's base. You can also keep the baking dish on an inverted steel plate. Increase the flame and pressure cook for two minutes. Remove the whistle and cook on low flame for 35-40 minutes. If you use an electric oven, cook at 180 degrees for 30-35 minutes.

Step 4 Check with a knife or skewer if it is cooked and serve

Insert a knife or a metal skewer into the cake, and if it comes out clean, then the cake is ready. Remove from the oven/cooker and allow to cool on a wire rack. This cooling process is done so that the cake doesn't break in between and comes out nice and clean. Once cooled enough, turn the cake tin upside down to remove the cake. You can also use the butter paper to lift off the cake, but you have to be a pro to make it happen quickly, as it can also break the cake. So, it's better to turn the tin upside down for a better cake. Before decorating, cut an even slice of the cake from the top to prevent any doomed top. But make sure you do this step when the cake is still warm and not completely cold. Take whipping cream, line the cake evenly, and scrape any extra cream. Once done, you can use cherries to decorate the cake or even tutti-frutti it entirely depends on your choice.

The cake is ready now.

Cake Mixing:

Two or more ingredients are uniformly spread in each other until they become one product after mixing. In the case of the cake, "mixing" refers to beating, blending, binding, creaming, whipping, and folding ingredients. The temperature of the batter, the viscosity of the batter, and the specific gravity of the batter are all key control points for ensuring product quality. After mixing, the temperature of the cake batter has a significant impact on the final cake quality. The viscosity of the batter is affected by the batter temperature, which affects batter aeration and stability. The ideal batter temperature for sponge cakes is 27-330 C, whereas the temperature for butter cakes is 20-250 C. Because the mixing action and its duration primarily determine the specific gravity of the batter, controlling the mixing time are critical.

The weight of a particular volume of any substance divided by the weight of the same volume of water is known as specific gravity. Specific gravity indicates how much air has been included in the batter. According to research, the tenderness, grain, texture, and volume of the completed cake are all influenced by the specific gravity of the batter. The product's requirements determine the mixing procedure.

The many methods of cake mixing are listed in the table below, with the following goals in mind:

- To make a smooth, even batter out of the components.
- Include as much air as possible into the batter.
- To achieve the desired texture in the final product.

Mixing Methods	Creaming, A	Whipping, B	Mixing	Folding, D
Creaming method or Sugar batter method	Butter + sugar	Eggs + sugar	B Into A and Moisture	
Whisking method Or Sponge method		Eggs + sugar		Flour and Melted Butter
Flour Batter method or Combination method	Flour + butter	Eggs + sugar	B Into A and Moisture	
Rubbing method or In One method	Flour + butter	All Other Ingredients		

Fig 3.4.5 Mixing Method for Cakes

Baking of Batter

Cake baking is the final stage of cake preparation; however, it is a critical step in producing a high-quality result, with oven temperature, duration, and humidity being the most influential factors on cake quality.

The cake-baking process is divided into three stages:

- **Rising:** As the temperature of the cake mixture increases, the gas cells (beaten in during the cake mix-manufacturing) expand, releasing carbon dioxide through the rising chemical agent (e.g. baking powder). The cake batter becomes slightly thinner and rises quickly at this point. Rising begins on the edges and advances inwards to the centre.
- **Setting:** The cake's centre rises slightly higher than the edges during this stage. At this point, the cake's structure is starting to take shape. Browning begins on the cake's surface, and tiny bubbles may emerge. Any shaking at this point could cause the cake to topple or lose volume.
- **Browning:** The cake starts to firm up, and the crust colors.

Cake Baking Temperature

- For Heavy Cake:
  1. The temperature should be less than 1800 C, but it will take more time
  2. For example, Christmas Cake

- For Lighter Cake:
  1. The temperature should be 190- 200oC, and the baking time would be less
  2. For example, Cupcakes

Effect of Oven Temperature on Cake Characteristics

- If the temperature is too low, the batter will solidify too slowly, allowing the gas cells to expand and combine, resulting in a heavy, rough-textured cake.
- If the temperature is too high, the outside of the cake may sear and burn before the entire mixture has set, resulting in a "wet spot."

Cake quality parameters

The quality of parameters is influenced by the ingredient's quality, the formulation's balance, and the control point in various unit operations. The following factors have an impact on cake quality:

1. The order in which ingredients are added during the mixing process
2. The temperature of the batter
3. The viscosity of the batter
4. The pH of the batter
5. Batter specific gravity
6. Clean and sanitary operation
7. Temperature and duration of baking
8. Cake cooling temperature
9. Use appropriate packaging materials.

3.4.4 Formulation and Method of Biscuit Processing

In India, biscuits are one of the essential segments of the bakery business. The name biscuit comes from Danisbiscoctus, which means "twice-cooked bread." It relates to bread rusks manufactured for seamen (ships biscuits) during the middle Ages. In the United Kingdom and some other nations, biscuit encompasses everything. It contains products known as crackers (that make a cracking noise when broken).

Hard sweet and semi-sweet biscuits, cookies (derived from the Dutch term koekje, which means "little cake"), and wafers are baked from a fluid mixture between hot plates. Cookies are created with soft wheat flour and sugar and shortening composition but are low in water content. Crackers are prepared with more developed dough, whereas cookies are made with less developed flour. They are all manufactured with flour (typically wheat flour) and have low moisture content, so they will last a long time if kept dry and away from oxygen. Table 5 lists the essential ingredients for cookies, biscuits, and crackers:

Ingredient	Function
Refined Wheat Flour	Refined wheat flour serves as a protein matrix and aids in structure.
Water	Water aids in the mixing of other ingredients, the regulation of dough temperature, and the creation of gluten.
Sugar	Sugar is generally utilized to add sweetness and aid in air assimilation. In addition, sugar is a tenderizer when baking, delaying the gelatinization process.
Fat	Tenderizers are fats that impart lubrication and tenderness. It also aids in the incorporation of air into the dough/batter.
Eggs	Gluten's framework and structure are supported by eggs. It contributes to the leavening function, as well as color and flavor.
Milk Powder	Milk powder gives the product color, taste, and flavor.
Leavening Agent	Using a leavening agent aids in creating the desired lift, bite, and texture. It also aids in the management of the dough's pH level.

Fig 3.4.6 Ingredient for cookies/biscuits/crackers

Practical Activity

Ingredients:

- 1/2 cups (325 grams) of all-purpose flour
- 1/2 teaspoons (10 grams) baking powder
- 1/2 teaspoon (2 grams) kosher salt
- 1 tablespoon (15 grams) granulated white sugar optional)
- 1/2 cup (113 grams) cold unsalted butter, cut into chunks
- 3/4 cup (180 ml/grams) cold milk (whole or 2% reduced fat)
- 1 sizeable hard egg (50 grams), lightly beaten

Method

Preheat the oven to 400 degrees F (200 degrees C) and place the oven rack in the centre. Line a baking sheet with parchment paper.

In a large mixing bowl, sift or whisk together the flour, baking powder, salt, and sugar (if using). Cut the butter into the dry ingredients until the mixture resembles coarse crumbs (use a pastry blender, two knives, or fingertips). Add the milk and lightly beaten egg and mix just until the dough comes together (the texture should be sticky, moist, and still lumpy).

Place the dough on a lightly floured surface. Knead gently until it just comes together. Roll or pat the dough to about 3/4 inches (2 cm). Cut out biscuits with a lightly floured 3-inch (7.5 cm) round cookie cutter. Place on the prepared baking sheet and brush the tops with the milk or cream. Bake for about 15 to 17 minutes or until the tops are golden brown and a toothpick inserted in the centre of a biscuit comes out clean. Remove from oven and place on a wire rack. Serve warm with butter. Makes about 8 - 3 inch (7.5 cm) biscuits.

3.4.5 Classification of Biscuits

Biscuit dough is divided into two types one is firm and soft. The consistency of the flour is determined by the amount of water available to hydrate it. When there is a high water content (and hence a low-fat content), the blending with the flour results in the formation of gluten, necessitating mechanical work, kneading, and the development of stiff dough's. The short dough is made when the amount of fat in the dough is more than the amount of water required, and the mixing is done so that little or no gluten forms as the flour hydrates.

Biscuits can be categorized in several ways.

1. Based on the texture and hardness of the material.
2. Based on how dough and dough pieces are formed, such as fermented, laminated, cut, molded, extruded, deposited, wire cut, co-extruded, etc.
3. The addition of fat and sugar to a recipe.
4. Depending on the equipment used to create the individual spots, cookies can be divided into four broad classes.
    - Cookies made with a rotary mould
    - Cookies with a wire-cut design
    - Cutting machine cookies and
    - Deposit cookies

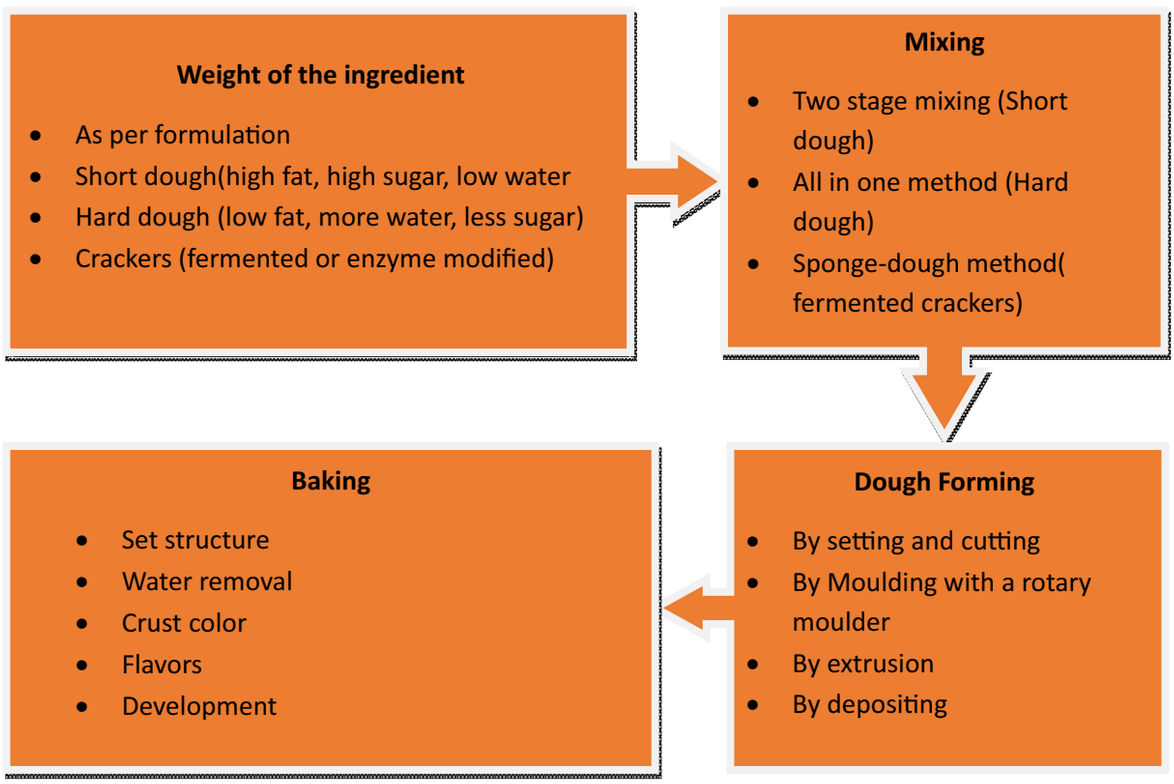


Fig 3.4.7 Classification of Biscuits

Mixing Process

One of the essential processes for developing the dough to the desired consistency is mixing the ingredients. The goal of mixing is to distribute the components equally and turn them into cohesive, extensible, machinable dough that may be sheeted or laminated into a continuous sheet before cutting. Proper mixing is achieved by balancing the formulation, adding ingredients in the correct order, mixing time, rest time required at various stages, mixer blade speed, dough temperature, and pH after each mixing stage.

Baking Process

The baking process controls the structure, rate of moisture loss, color formation, flavor development, and size and thickness qualities. For 10-20 minutes, bake at 170-2000 C. During baking, the following physical and chemical changes occur:

- Any gases that expand, such as air and carbon dioxide from leavening chemicals, cause the biscuit to expand.
- When water is turned to steam, the biscuit expands as well.
- The proteins present will begin to denature, and the starch will begin to gelatinise due to this expansion. The structure is set as a result of these activities.

Central issue/checkpoint during the processing of biscuits:

The following are the essential checkpoints for ensuring the end product's quality:

- During the mixing process:
- Maintain consistent dough temperatures while combining
- Maintain uniform mixing time from batch to batch

- Blend ingredients more thoroughly to avoid checking.
- Denature the starch using lecithin/emulsifiers or other additives, and the starch will begin to gelatinise. The structure is set as a result of these activities.

During Forming

- Maintain the dough's weight and size during the cutting process.
- Keep dough weights similar for diverse geometric shapes to minimum weight differences across the conveyor belt.
- Keep the scrap and return to the dough feed rolls. Hopper warm as much as possible.

During Baking

- Maintain the dough temp. and time as required during Post Baking
- Allow as much time as possible for the product to cool.
- Instead of using open-air conveyors, use covered tunnels.
- In a humid atmosphere, chill the product whenever possible. Avoid unexpected, icy draughts.
- Protect with appropriate packing.

Preservation of bakery products

The following are the main mechanisms that cause bread products to deteriorate:

1. Pathogen growth is occasionally accompanied by microbiological deterioration.
2. Due to chemical and enzymatic activity changes in color, odour, flavor, and texture.
3. Moisture and other vapour migration/oxygen affect product flavor and texture.

These pathways are affected by formulation and processing variables, which can be exploited to regulate deterioration:

- Moisture and water activity
- PH
- Temperature and humidity
- Emulsifier systems
- Good Hygienic practice during the process of product
- HACCP
- Preservatives and additives and
- Packaging.

Frozen Bakery Products:

Baking is also one of the World's oldest crafts. However, due to staling, most bread has a short shelf life. As a result, frozen dough technology has been created since the early twentieth century.

Customers profit from this method since it allows the baker or shop to serve fresh bread practically any time. As a result, this technology has become one of the most crucial in today's baking industry. Frozen dough is now used worldwide, resulting in cost savings for the manufacturer and increased convenience for the consumer. The following figure shows the methods for making frozen dough, partially baked dough, and fully baked bread.

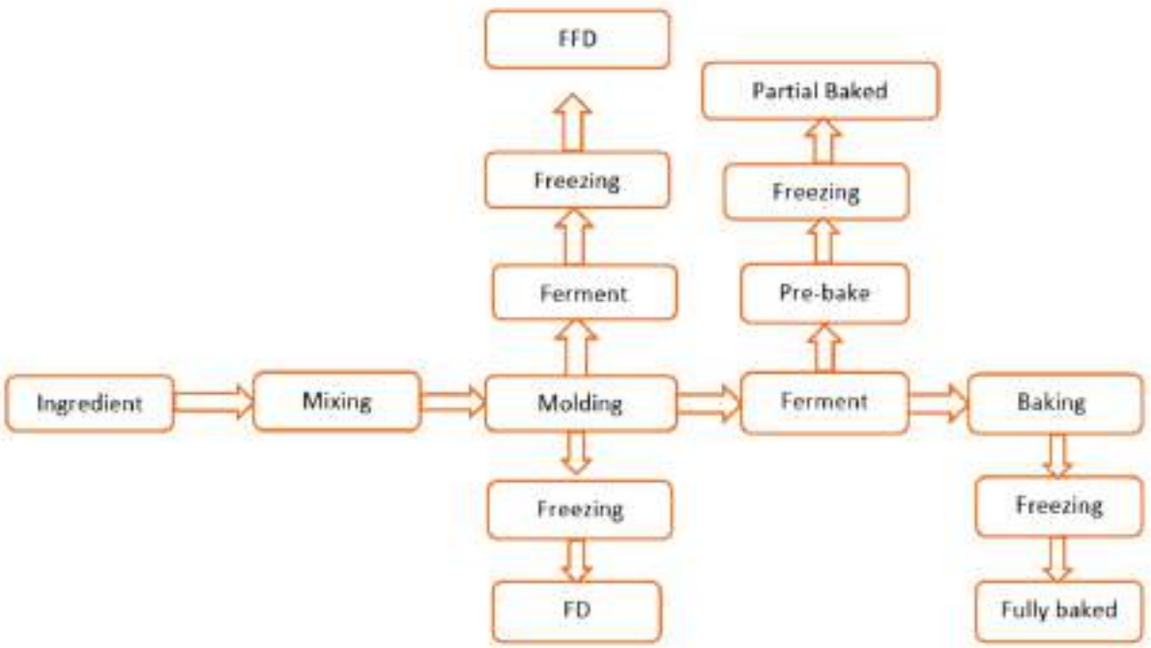


Fig 3.4.8 Steps for making different types of freeze products:
FD- Freeze dough, FFD-Fermented freeze dough

UNIT 3.5: Bakery Machinery and Equipment

Unit Objectives

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

1. Explain the various types and uses of bakery machinery and equipment
2. Carry out the fitment of multiple types of machinery for different bakery operations

3.5.1 Various Machinery and Equipments used in Baking

Every food processing operation comprises multiple unit operations carried out in a specific order. The following is a list of typical bakery machinery and equipment. Volume and budget determine capacity and automation level.

Flour sifter

It separates lumps or foreign matter from flour, sugar, salt, or other components. One intake port (often two or more, depending on capacity) and two outlet ports make up most of the system. One of the two outlet ports is the ejection port, while the other is the product outlet. It has a change component containing sieves of various sizes chosen based on the process requirements. Sieve size is usually expressed as a mesh number, such as mesh, 20 mesh, 1mm, 1.5 mm, 2mm, etc. In addition, sifters are sometimes equipped with magnets to capture ferrous contaminants.

Fig 3.5.1 Flour sifter

Grinder/Pulveriser

To reduce particle size, a grinder or pulveriser is employed. The hero is chosen based on its capacity and the particle size required at the output. Magnets are also placed on grinders and pulverisers to capture ferrous materials.

Fig 3.5.2 Grinder/Pulveriser

Pin Mill

It can also grind crystals and brittle materials to reduce their size.

Fig 3.5.3 Pin Mill

Hammer Mill

It also functions as a size-reduction machine. It is the most popular grinding machine. It is used to granulate or crush the material.

Fig 3.5.4 Hammer Mill

a) Whisk is used for light mixes such as whipped creams, frostings, and meringue, whereas
b) Beater is used for medium mixtures such as cake batters and cookie doughs.
c) Dough Hook is used for heavy doughs such as bread and pizza.

Vertical twin spindle mixer

Vertical mixers, like bread, are great for fermented dough (Sponge & Dough process).

Fig 3.5.7 Vertical Twin Spindle Mixer

Dough mixer/spiral mixer

A dough mixer is a mixer used to make bread and pizza dough. Dough mixers, unlike planetary mixers, feature a fixed agitator and a moving bowl that goes around it. The bowl's movement provides for a more even distribution of dough.

Fig 3.5.8 Dough Mixer/Spiral Mixer:

Dough divider

Dough dividers are used to cut vast quantities of dough in a short amount of time. At the head of the machine, the dough divider features an enormous press with blades. The flattened dough is placed on a reel plate and inserted beneath the head, and presses the edges of the dough are with a hydraulic or mechanical lever. This results in evenly cut little pieces of dough that are almost ready to bake. Most dough dividers have an integrated rounder that automatically moulds small bits of dough into round shapes. They can also be turned into squares, hexagons, or other shapes using specialty units.

Fig 3.5.9 Dough Divider

Dough sheeter

Flatbread dough, croissant dough, and pie crust dough can all be made with dough sheeters. A dough sheeter can also be used to manufacture cake fondant because it eliminates all the kinks and folds that would eventually show up on the end product. In addition, these work far faster than manual labor, allowing you to focus on other culinary activities while reducing gluten damage.

Fig 3.5.10 Dough Sheeter

Bread moulder

It is used to make bread moulds. To achieve optimum moulding, the pressure board should be changeable as needed. The pressure board's feed end should be slightly closer to the conveyor than the discharge end, or at the very least, not higher. The distance between the guides at the discharge end and the width of the bottom of the baking pan in which the dough will be dropped should be the same. Two curling chains are recommended as a minimum. The first chain should be long enough to connect with the second chain. The double chain should only be long enough to reach the pressure board.

Fig 3.5.11 Bread Moulder

Sugar sprinkler

Sugar was sprinkled with this device. Fine adjustments should be installed to ensure equal sprinkling across the width and the ability to manage various sugar particle sizes.

Fig 3.5.12 Sugar Sprinkler

Proofing Cabinet

They must rise before putting bread, doughnuts, and croissants in the oven to bake. The perfect atmosphere for yeast to thrive is created in proofing cabinets, which allows the dough to rise correctly after the bread has been formed into its final shape. Yeast cells develop slowly below 680 Fahrenheit and begin to die at 1400 Fahrenheit. Temperatures in proofing cabinets are between 75 and 850 Fahrenheit, perfect for letting the dough rise correctly.

Fig 3.5.13 Proofing Cabinet

Ovens in the Bakery industry

One of the most critical components of any bakery unit is the oven. A thermally insulated chamber is used to heat, bake, or dry things. Good ovens come with various accessories and mounting options for controlling and monitoring the operation. Smart ovens are programmed according to the recipe and sequentially control the process.

Ovens come in various shapes and sizes and are chosen based on their capacity, product, and price.

Rack Oven

- Bakeries that produce large quantities of bread and bagels are employed in rack ovens or revolving ovens. Racks revolve around a central shaft above a heating source, generally located at the bottom of the baking chamber in this oven. A conventional rack oven.
- It has multiple metal or stone shelves. These shelves are connected to a horizontal shaft in the middle. A separate motor spins.
- The shaft, which moves the shelves around, results in uniform baking due to the revolving motion of the frames.

Fig 3.5.14 Rack Oven

Deck Ovens

- Deck ovens have many decks, often built of ceramic or stone. On the deck, the food items to be backed are arranged.
- In the deck oven, there are two heating processes. The first is conductive heat, delivered directly from the deck to the dough.
- The second is radiant heat, which comes from the baking chamber's heated air and penetrates the dough to cook it further. Finally, steam injection systems are sometimes used in deck ovens to deliver water vapour into the cooking chamber. It produces perfectly crisp brown bread crusts covering a soft and fluffy interior. Deck ovens are ideal for making artisan bread like baguettes, ciabattas, and sourdough bread.

Fig 3.5.15 Deck Oven

Conveyor Oven

This is a continuous procedure employed when there are large volumes. It comprises a baking chamber with a belt conveyor that moves through it. Baked items are put on conveyor lines and cooked in these ovens. The oven produces hot air jets that are directed at the meal. The hot air's force helps it quickly break through the cold air barrier surrounding the uncooked food, resulting in speedier cooking. Because the belt's pace remains constant during baking, all things come out of the chamber with the same level of doneness. Conveyor ovens are simple to use. They contain programmable controls that automatically adjust the time and pace for you. Conveyor ovens are not without their drawbacks. It will not be able to bake everything. The holes are typically 3" to 5" tall, restricting the products you can bake to those not more elevated than the tiny opening. Under the mighty blasts of hot air, cakes, bread, puff pastries, and other baked goods required to rise or retain moisture may break down or dry out.

Fig 3.5.16 Conveyor Oven

Bakery Refrigerator

Bakeries require refrigerators to keep raw materials like eggs, fresh fruits, milk, butter, and other dairy products cool and fresh. Refrigerators are also used to store finished goods. Refrigerators come in a variety of shapes and sizes. The decision is based on the production volume and budget once again. Only a few of them are

1. Reach-in Refrigerator: This type of refrigerator is prevalent and can hold many things. It is found in practically all commercial kitchens.
2. Freezers: Freezers come in a variety of sizes and layouts. The upright cabinet, comparable to a reach-in refrigerator, is the most typical freezer. It has several shelves. Giant freezers may be necessary for high-volume bakeries, such as roll-in and walk-in freezers. These freezers are large enough to fit full oven racks straight into the freezer.
3. Workstation Refrigerators: These are multi-purpose refrigerators with a refrigerated compartment for keeping materials and a robust worktop for cooking food.

Fig 3.5.17 Bakery Refrigerator

Blast Chiller

Blast chillers swiftly reduce the temperature of cooked foods before storing them in the refrigerator or freezer. IQF (Individually Quick Frozen) is used for frozen bakery items in many circumstances.

Fig 3.5.18 Blast Chiller

Bread Slicer

A bread slicer is a machine that cuts loaves of bread into several pieces in one motion. Sharp blades spaced out at regular dimensions are common in commercial slicers. A lever on the side allows you to lower the edges of the loaf, cutting it into equal-sized pieces that can be packaged into a bread bag.

Fig 3.5.19 Bread Slicer

Weighing scales

A bread slicer is a machine that cuts loaves of bread into several pieces in one motion. Sharp blades spaced out at regular dimensions are common in commercial slicers. A lever on the side allows you to lower the edges of the loaf, cutting it into equal-sized pieces that can be packaged into a bread bag.

Fig 3.5.20 Weighing scales

Other items

1. Bakery Tables and Racks: From hand-rolling, kneading, and cutting dough to slicing, peeling, and chopping materials and decorating cakes, pastries, and other baked goods, solid and durable tables are utilized to complete the majority of baking operations. It features a polished, flat surface that is simple to clean and disinfect.

2. Oven Racks: Oven racks come in handy when storing a lot of full-size and half-size sheet pans. Oven racks allow you to move and process large quantities of food items at once, whether in the refrigerator for cooling, the proofing cabinet, or the oven for baking.

Fig 3.5.21 Bakery Tables and Racks

Fig 3.5.22 Oven Racks

Notes

UNIT 3.6: Cleaning Process

Unit Objectives

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

1. Describe cleaning process
2. Significance of hygiene and quality regulations

3.6.1 Cleaning Processes

Clean-In-Place(CIP)

CIP is a method used for the internal cleaning of machinery. It is done without dismantling pipes, vessels, process equipment, filters or fittings. In this process, a sanitising agent is circulated through the entire processing unit with the help of a spray ball. The turbulence created removes soil, ensuring the removal of bacteria and chemical residues.

Tips for conducting an effective CIP process:

- Use suitable vessels for the proper process
- Use the right cleaning and sanitizing solutions
- Ensure correct flow rate
- Ensure all connections are clean
- Monitor and verify the entire process

Clean-Out-Of-Place (COP)

COP is conducted at a cleaning station. This method involves the dismantling of the equipment. Equipment and units are scrubbed with soap in COP tanks during this process. After this, the tanks are rinsed to remove residual detergent or chemicals. Finally, equipment and units are reassembled and sanitised with heat treatment or sanitising agent.

Tips for conducting an effective COP process:

- Follow the order of tasks
- Use cleaning tanks as much as possible
- Ensure tools used in COP do not lead to contamination

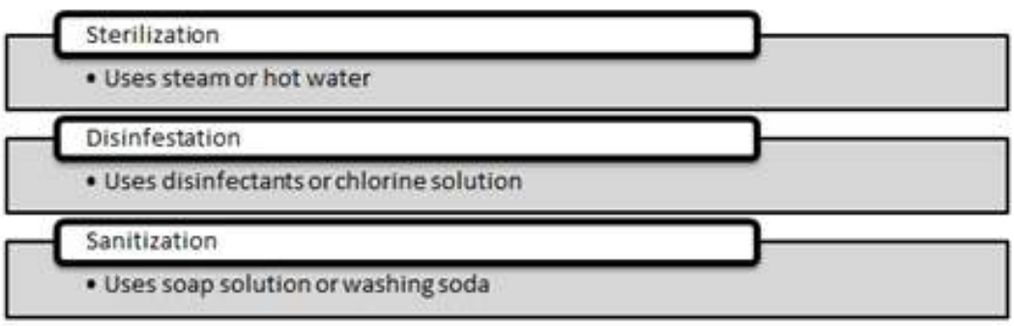
Food processing equipment and units that undergo the COP process are:

- Fittings
- Gaskets
- Valves
- Tank vents
- Grinders
- Pumps
- Knives
- Nozzles

Sterilising-In-Place (SIP)

SIP is when baking equipment is sanitized after the CIP process. It helps to eliminate any residual microbiological contamination.

SIP combines three processes: sterilization, disinfestation, and sanitization.



The following chart explains the process of cleaning the work area before Production. The dotted boxes describe pest-control measures and methods used for waste material disposal.

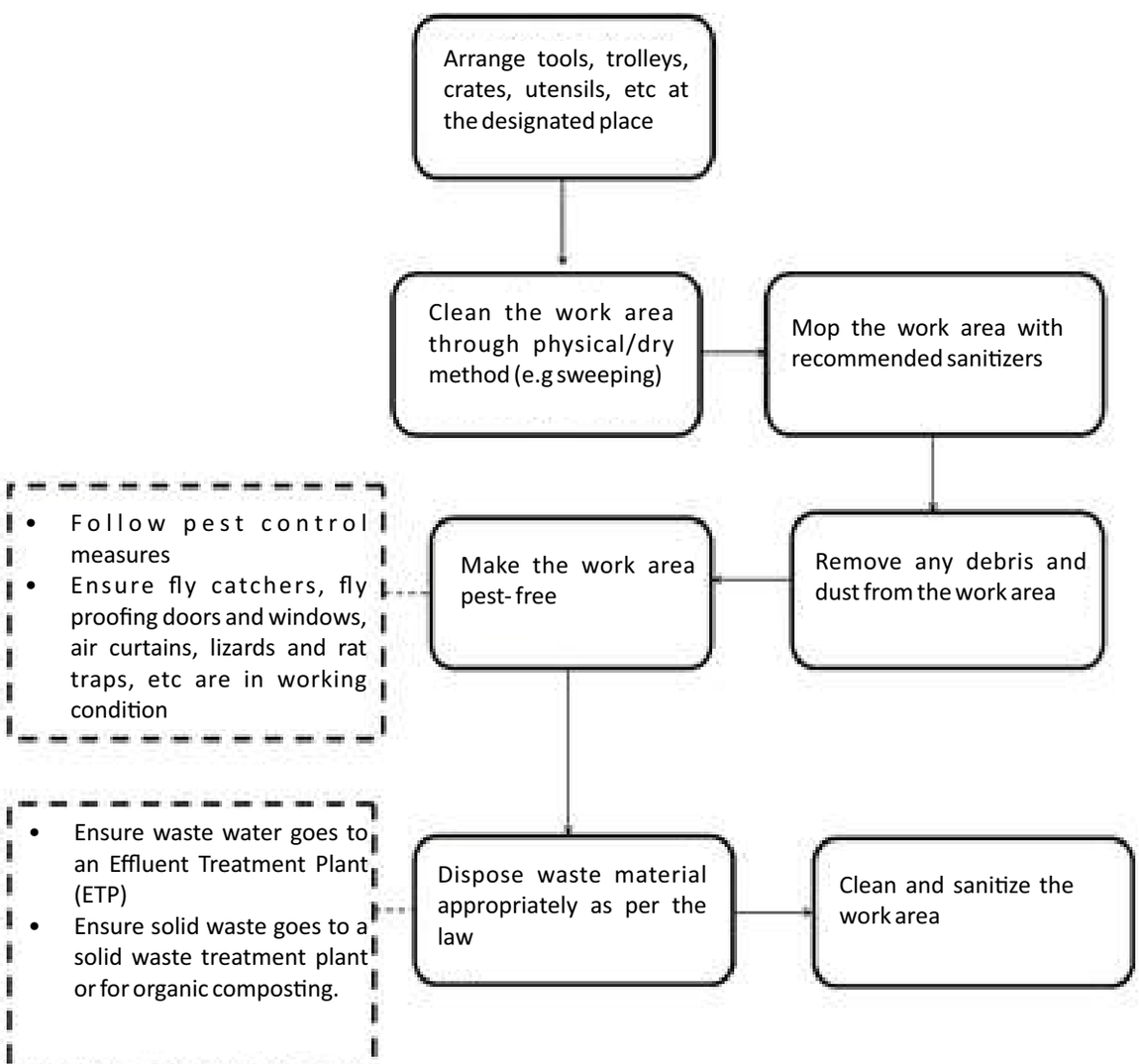


Fig 3.6.1 Sterilising-In-Place (SIP)

Air-Pressure Cleaning

The baking industry follows the air-pressure cleaning method to ensure the cleanliness of regularly used equipment.

The following chart explains the process in detail:

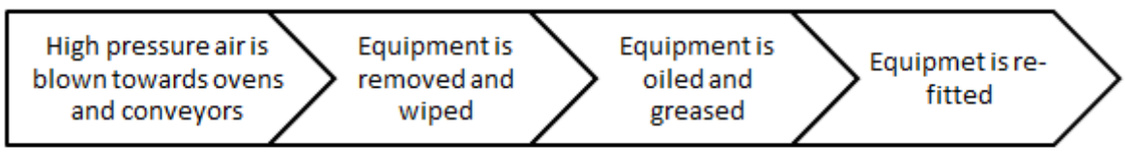


Fig 3.6.2 Air Pressure Cleaning

Process of Cleaning the Work Area

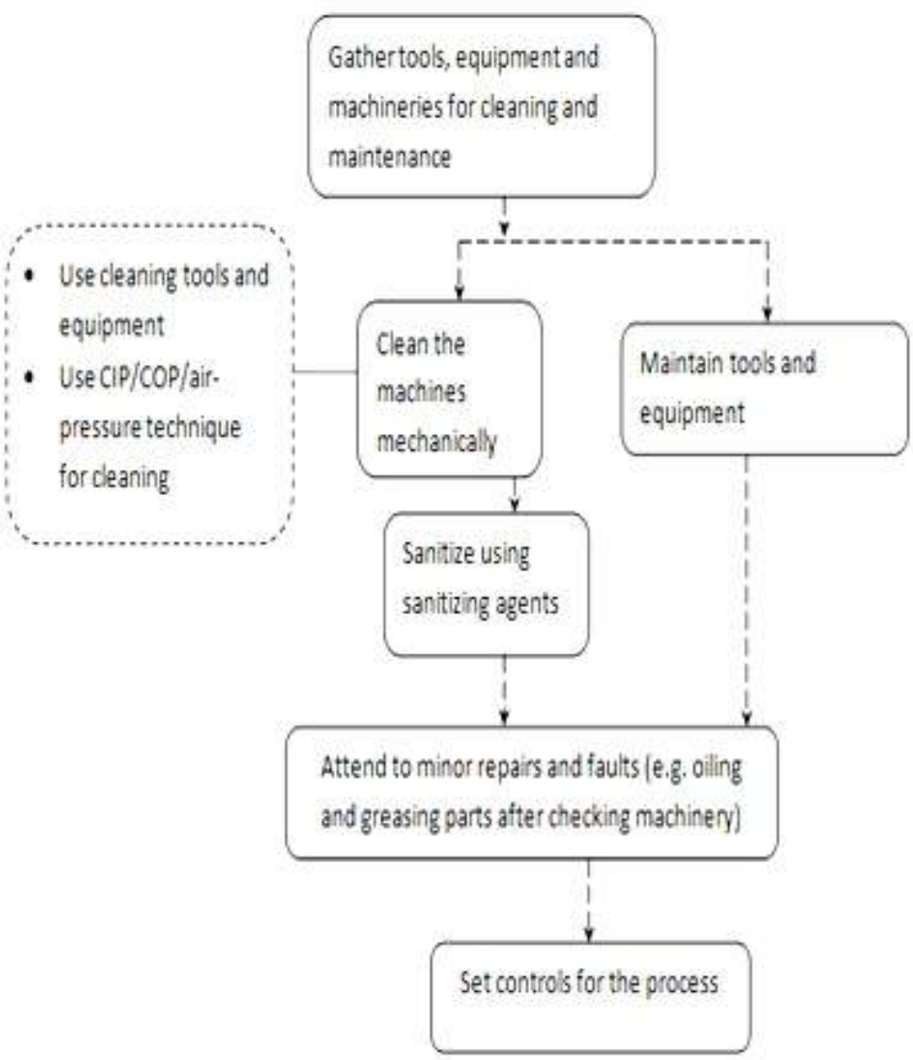


Fig 3.6.3 Process of Cleaning the Work Area

Process of Cleaning Machinery, Tools, and Equipment

The chart explains the cleaning of machinery, tools, and equipment used in the banking industry. The dotted chart states the techniques used for the mechanical cleaning of equipment

Source: https://www.csidesigns.com/uploads/resources/clean-in-place-5-steps-in-a-common-cip-cycle-infographic.pdf

Fig 3.5.24 Cleaning of machinery, tools, and equipment

Checking Scraping Off the Dirt, Rust, Food, Residues, and Unwanted Materials

Cleaning is a necessary process, and each step carried out during cleaning has much significance. Therefore, a worker must understand the various stages, sequence of carrying out these steps and essential aspects of cleaning attached with each step. Different furniture, fixtures, and machinery have different cleaning procedures based on their manufacturing materials and durable dirt. The following unit gives a clear idea about cleaning equipment and other institutions in a team.

Food businesses must keep their premises, fixtures, fittings, equipment, and food transport vehicles clean and sanitary. This means:

- Things like food scraps, garbage, dirt, grease, etc., should not be left to accumulate.
- Utensils and surfaces that come in contact with food should be clean and sanitary.

A typical cleaning plan in the food industry follows a systematized cleaning procedure:

Step 1. Preparation (Remove loose dirt and food particles)
Step 2. Cleaning (Wash with hot water (60 °C) and detergent)
Step 3. Sanitizing (bacteria-killing stage)
Step 4. Air drying

Removal of dust

- Removal of dust sounds like a straightforward thing, but it is an essential process in cleaning.
- Removing dust from equipment, furniture, or any surface mainly involves dry cleaning using dampened (wet but tightly squeezed) micro-fiber cloth.
- It is imperative to determine that the cloth used for dusting does not cause any scratches on the surface cleaned. Therefore, choosing a suitable cloth material for dusting is essential.
- Preferably a micro fiber cloth is used for dusting, but there can be another category of material as well:
  1. **Swabs:** These are all-purpose cloths made of soft, absorbent material. They are used for wet cleaning and damp dusting on all surfaces above floor level. They can also be used for cleaning sanitary fittings such as bathtubs and washbasins.
  2. **Wipes:** Sponges are used for washing walls, woodwork, glass, and upholstery.
  3. **Dusters:** These are meant for dusting and buffing. A fine mist of water or dusting solution is sprayed on them for damp dusting,
  4. **Chamois leather** is the skin of a chamois goat (antelope) used to clean windows and mirrors and polish silver and other metals when dry.
  5. **Glass cloths**: Glass cloths are linen tow yarn and do not leave lint. They can therefore be used for wiping mirrors.
  6. **Floor cloths** are more prominent, thicker, and coarser cotton than all-purpose swabs. They are used to wipe WC pedestals, clean tiles and pure marble or granite floors, remove spills, etc.
  7. **Scrim:** looks like sackcloth. It is used instead of chamois leather for cleaning windows and mirrors.

Scrapping of Rust

Any food processing unit has a lot of equipment, furniture, and metallic fixtures. Mainly these are made of stainless steel, iron, or chromium oxide quoted. When wet or in moisture, these metals react with oxygen and develop rust over time. Rust is brown and orange (iron oxide) and is extremely dangerous if consumed. In addition, rust can lead to food contamination and other ingredients. Thus, rust is fatal in a food processing unit.

Rust can easily be removed using chemicals like acids and abrasive agents. However, it can also be removed using readily available materials such as vinegar and salt. In the incoming section, we will discuss easy ways to clean rust from furniture, fixtures and cooking surfaces.

Cleaning rust using chemicals-

1. How to use oxalic acid

- Oxalic acid generally comes in powdered form.
- Very effective on rust but may adversely affect the furniture/fixture/surface if used in excess quantity.
- Highly reactive and may be dangerous if used without proper precautions
- Use proper protective gear like hand gloves, eyeglasses, and masks.
- Clean the rusted area with detergent and water. Let it dry properly.
- Mix oxalic acid with warm water (25 ml acid: 250 ml water). Avoid inhaling fumes.
- Pour the mixture into the rusted area and scrub the rust with steel wool.
- Wash off the acid from the furniture/surface and let it dry.

2. How to use citric acid?

- Citric acid is safer than oxalic acid and is readily available.
- It has to be used cautiously as it can even remove the layer of paint (if any) from the furniture or fittings. Thus, repainting has to be done.
- Clean the rusted area with detergent and water. Let it dry properly.
- Mix citric acid with warm water (10-15 ml acid: 50 ml water).
- Pour the mixture on the rusted area and scrub off the rust with steel wool or brush.
- Wash off the acid from the furniture/surface and let it dry.

3. Chemical Rust Remover

- Chemical rust removers are very effective for removing rust.
- They are available in the gel as well as liquid forms.
- These are made of toxic and harsh chemicals like phosphoric acid, oxalic acid, etc.
- Few chemical rust removers can also be organic and non-toxic.
- The worker is advised to follow the instructions given by the company for the usage of these chemicals.
- Also, since these are highly reactive, it is advised to wear safety gear like gloves, eyeglasses, masks, and a respirator.

Cleaning rust using organic cleaners-

1. Baking Soda Paste

- It is a safe and organic method to clean light rust.
- Mix baking soda with water and make a paste.
- Apply the paste to the rust and rest for 1-2 hrs.
- Scrub using steel wool and brush.
- Wash the paste and let the furniture dry.

2. Lemon and Salt

- Apply salt religiously over the rusted area.
- Use more salt if rust is more.
- Put lemon juice over the salt and rub.
- Let the paste rest for 2-4 hrs
- Use a brush over the surface to scrub
- After some time, wash the furniture/surface and let it dry

3. White Vinegar

- Dip the rusted part of the equipment in the vinegar
- Let it be dipped for some time
- Take out the part after some time and scrub and wash.

4. Rub potato and dish soap/salt

- Take a cut potato.
- Dip it in dish soap/salt
- Scrub over the rusted surface
- For tricky corners, pour potato juice and detergent soap mixture in that corner and let it rest for some time.
- Repeat the process if the process does not look very satisfactory.
- Wash and rinse the surface and let it dry.

Manual Cleaning method

1. Use Abrasive and scrubbers

- It is a bit time-consuming method
- It can be done using sandpaper, a screwdriver, or steel wool.
- Scrubbing involves high muscle power and is suggested only when rust is light.

How do you protect surfaces from rusting?

The worker can follow many methods to check that equipment and surfaces remain rust-free.

- Furniture should be kept dry and wiped with a soft cloth time-to-time to save it from rusting
- Use waterproof covering during the rainy season.
- Use anti-rust agents like WD-40 on surfaces and parts to save them from rusting. This is highly effective on surfaces like sinks in continuous contact with water.
- Cleaning food residues and unwanted materials from the food processing area-
- It is advisable to remove/clean the food residues and unwanted materials from the unit area to avoid any contamination.
- Food residues can also affect the visual cleaning environment.
- It is generally done through the dry cleaning method.
- Residues can be effectively cleaned using two methods:

I. Manual cleaning- using broom- dustpan, brushes, and a dusting cloth.
II. Mechanical cleaning- using vacuum cleaners, limited compress air, product flushes, and specialized application cleaning tools, e.g. belt scrapers, rotary brushes, and air knives.

Suppose the residue is sticky, like an oil crust created during the frying process. The scrapping method using sharp scrapers can also be used in that case.

It is advisable to clean the workspace floor thrice during the working day. In addition, some units also clean the residues once every hour.

Applying Recommended Chemicals and Cleaning Methods

There can be several cleaning methods explained in earlier units, viz.

- Dry (without water) and wet cleaning (using water as a base)
- Manual (by hand) and mechanical (using machines)
- CIP (cleaning the parts in place), COP (removing the parts to clean them)

What is Wet Cleaning?

Wet cleaning is the most common method of food processing cleaning, particularly in facilities such as meat processing facilities. It involves:

1. Cleaning up loose debris,
2. Pre-rinsing with ambient water,
3. Cleaning and scrubbing with specific cleaning chemicals,
4. Rinsing, and
5. Sanitization.

Wet cleaning in food manufacturing environments involves pre-rinsing, washing (with chemicals), post-rinsing and sanitizing food contact surfaces and food processing equipment. Below is an ideal process for you to follow.

The 3-step process for effective cleaning and disinfecting in food processing

Elpress advises the following 3 step process for effective cleaning in the food processing industry.

Step 1. Rinse

At the end of the production process, the areas and equipment are no longer clean. Food residues will always be present to a greater or lesser degree. To guarantee hygiene, the production areas must therefore be thoroughly cleaned. This process begins with the rinsing of equipment, walls and floors. This process requires pressurized water, transported to the required location by a booster unit and a network of pipes. The coarse dirt is removed by this boosted water rinsing step.

Step 2. Foam

Immediately after rinsing, the equipment, floors and walls must be thoroughly cleaned using foam cleaning – also called 'foaming' for short. In a centralized system, a foam system with an automatic dosing unit is used for this. The chemical is dosed to the satellites' water in a decentralized system. The foam is created with air pressure. A foam layer should be applied to all surfaces in the production area. The longer the foam is allowed to work, the better. The layer of foam is then rinsed off.

Step 3. Disinfect

After the foam's foaming and rinsing, an optional step in the hygienic process is possible: a post-treatment with disinfectant. This product has an antibacterial effect and is atomized over the equipment and, if necessary, the walls and floors. The disinfecting process ensures that microorganisms are removed or "killed". Depending on the disinfectant used, a further round of rinsing with clean water only may be necessary.

Effective cleaning involves proper heat/temperature, chemicals, human effort, and time.

Different cleaning methods can be decided for cleaning based on various factors:

- Type of product manufactured in the unit

PRODUCT	TYPICAL CLEANING METHOD
Cereals	Wet cleaning/ combined damp and dry cleaning Dry cleaning post-thermal process
Baked and fried snacks	Wet cleaning/ combined damp and dry cleaning Dry cleaning post-thermal process

- Type of process used for manufacturing the final product

PROCESS	TYPICAL CLEANING METHOD
Seasoning/Flavorings/Coating	Wet Cleaning
Oiling and Frying	Wet cleaning

- Type of equipment and infrastructure

EQUIPMENT	TYPICAL CLEANING METHOD
Ovens and stoves	COP
Conveyor belts for shifting foo	CIP

Fig 3.5.25 CIP cleaning of food conveyer belt

Similarly, different chemicals clean different dirt/soils in the food production unit.
A worker has to keep the following points in mind while selecting the correct chemical for cleaning:

- **Understand the aim of cleaning**
  1. Detergents dissolve grease and fat but will not kill bacteria.
  2. Disinfectant removes infection (reduce bacteria to a safe level) but will not dissolve fats.
  3. Sterilizers kill all living micro-organisms.
  4. Sanitizers combine the effect of both detergent and disinfectant.

- **Type of soil or dirt**
  1. Oil/grease (fatty soil) strong detergents with hot water
  2. Deposits like hard water mark clean best with acidic cleaners
  3. For rust and other mineral deposits use more acidic cleaners like vinegar. Even toilet cleaners are acidic in nature.
  4. For dairy products, highly caustic detergents are widely used.

- **Type of surface**
  1. Avoid using chlorine cleaners on the food preparation surfaces, it may be highly reactive.
  2. Aluminum can get discolored if acidic cleaners are used. Use mild detergents for aluminum surfaces.
  3. Metal tables, sinks and panelling should be cleaned using a non-abrasive cloth and cleaner. Clean with a detergent and a disinfectant, or a sanitizer, then rinses with hot water.

Ovens cleaning

Step 1. Use specialized chemicals such as a heavy-duty oven cleaner.
Step 2. Ensure that cleaning fluids are rinsed off, as they are highly toxic.
Step 3. For griddles & grills, use specialized chemicals to remove carbon (burnt food residue).
Step 4. Clean when the oven is warm to clear the burnt carbon and dirt effectively.
Step 5. Let it dry. Switch on only after the oven is completely dry.
Step 6. Switch on and check.

Fig 3.5.26 Oven cleaning in a bakery

Fryers cleaning

Step 1. Ensure that electricity or gas burners are turned off.
Step 2. Allow the oil to cool, and drain warm crude through an oil filter into a large container to hold all of the oil.
Step 3. Remove all food debris and clean with a strong detergent/degreaser.
Step 4. Rinse and dry well.
Step 5. Refill with filtered or fresh oil (no darker than nut brown).
Step 6. Turn it on to check fryer still works.

Refrigerators, Freezers & cold rooms cleaning

Step 1. Mop up any spillages immediately.
Step 2. Use a detergent & disinfectant which will not taint the food.
Step 3. Plan your cleaning well, with regular defrosting of freezers.
Step 4. Heavy-duty equipment and all electrical catering equipment.
Step 5. Refer to manufacturers cleaning guidelines.
Step 6. Ensure that all equipment is turned off and disconnected before cleaning.
Step 7. Check equipment after cleaning.

Fig 3.5.27 Cleaning a Refrigerator

Washing is an essential process of cleaning. Follow the following steps for washing surfaces or equipment in a unit:

Step 1 Wear proper protective gear like gloves, an apron and eye protection glass.
Step 2 Clean up loose debris, waste or residue
Step 3 Put a "Cleaning in Progress" mark to save any accidents.
Step 4 Choose and apply the appropriate detergent, chemical or cleaning agent. Apply detergent from top to bottom.
Step 5 Scrub as per the requirement (apply more pressure and time of dirt is strong)
Step 6 Rinse with water. The direction for rinsing should be top to bottom.
Step 7 Preferably use low-pressure foaming, scrubbing and low-pressure rinse to save the dirt, foam and filthy water spread in the surroundings. Also, it is better to use lesser pressure for equipment safety.
Step 8 Use an appropriate cloth, sponge or mop (on the floor) to remove the excess water
Step 9 Check for the visual impact of cleaning. If the result is not satisfactory, repeat the process.
Step 10 Dry the surface or the equipment properly using a lint cloth or wipe.

Disinfection

- Disinfection is the most crucial process after washing.
- It determines that the surface and equipment become free of micro organisms.
- It is advised to be done after sufficient training and knowledge.

The following steps should be followed to disinfect the facility:

Step 1. Wear proper safety gear like gloves, masks, eye protection glasses, respirators or a PPE kit.
Step 2. Read the instructions given on the disinfectant regarding the usage and precautions.
Step 3. Inform all the concerned personnel regarding the disinfection process to avoid an accident.
Step 4. Put signage regarding disinfection, if possible.
Step 5. Determine that the area to be sanitised is arid. Then, remove all the equipment, food items, and ingredients from the site to be disinfected.
Step 6. Do not mix the disinfecting chemical with any other chemical until specified.

Step 7. Cover the things which are not movable and not supposed to be sanitised.
Step 8. Close all the windows ventilators and seal all gaps to determine that the fumes of the sanitiser do not seep out from the area.
Step 9. Post-disinfection, let the area be out of use for some time.
Step 10. Take off protective gear, dispose of it properly and wash your hands.
Step 11. After the prescribed time, open the windows, ventilators and ducts to allow cross-ventilation.
Step 12. Inform people about completing the process and ask them to use good protective gear like masks and eye-protective glasses to avoid allergies or reactions.
Step 13. Wipe the equipment with a sponge before using it again.

Fig 3.5.27 Understanding Disinfection

Wiping off the water, drying and making them free from moisture

- Wiping activity helps in drying the surface thoroughly after washing and disinfection.
- Not wiping/ drying the water after cleaning or chemical after disinfecting can lead to marks on the surface.
- Airing the surface and equipment is recommended, but sometimes even cloth can dry.
- Wiping cloth should preferably be soft (to save from scratches), lint-free, and one-time usable.
- Reusing the wiping cloth can lead to potential contamination and transfer of bacteria from one surface to another.
- Wiping cloth, if reused, should be washed thoroughly using soap or detergents and dried (air-dried, machine dryer or sun-dried) to ensure no bacteria or micro-organisms grow on the cloth.
- No damp cloth from earlier cleaning should be reused for wiping at all.
- Wiping should be done gently, and the wiping direction should be up to down.
- Once wiping is done, remove all signboards put during cleaning or disinfecting.
- Wash your hands thoroughly after the job is done.
- The surface has become free from dirt and bacteria and is ready to be used again.

Fig 3.5.28 Wiping and drying surfaces after cleaning and disinfecting

Tips to clean effectively

- Follow any cleaning schedules or cleaning plan.
- Follow any training you have received, if cleaning at work.
- Use the right products for the cleaning activities you carry out.
- Always follow the manufacturer's instructions and guidance, including any recommended concentrations and dilutions of chemical substances.
- Store the cleaning materials safely and in accordance with instructions.
- Remember to never mix different chemicals together, as this can cause dangerous reactions.
- Wear PPE, such as gloves and aprons.
- Ensure that there is sufficient ventilation.
- Make sure to always wash your hands after cleaning, with an effective hand washing procedure, even if you were wearing gloves.

Scan the QR Codes to Watch the related Videos

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

Tools and Equipment's used in baking industry

https://www.youtube.com/watch?v=Js8uiPAQ5k0

Overview of the baking process

https://www.youtube.com/watch?v=HcI3v1d22CM

Storage of Finished product

Notes

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FICSI
Food Industry Capacity and Skill Initiative

4. Produce Baked Products in Artisan Bakeries and Patisseries

FIC/N5007

Key Learning Objectives

1. List the various types of breads and buns that are produced in artisanal baking.
2. Discuss the steps to be performed to prepare the dough/batter as per production needs.
3. Demonstrate the tasks to be performed to prepare dough/batter as per need.
4. List the various types of toppings and fillings that are used in craft baking.
5. Show how to apply toppings and fillings on cakes and other artisanal baked products .
6. Explain the steps to be followed for baking the products.
7. Demonstrate the procedure for baking the products as per standard work practices.
8. Discuss the standards applicable to the packaging of baked products .
9. Apply standard work practices to package and label the finished products .
10. Discuss the tasks to be performed to display, store and dispatch the finished baked products
11. Demonstrate the steps to be performed for providing the finished products to the customers.

UNIT 4.1: Different types of bread

Unit Objectives

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

1. Explain a variety of bread based on their shapes and manufacturing procedure.
2. Prepare a list of various ingredients to be used in artisanal baking.
3. Discuss the critical considerations for selecting the type of ingredients to be added per the product.
4. Describe the importance of yeast.
5. Demonstrate the process of gluten formation and the ways to avoid it.
6. Demonstrate the methods of bread making
7. Explain types and Techniques of emulsifiers, preservatives, colors and flavors used in baking.
8. Demonstrate methodology of artisanal baking.

4.1.1 Types of Bread

Bread and rolls come in a variety of shapes and sizes, which are governed by a variety of elements such as:

The type of flour used to make the bread

- If the bread is leavened
- How is the bread used?
- Local or regional customs
- Cooking the dough, such as baking, steaming, deep-fat frying, etc.
- The bread's symbolic importance for a particular festival or festive event

Some of the most common bread shapes are described below.

Baguette 	A baguette is a long, rounded shape that has become a popular name forvarious bread with similar conditions. Baguette is a French phrase for "stick" or "small rod." A French baguette can be up to 2 feet long, 2 to 4 inches wide, and 9 ounces or more in weight.

Baton 	A baton is similar to a baguette, although it is slightly smaller.
Ficelle 	"ficelle" comes from the French word "string," referring to a minor baguette form. Although the length is similar, the bread's width and weight are usually half that of a baguette.
Bloomer 	Bloomer refers to a cylindrical bread flat on the bottom with multiple diagonal slashes over the top. The name is most commonly used to describe a popular bread shape in the United Kingdom. Bloomers can be produced with various flours, although wheat flour is the most common.
Pullman 	As the form of the bread and the shape of the railway car are similar, this phrase refers to a bread shape called after the famous Pullman railway coach of the United States. A Pullman loaf is baked in a Pullman pan, which includes a sliding top that covers the dough while baking, trapping it inside to form a rectangular shape. The pan comes in a variety of sizes, but the most common are 13" x 4" x 4" and 16" x 312" x 312". Typically, the Pullman loaf is sliced and used as sandwich bread.

Vienna 	A circular loaf with tapered ends is described as the Vienna shape.
Moulded Tin or Split Pan 	A rectangular bread shape that is split down the length of the loaf is referred to as a moulded tin. It is made by placing two parts of dough in the bread pan next to each other, resulting in two very narrow rectangular loaves linked together when baked. Using one piece of dough and slashing it down the centre is a more straight forwardmethod of making the loaf.
Boule 	The word "boule" in French means "ball" or "round," and it refers to a vast circular bread baked on a flat surface in an oven or hearth. The boule shape is found in a wide range of bread, but it is most commonly associated with French bread. The term "cob" is most frequently used in the United Kingdom to denote loaves with similar shapes.
Coburg 	A Coburg is similar to a cob, except it has a cross slashed into the top.
Cottage 	A cottage is a vast, circular shape that resembles a cob or boule but has a smaller round of dough on top. Because some of the top round's dough is pushed into the bottom round, making a hole through the centre of the entire game and continuing into the bottom round welds th dough of the two rounds. Cottage breadis most commonly referred to as such in the United Kingdom.

Braided 	Braided bread is prepared by weaving dough strands together into a braided shape. Several types of braided bread use three to six strands of dough, with some incorporating as many as twelve strands.
Ring 	A ring form can be utilized in various bread recipes. However, it's most commonly associated with holiday bread, particularly Christmas and Easter. Bagels are shaped like smaller versions of rings.
Rolled 	Rolled breadis formed from flattened dough like jelly or Swiss rolls. The dough is often covered with other ingredients before it is moved. The elements can be savory or sweet, depending on the recipe.
Flatbread 	Flatbreads are available in various shapes, thicknesses, and sizes. Thicker flatbread-like focaccia is typically leavened, whereas thin, pancake-like flatbread like chapatis are frequently unleavened. Many flat breads, such as parathas, have a spherical shape, while others have a freeform or triangular shape.

Table 4.1.1 Most common bread shapes

Bun and roll shapes

Rounded 	A spherical form is perhaps the most frequent shape for various rolls and buns.
Kaiser 	"Kaiser roll" refers to a round roll with a five - petal floral pattern.
Crescent 	Rolling up triangles of the flattened dough and curling the ends into a crescent shape creates a crescent shape.
Fan Tan 	A fan tan is a New England -style dinner roll with a fan shape. This unusual shape can be made in a variety of ways.

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4.1.2 Understanding the Purpose of Crucial Bakery Ingredients

Each ingredient you use serves a particular function, reacting with each other to produce new combinations and create the finished baked product's structure, flavor, and texture.Following is the list of ingredients with their role and purpose in baking:

Wheat - Wheat is more widely used in baked goods than any other cereal grain. Its popularity is because of the gluten that forms when flour and water are combined. Raised bread is difficult to fathom without gluten. Wheat is also popular because of its mild, nutty flavor. Wheat is the most frequently produced cereal grain globally due to both of these features.

Classification of wheat - The bakery business relies heavily on flour. Wheat is used to make the flour. As a result, learning about wheat is essential. Among all grains, wheat is the most critical. We can obtain high-quality flour by using high-quality wheat.

Some bakery items that contribute to a healthier lifestyle and, as a result, have varying food ingredient additions:
According to color - Which is due to environmental factors:

- Red wheat
- White wheat
- Yellow

According to hardness, wheat is classified into:
Hard wheat - Bakery products are made from the complex type of wheat flour because it has the following characteristics:

1. High in protein
2. More water absorption power (WAP)
3. Good mixing capacity, that is, it is easy to mix
4. Fermentation tolerance
5. Good gas retention power
6. Falls into separate particles if shaken by hand
7. Feels slightly coarse and granular

Hence it is mainly used for yeast products (e.g. bread).
Examples of hard wheat:

- Hard red winter,
- Hard red spring and
- Durum

Soft wheat - Soft wheat flour contains the following characteristics:

1. Less protein
2. Less WAP
3. Poor mixing capacity
4. Poor fermentation tolerance
5. Tends to clump and hold together if pressed
6. Feels soft and smooth

Hence, it is mainly used to make biscuits, cakes and pastries.
Examples of soft wheat:

1. Mild red winter and
2. Soft red spring

Fig 4.1.1 Classification of wheat

Characteristics of good quality flour

Bakers need good quality flour for production. Good quality flour should have the following characteristics:

Colour - The flour should be a light cream colour. When displayed to the light, good-grade flour will reflect the light. Bleaching the flour aids in the colouration process.

Fig 4.1.2 Colors of wheat

Strength

There are two types of flour:

- strong and
- weak

The strength depends upon the gluten quantity present in the flour. Strong flour is preferred for making bread, and weak flour is preferred for making cakes and confectionery products.

Tolerance - Tolerance refers to flour's ability to survive more fermentation and mixing than is required to mature its gluten adequately.

High absorption power - High absorption power refers to the flour's ability to absorb a large amount of water. Bread will have lower quality and yields if the flour has less WAP.

Uniformity - The quality of the result will vary if the flour is not used uniformly. To achieve a desirable outcome, regular monitoring and correction are essential.

Flour Testing - These are several methods for testing the flour.

Chemical analysis:

Moisture test	Flour should have 14% of moisture, and more than this will affect the storing quality of the flour
Ash test	It helps find the number of minerals found in the flour.
Protein test	Quantity and the quality of the protein can be analyzed.
Falling number	The falling number indicates the activity of enzymes.

Physical analysis:

Amylograph	For enzymic activity.
Farinograph or alveograph	Tests the strength of the flour and water absorption.
Extensograph	Tests the dough handling properties.
MacMicheal Viscosimeter	Tests the viscosity of a flour solution.

Physical examination:

Colour test	Checks if the particles of the endosperm are separated.
Baking test	Tests the overall evaluation of the flour quality.

Test for water absorption power (WAP) - Take 100 gms of flour and mix 50 ml of water. Mix it well. If the dough is stiff, add 1 ml of Taking 100 gms of flour and mix 50 ml of water. Mix it well. If the dough is stiff, add 1 ml of water at a time and mix until it becomes a pliable dough. After obtaining this quality, note the quantity of water added. This quantity will be the WAP of the particular flour. More protein flour has more WAP. It will increase the number of portions (yield).

Test for the gluten quality in flour - Take some flour and mix it with enough water. Knead it well to get a smooth dough. Then put this dough in water for 30 minutes at room temperature. Then take it out and wash it in the running water till the starch is completely removed. Squeeze the dough until it gives no white streaks, and what remains is called gluten. Squeeze out to remove the excess water, known as wet gluten. It can be expressed as a per cent of the flour sample. Then keep the wet gluten in a cool oven (140 C) until all the moisture evaporates. Now it is called dry gluten. The dry gluten weight should be 1/3 of the wet gluten. For example: If the damp gluten is 30 gms, the importance of dry gluten should be 10 gms. If the dough in the oven rises, the flour will have good-quality gluten.

PH value - PH value indicates acidity or alkalinity. It is measured from 0 to 14.7 is neutral. When the ph is above 7, it is called alkaline. When it is below 7, it is acid. The pH value should be 5.5-6.5 for bread making and 4.5-5 for high-ratio cakes. However, some cakes are on the alkaline side.
Functions of Flour - Wheat flour is the most widely used flour. All-purpose flour, bread flour, and whole wheat flour are all included. Gluten is a protein found in wheat that provides dough with elasticity and strength. When yeast and flour are combined with liquid and kneaded or beaten, the gluten develops and stretches to form a network that traps the yeast's carbon dioxide bubbles.

Whole wheat flour recipes have less gluten and produce denser loaves. Most of these recipes call for all-purpose flour, which raises the gluten content and results in lighter, taller loaves.

- **Provides structure** - Flour is the main ingredient for toughening or structure construction in baked foods. The product's design enables it to hold more, more extensive air spaces that expand and leaven. It keeps the items from collapsing once they've cooled and been removed from the pan.
- **Absorbs liquids** - Driers are ingredients that absorb liquids, such as wheat. The three essential components of flour are starches, proteins, and gums, which absorb moisture (water) and oil and help to bind items together. In bread baking, the absorption value of flour is a critical quality component.
- **Contributes flavor** - Wheat flour is a clean, full-bodied flour with a mild, nutty flavor commonly used in baking items. Each variety of flour has its particular taste and is utilized accordingly. For example, coarse flour has a more robust flavour than sophisticated patent flour, such as cake flour, due to its higher protein and ash content. The most robust flavour will come from whole wheat flour. Wheat flours have a moderate and slightly nutty flavor to them. However, each has its distinct flavor. Clear flour should be expected.
- **Contributes color** - The colour of the flours varies. Regular whole wheat flour, for example, is a nut-brown colour, whole white wheat flour is golden, durum flour is a pale yellow, unbleached white flour is creamy, and cake flour is a bright white tint. These hues are reflected in the colour of baked foods. Flour also provides protein, a tiny amount of sugar,

and starches to Maillard browning, which results in a dark stain on crusts by the breakdown of sugars and proteins. Maillard browning occurs more frequently in high-protein flours than in low-protein flours.

Liquid - Any baking recipe that calls for juice or "wet" ingredients will fail. Depending on the baked food, each drink has a different function; however, alterations or substitutions are also acceptable. Bakeries use the following liquids in their products:

- Water is the essential liquid ingredient in many baked foods, especially bread. Water helps dissolve yeast in bread and encourages it to become active. It combines flour and other dry ingredients to make a smooth, workable dough. Water functions as a binding agent for the bread in this way. Water can also provide moisture to various baked items without impacting the final flavor.
- **Milk and cream** - Milk and cream wet dough and mixtures in the same way as water. Unlike water, they offer a subtle taste to the final baked items and boost their richness.It's possible to impart varying degrees of richness to the dough or batter you're preparing with it, depending on the fat percentage of the milk or cream—skim, 1%, 2%, whole, half and half, or heavy whipping. Milk and cream also give baked items a fuller, moister feel and help them brown on the outside.
- **Yoghurt and sour cream** - The dough is moistened with yoghurt and sour cream, with a harsher and tarter flavor than milk or cream. They can also be used as a binding agent in quick bread or muffin recipes, removing some of the sweetness from additional sugar while adding structure and assisting crumb development. Instead of milk, buttermilk can be used to make a moister loaf with a cake-like texture.

Tips for using liquid ingredients -Because tap water has been chemically treated, it may cause the temperature to rise more slowly. Hard water is alkaline, which weakens the gluten and reduces the volume of the loaf. Soft water is slightly acidic, which encourages yeast activity. If your breadisn't rising correctly boils the water, cool it to room temperature before using it, or use bottled spring water. Because a too-cool liquid can slow or stop yeast action, a too-hot drink will destroy the yeast and prevent it from rising. Therefore, only warm liquids should be added to dry ingredients in a yeast bread recipe.

When yeast is dissolved directly in water, the ideal temperature range is 100°F-110°F; when yeast is added to dry ingredients, the perfect temperature range is 120°F-130°F.If the dough becomes too dry during the kneading process, sprinkle it with water.

Sweeteners - Sugar, Brown sugar and jams give the crust of the bread a rich brown colour and flavor. Liquid sugars, such as corn syrup, honey, molasses, or maple syrup, are used to sweeten and flavor baked goods. This sweet flavor can be enhanced and adjusted with vanilla extract and other liquid flavourings.

Salt - Salt is essential in bread manufacturing because it functions as a preservative, extracting the fluids from microorganisms and then killing them. As an anti-raising agent, it regulates bread's leavening processes by inhibiting yeast action. It slows down all chemical reactions in the dough, including fermentation activity, bringing it to a more stable level. It increases the water absorption capacity (WAP).It also adds taste to baked goods and masks off-flavors by

making the dough a little firmer and strengthening the gluten protein. Other ingredients, such as butter and flour, benefit from it. Bread rises faster without salt, and air pockets form where the gluten has split, causing holes to form. Bread that hasn't been salted will taste bland. If you don't want to use salt, shorten the proofing time so that the enormous air pockets don't emerge. Automatic bread-making equipment should not be used to eliminate salt from recipes.

Eggs -Eggs are a binding ingredient that aids in the sticking and rising baked items. They also improve the nutritional content, colour, flavor, texture of the meal and the end product's moisture. They also aid in the fineness of the crumb and the tenderness of the crust. Eggs provide richness and protein. Egg yolks contribute fat to recipes, which gives them more taste. Eggs are used as a wash in several recipes, which adds colour. Because of these qualities, substituting other components for eggs in a recipe can hurt the final flavor; bakers should use canola or vegetable oil instead.

Fat and oil -Butter, margarine, shortening, or oil provide flavor to bread while making it tender and moist. Fat helps bread last longer by slowing moisture loss. When utilizing Yeast, the fat is cooked with liquid. If the recipe calls for it, use oil instead of margarine/shortening. Although the oil does not have the same flavor as butter and does not usually perform the same way, it is frequently used as a butter substitute in recipes. Bakers should use canola or vegetable oil in quick bread, muffins, and other recipes where the oil isn't supposed to affect the final flavor. Oil gives baked goods structure and moistness and enhances their flavor.

4.1.3 Importance and Usage of Yeast in Baking

The heart of the bread-making process is yeast. The critical element causes the dough to rise and imparts freshly baked bread's lovely flavor and scent. Other ingredients are added to finish the reactions, resulting in a newly baked loaf of hot, crusty homemade bread. Yeast comes in a wide variety of shapes and sizes. Only a few, such as Saccharomyces cerevisiae, or "sugar-eating yeast," are suitable for breadmaking. Isolated strains of this yeast are then maintained under simulated conditions. A biologically active raising agent causes the dough to rise in volume. Carbon dioxide (CO_2) is generated and creates bubbles during the rising and proving process, which not only causes the dough to rise and makes the baked bread porous, improves the grain, and can be compressed and sold fresh or dried and sold in granular form. Yeast softens the dough (gluten) enough to stretch under the pressure of CO_2 gas and form the product's structure. In the oven's heat, the small amount of alcohol produced evaporates.

Fig. 4.1.2 Types of yeast.

Types of yeast

There are two types of yeast:

- Fresh yeast and
- Dry yeast.

Fresh Yeast - Compressed yeast is another name for fresh yeast. It's a wet concoction of yeast, plants and starch. It should be kept in the refrigerator at 40-450 degrees Fahrenheit. It has a lovely ripe apple aroma and is inactive at chilly temperatures. It is yellowish cream in colour and shows clean fracture without crumbling when broken. When added to the dough, it quickly produces gas. Bakers prefer fresh yeast because it is less expensive and more consistent. Because of the high moisture content, it can be preserved for 2-4 weeks. There are two types of fresh yeast:

- **Cream yeast** - Cream yeast isn't sold in Indian stores. This yeast comes in the form of a suspension and is carried via motor and tube. Because of the high moisture content, it can only be stored for 7-10 days.
- **Compressed yeast** - Compressed yeast is cream yeast that has removed most of the liquid. It's a soft, beige-coloured solid with a crumbly texture known in the consumer form as little, foil-wrapped cubes of cake yeast.

Dry yeast - Dry yeast has a long shelf life and very little moisture. It has a greyish-brown colour, granular texture, and a peculiar odour.

- **Active dry yeast** -It's a yeast-corn flour or corn meal mixture formed into cakes and dried. It comes in granular and multiple forms. It comes with some sort of growth medium. In most cases, active dry yeast must be proofed or rehydrated before being used in the sponge or dough processes. However, the low moisture content can be preserved for an extended period (4-6 months).
- **Instant dry yeast** is the most common type offered to non-commercial bakers. It is made up of powdered coarse oblong granules. It is still alive but in a dormant state. It starts to generate yeast when it gets warm and damp, with live yeast cells encased in a thick layer of dry, dead cells. It has superior keeping properties to other forms. It can be stored at ambient temperature for a year or frozen for over a decade. However, it is more susceptible to thermal shock when employed in recipes.
- **Rapid-rise yeast** - is a type of dry yeast (typically a form of instant yeast) with smaller granules, allowing it to dissolve faster in dough and produce more carbon dioxide, allowing for rapid rising. This yeast is not commonly employed in bakeries because most baking experts believe it decreases the completed product's flavor potential.
- Deactivated yeast is a dead yeast with no leavening value and cannot be substituted for other yeast types. It is typically utilized at 0.1 percent of the flour weight in pizza and pan bread doughs. However, manufacturer specifications may vary. It's a potent reducing agent used to make the dough more extensible.

Yeast culture - Culture would be begun by leaving rye dough at 24–27°C for several hours, likely stimulating the grain microbes to begin lactic acid fermentation. Another option is to add sour milk to the dough and let it rest for a few hours. To mimic the flavor of real sour dough, a blend of pure organic acids can be used. If the culture wants to provide both yeast and sour bread flavor, it must either acquire wild yeast or introduce a starter culture that includes yeast. In certain

circumstances, the lousy dough culture is employed to give the sour dough flavor, and regular yeast is used instead. If you're using a pre-made culture, activate it by mixing it with rye flour and water and sitting in a warm location until it's fully active. The active culture is then fed flour and water to keep it alive. When the culture reaches total activity, it combines flour, water, salt, and fat. To minimize over-toughening, the resulting dough is carefully kneaded. After that, the dough is fermented for about half an hour, knocked back, scaled, proven, and baked.

Commercial yeast is used in specific sour dough bread, but the real sour dough is used in others. In sour rye dough, ordinary baker's yeast is at a disadvantage since the low pH required for rye bread is not the yeast's optimal pH. Traditional improvers are not employed in rye bread, but additions are occasionally used to boost the dough's water absorption. Examples include polysaccharide gums like guar and locust bean gum, pre-gelatinized potato flour, rice starch, and maize starch.

4.1.4 Methods of Bread Making

The principal methods of bread-making are:

- Straight dough method.
- Modified straight dough method
- No-time dough method or Chorleywood method
- Delayed salt method.
- Sponge and dough method.
- Ferment and dough method.

Straight dough method

- All components are combined, and the dough is fermented for a specific time.
- The flour's strength determines the time it takes for the straight dough to ferment. To mature correctly, strong flour takes extra fermenting time.
- Straight-method bread should be made with flours that require 2 to 3 hours of maturation. Flours that take a long time to mature should not be used since it is impossible to manage the dough's temperature during long fermentation periods. Temperature rise will result in an acid taste and flavor in the bread

Modified straight dough method

- The straight dough method is changed to ensure the even distribution of fat and sugar in sweet doughs.
- Soften the yeast in a separate container with some of the liquid.
- Mix the fat, sugar, salt, milk solids, and flavourings until smooth.
- Add the eggs one at a time as they are absorbed.
- Mix in the liquid for a few seconds.
- Combine the flour and yeast in a mixing bowl. To make a smooth dough, combine all ingredients in a mixing bowl.

No-time dough method or Chorleywood method

- The dough is fermented in the usual manner. It is just allowed a brief period (approximately minutes) to recover from the mixing strains.
- Because the dough is not fermented, the two functions of fermentation (gas production and gluten conditioning) are achieved by increasing the yeast quantity (2 to 3 times the original quantity) and making the dough slacker and warmer.

- Although this procedure can be used to manufacture good bread (in an emergency), the result is low shelf life. Gluten and starch are not sufficiently conditioned to hold moisture due to the lack of fermentation..

Delayed salt method

- This is a slight modification of the linear approach. All of the components are blended except for the salt and butter.
- Because salt regulates yeast enzymatic action, the speed of fermentation of a salt-free dough will be faster, resulting in a shorter total fermentation period.
- At a later stage, the salt is applied. The baker's preference may determine the manner of adding salt later. For example, it can be sifted and added to the dough or creamed with oil and salt.
- Whatever method is used to combine the salt, just three-quarters (of the whole mixing time) should be done first, and one-fourth should be done when the salt is added.
- The fermentation speed is increased, and gluten is reduced due to the lack of salt matured in a relatively short time

Sponge and dough method

- It requires excessive time to condition and should not be utilised to make bread using the straight dough method. When the challenge of managing the dough temperature duration is not as severe, the sponge and dough approach is more appropriate.
- Flour is combined with a proportionate amount of water, yeast, and sugar. Longer fermenting sponges may also contain a small quantity. In a large mixing bowl, evenly combine all of the ingredients.
- This sponge is fermented for a specific amount of time. The fermentation takes about 16 to 17 hours, and the shortest is approximately one hour.

Added Benefits

- Flexibility in scheduling. Sponges can usually be kept for a longer time than the final dough.
- Increased taste as a result of the sponge's long fermentation.
- Because yeast multiplies during sponge fermentation, less yeast is required.

Ferment and dough method

This is a sponge and dough process variation.

- Milk, eggs, significant fat, and sugar are frequently found in bread formulas.
- All of these formula elements will slow the yeast activity.
- When all formula yeast, part of the flour, yeast food, and enough water are mixed, the yeast is given an environment that promotes vigorous activity at first. By the end of the fermentation time, it is in a fit state to take on additional loads of fermentation in the presence of milk, eggs, excessive fat, etc.
- The formulation of the desired product determines fermentation time, but it is frequently a matter of personal preference.
- Over-fermentation of a ferment containing milk should be avoided because it will produce more lactic acid than needed, affecting the result's flavor, taste, and texture.

4.1.4 Steps of Bread Making

Step 1 : Scaling ingredients - All materials must be precisely weighed. Volume can be used to measure water, milk, and eggs. They're measured in pints per pound or kilogrammes per litre. However, when dealing with vast volumes of liquids, it is more accurate to weigh them. Extra caution is required when measuring spices and other substances in small quantities. This is especially true in the case of salt, which influences the rate of fermentation.

Fig. 4.1.3 Scaling of Ingredients

Fig. 4.1.4 Mixing

Step 2 : Mixing - Mixing yeast doughs has three primary purposes: Combine all ingredients into uniform, smooth dough. Distribute the yeast evenly throughout the dough. To develop gluten

Step 3 : Fermentation- The act of yeast acting on the sugars and starches in the dough to produce carbon dioxide gas and alcohol is known as fermentation. Gluten becomes smoother and more elastic during fermentation, allowing it to stretch further and contain more gas. A dough that has not been adequately fermented may lack volume and have a gritty texture. When dough ferments for too long or at too high a temperature, it becomes sticky, difficult to work with, and sour. A young dough has not been fully fermented, while an old dough has been fully fermented.

Fig. 4.1.5 Fermentation

Doughs with weak gluten, such as rye and rich doughs, are frequently under fermented or "put to the bench young." The yeast process continues until the dough reaches a temperature of 140°F (60°C) in the oven, killing the yeast cells. It's vital to remember that fermentation continues during the subsequent phases of making yeast dough: punching, scaling, rounding, benching, and make-up or moulding. If you don't give yourself enough time, you can end up with the over-fermented dough. Doughs for rolls and loaves that require much makeup time should be slightly under-fermented to avoid the dough becoming too old by the time the makeup is finished.

Step 4 :Punching or Knock Back - Punching is when you use your fist strike the dough. It's a way of deflating dough that releases carbon dioxide, redistributes yeast for future growth, relaxes gluten, and equalizes the temperature throughout the dough. Depending on the product, more fermentation and punching may or may not be required.

Fig. 4.1.6 Punching or Knock Back

Step 5 : Secondary Fermentation - This second rise helps with structure and flavor development.

Step 6 :Scaling - Depending on the product being created, divide the dough into equal-weight pieces using a baker's scale. Weight loss due to the evaporation of moisture in the oven is considered while scaling. This weight reduction is around 10% to 13% of the dough's original weight. The amount of baking loss varies on the baking time, the unit's size, and whether it's baked in a pan or on its own. Scaling should be done quickly and efficiently to minimize over-fermenting the dough.

Fig. 4.1.7 Rounding and Shaping

Step 7 :Rounding and Shaping - The bits of dough are formed into smooth, round balls after scaling. Extending the gluten on the outside of the dough into a soft layer, this technique creates a kind of skin. Rounding the dough helps retain gases produced by the yeast and simplifies later shaping.

Step 8 :Benching - Allow rounded dough portions to rest for a few minutes. This relaxes the gluten, making it easier to shape the dough. Fermentation is also ongoing during this time. The spherical dough is placed in special proofers for this rest in large operations. Smaller operations may lay the dough in boxes stacked on top of one another to keep it covered, or it may simply be placed on the work bench and covered.

Step 9 :Make-up and Panning -The dough is formed into loaves or rolls baked in pans or baking sheets. Machines are used in large or commercial bakeries, but the baker in a small company does most of the makeup by hand. The ultimate baked product relies heavily on proper makeup or shaping. During the moulding process, all gas bubbles should be ejected. Large air holes in baked goods will arise from bubbles remaining in the dough. The pan and hearth bread seam must be centered on the bottom to avoid splitting during baking. The pan size must match the dough's weight for units baked in pans. Too little or too much dough will result in a poorly shaped loaf.

Fig. 4.1.8 Make-up and Panning

Step 10 :Final Proofing - Final proofing is a continuation of the yeast fermentation process. The volume of the formed dough is increased by fermentation. Bakers use two terms to distinguish between fermentation of the mixed dough and proofing the makeup product before baking. Before baking, the dough must be mixed, and the makeup product must be proofed. Proofing temperatures are usually higher than those of fermentation. Under proofing leads to low volume and thick texture. Over-proofing leads to gritty texture and taste loss.

Step 11 :Scoring - Slashing the dough with a very sharp blade or knife to allow it to expand during baking is known as scoring. The main goal is to keep the bread from growing in the wrong way during oven spring. In other words, purposely generating a weak region on the loaf's surface protects the loaf from bursting at weak points established during shaping. Only one direction of scoring should be used.

Fig. 4.1.9 Scoring of bread

Fig. 4.1.10 Baking of bread

Step 12 :Baking - The following are some of the changes in the product during baking: Oven spring is the quick rise in temperature in the oven caused by the generation and expansion of trapped gases caused by the oven's heat. The yeast is quite active at first, but when the temperature inside the dough exceeds 140 degrees Fahrenheit (60 degrees Celsius), it dies. Protein coagulation and starch gelatinization are two processes that occur in the body. In another way, the product becomes firm and maintains its shape. The crust's formation and browning

Step 13: Cooling - Bread must be removed from pans and cooled after baking, and the alcohol produced during fermentation must be evaporated. The gluten strands must cool before reconnecting. Because they will obtain enough air circulation, small rolls spaced out and baked on sheets can be left on them. Bread can be coated with melted shortening before cooling if soft crusts are desired. Cooling in a draught will cause the crust to crack.

Fig. 4.1.11 Cooling of bread

Fig. 4.1.12 Slicing of bread

Step 14: Slicing is cut when the bread cools, and the structure has settled. It takes about 4 hours for the bread to chill and become useful.Slicing can be done with a sharp bread knife or a bread slicer. Freshly baked or warm bread will never be cut correctly

Step 15: Storing - Bread that will be served in less than 8 hours can be placed on racks. Wrap cooled bread in moisture-proof bags to keep them fresh for longer. Moisture will accumulate within the bags if the bread is not entirely cool before wrapping. Wrapping and freezing preserve the quality of the food for a more extended period.Staling, on the other hand, is increased by refrigeration. Wrapping hard-crust bread will cause the crusts to soften and become leathery.

4.1.6 Bread improvers

Flour is classified as either strong or weak. Flour strength varies depending on its strength and other aspects, such as starch content, sugar content, the flour's water absorption power (WAP), and even the color. These factors will have an impact on the final result. Because availability varies, it is not always possible to use the correct type of flour to make decent bread. As a result, something must be added to the dough to bring the finished product up to a predetermined standard. This addition should be done with caution and knowledge since otherwise, the bread's quality may deteriorate rather than improve.

Bread improvers enable the baker to produce an improved loaf with better keeping qualities, more pleasing textures, softer crumbs, added bloom and enhanced flavor when added to the dough. The functions of improvers are:

- Shorten dough resting time
- Increase bread volume
- Increase gas retention
- Speed up proofing time
- Improve crumb texture
- Improve shelf life

There are three main types of bread improvers:

1. Mineral additives
2. Yeast foods
3. Enriching agents Mineral Additives:

Mineral bread improvers are used during the milling of wheat flour. However, they are commonly used by the baker during production as well. They will include the following:

- **Calcium propionate**- it controls rope and mould disease. It is used 3-5 gm per kg of flour. Calcium peroxide-It makes the skin of dough dry, so it can be used in automatic bread plants for moulding as the dough does not get sticky.
- **RusulphatesPe** – used by the miller at the rate of ¼ to ½ oz per 280 lbs (one sack). The persulphates used are potassium and ammonium. Flour treated with persulphates will consume more water and increase yield.
- **Glycerol Mono Stearate** - The mono glycerol ester of stearic acid, which has remarkable emulsifying power, is used as an emulsion stabilizer and a crumb softener in bread.
- **Potassium iodate**- it improves the extensibility of the gluten
- **Potassium Bromate** – The miller uses it at 1 lb per sack (280 kg). Bromate increases the stability of the gluten to extend. In addition, bromate has an astringent action on gluten, thereby increasing the water in the dough. It also increases the gas-retaining properties of the gluten, thus improving loaf volume.
- **Lecithin**- It helps to increase the fermentation tolerance, producing better dough machinability, gas retention power and dough stabilization. It also gives yeast products uniform crust colour, tender crust, uniform grain, smooth texture, and anti-staining quality.

- **Phosphates** – Acid calcium phosphates and ammonium phosphates have a tightening action on gluten. Since phosphates are a necessary constituent of yeast food, they are fermented stimulants. Acid calcium phosphate (ACP) is used at the rate of 1 lb per sack (280lbs), which can be increased to 2 kg per sack to inhibit rope development. Phosphate is added at the rate of 8 oz per sack.
- **Ascorbic acid** is an oxidizing agent that improves the dough's stability.
- **Lime Water** – Lime water was used to retard the fermentation of the dough in hot weather climates. In addition, it has an astringent action on gluten. As lime is alkaline, it reduces the dough's acidity and thus slows the rate of fermentation. It is used at the rate of 1 quart per sack.
- **Organic acid** – Organic acids are natural constituents of fermented dough. They are added to get the dough better conditioned. Lactic acid can be added at the rate of 8 oz per sack. Succinic acid is added at 2-4 oz per sack.

Yeast Foods: Yeast foods indirectly affect the bread in several ways through their effect on fermentation. Malt provides food directly to the yeast and manufactures further supplies when needed while mellowing and softening the flour's gluten. There are two types of malt:

1. Diastatic
2. Non-Diastatic

Diastatic malt enhances the flavor of the dough by increasing the sugar level and providing diastatic sugar for the fermentation process. Proteolytic enzymes, which alter gluten, are also found in diastase enzymes.

Non Diastatic malt is used to give sugar and enhance the beer's flavor. Natural sugar is found in flour. This is primarily sucrose in various forms. Usually, it ranges from 4.5 to 3%. This quantity is insufficient for successful fermentation. There must be enough sugar to provide enough gas to give the loaf the volume and allow for the crust's caramelisation during baking. Sugars are not complete meals for yeast because they do not contain nitrogen, but they create the material from which CO_2 can be produced.

Enriching Agents - Enrichment is a way of increasing the nutritional value of the bread along with improvements in volume, texture and the keeping quality of the bread.

- **Fats** - Fats affect dough physically rather than chemically. Because fat is a shortening agent, it lessens roughness, resulting in a more mellow product. It's beneficial when working with solid wheat with a lot of challenging and harsh gluten. Fats can be utilised in tiny amounts to have the best results. Fat also adds to the nutritional value of meals. They add moisture to bread, preventing it from drying out. They also provide the bread flavor.
- **Milk and Milk Products -** Whole milk added to dough adds fat, sugar, calcium salts and casein.
- **Eggs –** Adding eggs to a bread dough improves many aspects of the recipe. The egg contributes to the increased volume, improved texture, and improved oven spring. It is cost-effective because it dramatically improves the product's quality and volume.

For a Bread with a:	Do this:
Crispy crust	Brush the loaf gently with cold water before baking. Shiny bronzed crust.
Shiny bronzed crust	Brush loaf gently with 1 egg beaten with 1 tablespoon water before baking
Shiny crust	Brush loaf gently with 1 egg white beaten with 2 teaspoons water before baking.
Golden Crust	Brush loaf gently with 1 egg yolk beaten with 2 teaspoons water before baking
Soft, tender, bronzed crust	Brush the loaf gently with milk before or after baking.
Softer, richer-flavored crust	Brush the loaf gently with a little melted butter before or after baking.
Slashed top	Brush loaf gently with 1 egg white beaten with 2 teaspoons water before baking. Sprinkle on one or more: Kosher or course sea salt; herbal salt substitute; sesame, sunflower, or poppy seeds; minced garlic or onion; grated hard cheese; or chopped nuts.
Sprinklings	Brush loaf gently with 1 egg white beaten with 2 teaspoons water before baking. Sprinkle on one or more: Kosher or course sea salt; herbal salt substitute; sesame, sunflower, or poppy seeds; minced garlic or onion; grated hard cheese; or chopped nuts.

Table 4.1.2 Finishing touches to "dress" up bread

4.1.7 Staling and spoilage of bread

Bread is a perishable item that tastes best when eaten 'right away.' Bread, unfortunately, only stays 'fresh' for a few hours after it comes out of the oven. It is subjected to many changes during storage, resulting in the loss of its inherent freshness. The factors influencing the pace of freshness loss in bread during storage can be split into two categories: those caused by a microbial attack and those caused by a series of slow chemical or physical changes that cause the crumb to stiffen up, a process known as staling gradually.

Some of the changes which occur in bread as a result of staling are:

- Increase in crumb firmness
- Increase in crumbliness of the crumb
- Deterioration in flavor and aroma
- Loss of crust crispiness

Anti-staling ingredients:

Emulsifiers - Bakers have been using emulsifiers called bread softeners for several years to make bread that stays soft for extended periods. It is incorporated into the dough as it is mixed. Monoglycerides, calcium stearoyl lactylate, and sodium stearoyl lactylate are some of the most frequent ones. After the bread has been baked, the softening process begins. Potato bread will also resist staling because potatoes are anti-staling elements. Anti-staling chemicals can also act as dough conditioners or strengtheners.

Enzymes - Enzyme makers are hard at work on generic and protein engineering enzymes that will significantly extend the shelf life of bread. Some of these enzymes are already available, according to a report given at the American Society of Baking's Annual Convention in 1999.

However, because every baker wants a better enzyme, enzyme makers will continue to develop new ones. It was also said that it takes between 2 and 3 years from when a specific enzyme is identified to when it is accessible for baker usage

Advantages of Using Enzymes instead of Chemicals
Since enzymes are produced from natural ingredients, they will find greater acceptance by the housewife than when chemicals are used.

1. **Mould and Mold Inhibitors** - When it comes to preventing mould in bread, sanitation is crucial. Mould spores will not survive the baking process. When the loaf comes out of the oven, the interior temperature is around 210 to 212 degrees F, which kills any mould spores that may be present in the dough. As a result, bread and other bakery items can only be infected after being removed from the oven.
2. **Micro biological spoilage** - Although 1100 F is the best temperature for delaying the staling process in bread, microbial growth is possible because of the adjustable moisture and temperature. Moulds and bacteria cause the most prevalent microbiological spoilage in bread. In contrast, specific yeast forms cause the least amount of microbial spoilage.
3. **Mould spoilage** - Bread mould deterioration is caused by contamination after it has been processed.Their thermal inactivation during the baking process makes bread loaves fresh out of the oven, free of moulds or mould spores. Mould spores in the atmosphere surrounding loaves during chilling, slicing, packaging, and storage infect bread after baking. They usually take shape. Mould infestation is characterized by soft spots on bread that are bluish-green, green, or pinky in colour and emit a musty odour.
4. **Prevention of mould infestation** - To prevent the formation of moulds in bread, it is imperative to follow strict hygiene and sanitation in the bakery, like:
   - Proper ventilation and circulation of air.
   - The area should be arid and moisture free.
   - The site should be well-illuminated.
   - Handling bread hygienically.
   - Keep on stock rotation every 24 hours. Overstocking may lead to spoilage.
   - Maintaining proper room temperature.
   - Follow the HACCP plan.

5. **Bacterial spoilage** - Bacillus mesenteric or bacillus pulmilus produce rope, a germ illness. During warmer temperatures, bacteria are most prone to form in bread that has not been adequately fermented or baked. This condition causes the bread cells to break down, resulting in a sticky, pasty mess.

   The crumb will stretch into long, sticky, web-like strands when pressed together and pulled apart. The result will smell like overripe cantaloupe, which is unpleasant. In addition, bacteria could be found in flour and yeast substances. Rope spores, unlike mould, are not killed by high temperatures.

Symptoms of toppings:

- Repelling odour, something like over-ripe cantaloupe.
- Sorry and bitterly taste
- Sticky and web-like crumb
- Reddish brown-coloured crust.

Prevention of bacterial Spoilage:

- Regulate the acidity of the bread-add vinegar or acetic acid or reduce the pH
- Proper ventilation and circulation of air.
- The area should be arid and moisture free.
- The site should be well-illuminated.
- Handling bread hygienically.
- Keep on stock rotation every 24 hours. Overstocking may lead to spoilage.
- Maintaining proper room temperature.
- Follow the HACCP plan.

4.1.8 Yeast Fermentation

Fermentation is the term for the process of yeast cells reproducing. The yeast begins to produce and grow aggressively at a favourable temperature, moisture, and food (sugars present in carbohydrates of flour), creating ethyl alcohol and carbon dioxide. The formation of both of these aids in the rising of the dough. Both gases disappear with the steam when baked. This is known as alcoholic fermentation.

$C_6H_{12}O_6 + O_2 + \text{Yeast} \; C_2H_5OH + CO_2 + \text{Energy}$

The presence of a food source and hydration, whether from water or another liquid, stimulate yeast activation and the start of fermentation. Yeast eats sugar from complex starch molecules in flour, a complex carbohydrate. When the starch molecules are moistened, enzymes in the flour break them down into simpler sugar molecules.

With each step, the yeast breaks down these simple sugars, such as glucose and, to a lesser extent, fructose, into smaller and simpler molecules for energy (food), from which it grows and multiplies (budding, also known as mitosis), and exudes a liquid that releases carbon dioxide and ethyl alcohol into the dough's existing air bubbles.

Fermentation typically ends with the bread-baking stage.

Factors affecting fermentation –

1. Slower fermentation is best for developing flavor and gluten strength.
2. The temperature of the dough; optimal fermentation temperature is 78 - 82 degrees F
3. The room's optimal temperature is 75 - 80 degrees F. (When the temperature exceeds 85 degrees F, off flavors result.) The dough can still rise in more relaxed environments, but much more slowly.
4. Fermentation time; allows for the development of distinctive flavor and texture, depending on the type of pre-ferment
5. Amount of yeast; the more yeast, the faster the fermentation. Too much can add an undesirable yeasty flavor.

6. Type of yeast; instant active dry yeast contains fast-acting yeast
7. Amount of salt; typical Baker's Percent is 1.8 to 4.5
8. Amount of sugar; small quantities (up to 5 Baker's Percent) increases yeast activity. Above 10 Baker's Percent slows yeast activity
9. Type of sugar; sucrose, glucose and fructose are fermented rapidly; maltose is fermented slowly; lactose is not fermented at all
10. PH of dough; optimal pH is acidic 4 to 6. Above, fermentation slows. As yeast ferments, it produces acids to lower the pH to that range
11. Presence of antimicrobial agents; most spices have antimicrobial activity, such as cinnamon and slow fermentation. Be careful how much is added to the dough directly.

Bacterial Fermentation - Bacterial fermentation, especially with sourdough or wild yeast pre-ferments, is another type of fermentation that impacts bread. These rod-shaped bacteria aid in fermentation and create flavorful acids such as lactic and acetic acids, among others, and CO2 as metabolic by-products (fermentation). They're held in place by an elastic gluten network generated in the bread dough by combining, kneading, and rising moistened wheat flour, which leavens or raises the bread. During the early stages of baking, the alcohol swells as a gas, considerably increasing the oven spring and adding to the bread's taste. Both the carbon dioxide and the alcohol evaporate during baking, leaving a well-risen loaf with flavor from the alcohol.

4.1.9 Artisan Bread

An artisan baker is a skilled craftsperson taught to mix, ferment, shape, and bake a handcrafted loaf of bread. They are made of the science behind the chemical reactions of the ingredients and how they're used to make the final product; the best conditions for the bread to develop Artisanal bread is a type of bread made by hand. Homemade bread is prepared by a craftsperson mainly using traditional techniques, Handcrafted in small batches and free of preservatives. It is usually assumed that such bread is primarily made by hand; however, many artisanal bakeries use mixers, hydraulic dividers, and moulders, so the amount of hands-on craftsmanship is greatly diminished.

How to tell True Artisan Bread from one that is called Artisan?
Begin by looking at the ingredients. True Artisan Bread usually only include flour, water, salt and yeast. Sour-based dough may not even include yeast in the elements. Flavored Artisan bread may list other ingredients like olives, tomatoes, garlic, and herbs. True Artisan Bread will have its unique, irregular shape; there is no cookie-cutter process used when making and baking True Artisan Bread. Controlling the fermentation and the action of natural bacteria can produce amazing artisan bread that has flavor profiles from a light, delicate flavor to a deep, robust and rustic flavor.

Traditional production methods - Bread has been made without equipment for generations, except for ovens, which were previously wood-fired. Today's artisan bakers aim to replicate these old procedures as closely as possible. Even if mixers are used to make the dough, at least some of the manufacturing should be done by hand, as previously stated. Bakers also look for flours similar to those used in traditional European bread, such as those with a slightly lower protein concentration and a more significant ash percentage. Doughs are fermented for extended periods at lower temperatures, frequently without proof boxes, because fermentation is vital for flavor. Hearth ovens or deck ovens are invariably used.

4.1.10 Cakes

Cake-making ingredients are classified as
Essential ingredients - Flour, sugar, shortening, milk and eggs.
Optional ingredients - Baking powder, flavouring and essences, fruits, nuts, cocoa powder, chocolate, cake improvers, syrups etc.

Ingredients are also classified according to the function they perform in cake making.

- Structure builders: Flour, eggs, milk and shortenings.
- Tenderizers: fat, sugar, baking powder and egg yolks.
- Dryers: Flour, starches and dry milk powder
- Toughness: Flour, dry milk powder and egg whites.
- Favourers: Butter, eggs, vanilla or other flavourings, liquid and salt.
- Moisteners: milk or water, liquor, egg, syrups and sugar.

1. **Flour** - Except for cheesecakes, foam cakes, and gluten-free cakes, most cakes contain wheat flour as the primary ingredient. It creates the crumb structure in cakes and is used to bind everything together.
2. **Sweeteners-** Caster sugar, Icing sugar, Brown sugar - Sugar's primary function in a cake recipe is to bring sweetness. However, it also has various parts depending on whether it's crystalline (granulated white, caster, or brown) or liquid (granulated white, caster, or brown) (honey or corn syrup). All sugar functions as a tenderizer by limiting excessive gluten formation in the wheat flour proteins and slowing the coagulation of the egg white and milk proteins. It also contributes to the structure of the cake when baked. Dextrose, caster, icing, and brown sugar are other sugars in cakes. Invert sugar, corn syrup, glucose, molasses, honey, sorbitol, or refiner syrups are also used with powdered sugar because of their unique properties.
3. **Fats and shortenings** - Butter, lard, hydrogenated fat, and margarine are the four forms of fat and shortening available. Solid fat, also known as plastic fat, solid shortening, stick butter, or margarine, has the primary function of incorporating numerous air bubbles into its pliable bulk for volume. Creaming or beating the fat with crystalline sugar, also known as white granulated or brown sugar (white granulated sugar mixed with molasses), does this. However, it can only be done successfully if the necessary components, ratios, mixing durations and temperature (700 F-750 F) are followed, as well as the use of the proper instruments. Too-hard fats will not cream up well, while too-soft fats will lose their aeration.
4. **Eggs** - Depending on the part used, eggs perform various crucial tasks in a cake recipe. Foamed eggs, mainly separated and whipped whites, give leavening. Whole eggs and egg whites aid the cake's structure. Egg yolk is also high in the emulsifying ingredient Lecithin, which acts as a tenderizer by allowing air to be incorporated during the creaming or whipping process while inhibiting wheat starch gelatinization. Egg yolks also give colour (because of the presence of Luthien), nutrients, and flavor to the completed cake and help keep it moist. Eggs also act as binders, making them more sustainable. On the other hand, whites can have a drying effect. However, they contribute slightly more protein than yolks, with far fewer nutrients and without fat and cholesterol.
5. **Learners** - A leaven, often called a leavening agent (also known as a raising agent), is any of many substances used in doughs and batters that cause a foaming action (gas bubbles) that light softens. It starts withcreating millions of tiny air bubbles from various mixing methods, trapped in the structural framework of the cake's batter by the gluten strands. Air incorporation comes from beating eggs, creaming butter and sugar together, folding

ingredients together, and from any agitation. Cakes are leavened when the air bubbles in their batters expand when heated from water vapour or steam from liquids. The type of leavener used is based on the kind of cake required, according to volume, taste, flavor, colour, structure, and consistency.

- **Flavourings and essences** - These components give baked goods their unique flavor. Flavour can originate from wet and dry ingredients; for example, we use a sprinkling of cocoa powder to add depth to the chocolate flavor. Ground spices, extracts (exceptionally pure vanilla extract), citrus zest (peel), citrus oil, and even liqueurs are all examples of flavourings and essences. Essence refers to an oil, extract, or concentrated substance derived from an animal or plant. Fats are usually sold in their purest form, which doesn't include alcohol or water. It must be used with caution. Extracts are diluted oils typically such as pure vanilla essence, orange, pineapple, strawberry, and so on, are two types of flavors and meats. An essence's purpose is to impart flavor, and it's always added to the batter right before baking to keep the flavor in the batter.
- **Flower Essences** - Baking with flower essences can add a subtle, aromaticflavour to cake sponges, cookies and frostings. Violet, lavender and rose cores are some of the most popular flower essence flavors.
- **Fruit Essences** - A fruit essence rather than the fruit itself can give a more intense flavor. It also means fruit doesn't have to be added to the sponge, altering the texture and colour. Strawberry, raspberry, and blueberry are delicious berry essences, while orange and lemon bring a sharper citrus flavor. Banana essence gives a robust synthetic banana flavor, so add it little by little so as not to overdo it.
- **Candy Essences** - Candy oils come in a wide range of flavors, such as orange, lime or lemon, tangerine, cherry, etc. Nut Essences: A splash or two of nut essence can transform your cakes and cookies for a delicious nutty flavor. Almonds and hazelnut work exceptionally well when paired with other ingredients in your cake, such as fruit and chocolate. Avoid nut essences like nut ingredients if you have a nut allergy.
- **Bean essences** - Vanilla bean paste is a much thicker mixture of vanilla beans, sugar and water and can be used sparingly as an alternative to vanilla extract. Other essences commonly used in baking include coffee, rum, brandy and coconut.
- **Salt** - Salt or sodium chloride is an essential ingredient in cake making. It is generally added at a later state while baking cakes. Without salt, the cake will taste flat. Usually, only a pinch of salt is added, but the amount of salt added may differ according to the amount of flour/ salted butter used. It should be such that the salty flavor should not be discernible. Depending upon the method of combining ingredients, salt can also have a strengthening effect if combined with egg whites. If whipped egg whites to which salt has been added are "folded in," they're better able to hold their volume. Although salt book of some recipes. It balances the sweetness and other flavors during baking, moistens the cake (as it is hygroscopic), and improves the crust colour of cakes by lowering the caramelization temperature of sugar.
- **Emulsifiers** - Convenience, quick aeration, consistent performance, steady production, and end-product stability are important considerations when looking for the ideal cake emulsifier for industrial cake production. Oil and water are incompatible because their contact produces much energy at the joint surface. The physical mixing process can break up the fat into fine droplets that can then be dispersed/distributed into the water phase to form a dispersion known as an emulsion. An emulsion is a multiphase system with at least two immiscible liquid phases that is unstable.When the physical mixing motion is

terminated, the oil droplets agglomerate and the oil and water split into two distinct layers. Convenience, rapid aeration, consistent performance, reliable output, and end-product stability are important considerations. The droplets of the disperse phase must be as small and widely (fatty acid) end that has no charge and is attracted to oil and a polar (glycerol) end that has a mission and is attracted to water. A molecule like this can attach itself to the oil-water contact. The opposite end will submerge in the aqueous phase, while the non-polar end will submerge in the lipid phase, preventing the oil droplets from coalescing. This aids in intimately mixing the two steps and forming a stable emulsion.

Cake-making methods

It can be divided into two main categories:

A. Shortened cakes – In the shortened category, there are 4 methods of mixing

1. Creaming method or sugar batter method
2. Two-stage method or blending method
3. Flour batter method
4. Sugar batter method

B. Egg foam method

1. Sponge method
2. Angel food method
3. Chiffon method

The three main goals of cake-making are:

- Combine ingredients into a smooth, uniform batter.
- To form and incorporate air cells in the batter.
- To develop a proper texture in the finished product.

A. Shortened cakes – In the short-end category, there are 4 methods of mixing

- **Creaming method:** Cookies, marble cakes, chocolate chip brownies, cupcakes, and so on are some examples.
- **Two-Stage method**: This method is commonly utilized when a recipe involves a higher proportion of sugar than flour by weight.
- **Flour Batter method**: The following procedure is used only for a few speciality items. It produces a fine-textured cake, but some toughening may be due to gluten development.
- **Sugar Batter method**: The sugar batter is based on oil emulsion in water with air bubbles trapped in the fat phase. At the same time, other ingredients are dissolved in the water phase.

B Egg foam method:

The egg foam method relies on the leavening power of eggs and steam to create the lift necessary to make a delicate angel food cake or Genoese.

Sponge cakes are produced with the three essential elements for any baker: eggs, sugar, and flour, though some sponges include butter. Sponge cakes (Genoese in French) are traditionally baked without baking powder or baking soda, relying exclusively on the air beaten into the eggs for volume and lightness. Eggs, sugar, and flour are all used in equal amounts in the sponge.

The sponge method is of six types:

1. **Cold-Foaming method-** This method is typically used when the sponge is soaked with a liqueur or flavouring, as in tiramisu or trifle, for example.

2. **Warm-**Foaming Method
3. **Egg -** Foaming Method
4. **Emulsifiers -** The emulsifier approach is another option, perhaps the most used in the baking industry today. It's quick, easy, and practically flawless.
5. **Ladyfinger sponge-** Another sponge variation is the ladyfinger sponge, also known as a piped sponge, which is used not only for cookies but also for several classic desserts, including tiramisu, charlotte Russe, and gateau Malakoff
6. **Othello sponge-**Othello sponge is comparable to the ladyfinger sponge, and the two are easily interchangeable. The Othello sponge has a lighter structure due to less flour and more egg white.

Angel food method - This cake has no fats or chemical leaveners. It is leavened entirely with stabilized egg white foam.

Chiffon method - The ingredients for a chiffon cake include vegetable oil, eggs, sugar, flour, baking powder, and flavourings. It's a mixture of butter and foam (sponge) cakes. Vegetable oil is used in place of typical cake ingredients such as butter or paste (such as shortening)

Cake improvers

The ingredient Cake Improvers is a "wonder ingredient." When added to cake batter during the creaming stage, it makes the crumb soft and moist while extending its shelf life. Rice starch, polyglycerol esters, mono- and diglycerides are all ingredients in many boxed cake mixes and commercial baked goods.

How cake improvers work

Adding small amounts of specific starch to cake batter mixes improves the batter mix's basic vital properties, as evidenced by both the prebaked batter mix's specific gravity and the significantly increased cake volumes obtained in the finished baked cakes. When these particular types of starch are used, the resultant baked cakes have exquisite crumb softness at first and can preserve crumb softness for up to six days.

Various low amylase-containing starches may be incorporated in cake batter mixes, like waxy maize starches, waxy sorghum starches, starch ethers and esters, which are considered to contain at most trace amounts of amylase.

Cake gel is a cake improver made up of emulsifiers and humectants that boosts volume and creates a more homogeneous crumb structure by increasing aeration.

- It increases cake suppleness.
- It improves batter stability and decreases deviations that may occur due to changing flour quantities or process settings.
- Cake gel aids in the smooth mixing of all components, increasing batter consistency and strength, improving crumb texture and uniformity, adding volume, and improving eating qualities.
- Emulsifiers, propylene glycol, and water are among the constituents. It should be used at a dosage of 3 to 8% of the flour weight in the cake batter. (30g to 80g of flour to 1kg of flour).

What is the purpose of a cake enhancer?

- These fatty acids are derived from vegetable fats and act as emulsifiers, making mixing lubricants and liquids easier. They also act as texture enhancers and stabilisers.

- They are often used in commercial baked goods to keep baked goods fresh and soft and assist cakes in staying moist, light, and fluffy for longer.

Secrets to baking perfect cakes

1. Good results start in the mixing bowl - A series of ingredients mixed in a particular order to trigger reactions that result in specific outcomes.

- Butter cakes, like pound cakes and most layer cakes, achieve their soft, fine texture and moistness (called a crumb) by creaming together butter and sugar, adding eggs, and gradually mixing dry ingredients into the mixture while alternating with a liquid, such as milk or buttermilk.
- When whole eggs or egg whites (depending on the cake) are whisked until voluminous and then folded into the batter, angel food, sponge, and chiffon cakes obtain their trademark airy, foamy textures.
- Whipping the eggs incorporates air, giving these cakes volume and making them springy and stretchy.

2. Know your oven - Get an oven thermometer to avoid underdone or overdone cakes; it's the best way to adjust your range correctly.

- Preheat the oven to 350°F and bake the cake in the centre (too close to the top or bottom can cause over-browning).
- Close the oven door gently—a forceful smash can release trapped air bubbles in the batter.
- Lightly press the centre of the cake to see if it springs back; if it does, it's done.
- Alternatively, you can use a wooden pick; it should be clean.

3. Choose the proper pan size (and colour) - You need two 9-inch round cake pans for the recipe, but you only have 8-inch pans. What should I do?

- Get two 9-inch baking pans. Because a cake increases volume by 50 to 100 percent during baking, pan size is stated in recipes; if your pan is too small, the cake may overflow.
- Compared to silver-coloured aluminium pans, glass or black non-stick pans usually require a 25-degree reduction in baking temperature.

4. Use the suitable flour for the recipe - Different flours contain varying percentages of protein—the more protein, the more gluten.

- Cake flour has minor protein and yields extra-light baked goods, like angel food cake.
- Bread flour has the most and is used for denser items; all-purpose is in the middle and produces tender cakes.

5. Chemistry counts - The close chemistry between key ingredients lays the groundwork for a great cake.

- Flour thickens the mixture and adds gluten, a protein that helps the cake hold its shape. When flour is mixed with a liquid and stirred, it forms.
- Don't overmix, as this will result in a tough cake. Learners, such as baking soda or powder, release carbon dioxide bubbles, which are retained in the batter by the starch and expand during baking, causing the cake to rise.
- Fats, such as butter, shortening, or oil, prevent gluten development while keeping the cake moist.
- Sugar breaks up gluten to maintain the delicate texture, absorbs liquid to keep the cake

moist, and caramelises in the oven to enhance flavors and help the cake brown.

- Eggs firm up when cooked, helping cake batters set in the oven. Eggyolks contain fat, as well as lecithin. This emulsifier allows fats and water to mix smoothly and ensures an even texture.

6. Give your cake cool down - Cool for 20 minutes in the pan on a wire rack before removing it from the pan. Place a plate on top of the cake after it has cooled, invert the pan, and gently tap or shake it to remove the cake. Angel food cakes are commonly made in tube pans and then switched to tremendous upside down while still in the pan, either on feet affixed to the pan or over a bottle—gravity helps the cake preserve its volume. Run a narrow spatula around the edges and release it onto a platter after cooling.

7. Frost like a professional - Place the first cake layer on top of a small dab of frosting in the centre of the cake plate. As you work, this will keep the cake from moving. Frost the top with an offset spatula, then add the next layer and a thin coating of frosting to the entire cake. (The crumbs are held in place by this crumb coat.)Place the cake in the freezer for 15 minutes, then take it out and finish icing the top and sides.

8. How to factor in a higher altitude -Cakes rise more at higher elevations due to lower air pressure, and liquids evaporate more quickly, causing them to dry out. Follow these instructions if you live over 3,500 feet: For each cup used, increase the oven temperature to 375° and the liquid by 2 teaspoons. Reduce the amount of sugar in each cup by 1 tablespoon, the amount of baking powder in each teaspoon by 18 teaspoons, and the baking time by 5 minutes.

UNIT 4.2: Types of Toppings and Fillings that are used in Baking

Unit Objectives

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

- Demonstrate various types of toppings that are used on the artisanal baked products
- Identify different creams and cream fats used in baked products
- Demonstrate the creaming process, including centre filling, sandwich, surface creaming etc.

4.2.1 Various Glazes and Toppings for Bread

Glaze/topping	Use
Egg wash glaze	This gives the roll a darker colour, polishes it up, and adds nutritional value. It is best to utilise simply the egg yolk, although the whole egg can still be used. With a delicate brush or piece of cloth, beat the egg with a bit of water and strain it to create a smooth-flowing egg liquid that can be applied with a gentle brush or a piece of cloth.
Saltwater glaze	The bread has a rustic pale colour as a result of this. Before baking, the bread is coated with saline water. Care should be given because the bread may get salty due to this.
Starch glazes	Corn starch slurry is sometimes used for glazing the bread. This also gives the bread a lustrous sheen.
Honey glaze	Honey is boiled before being used as a glaze because it is a sticky substance that will set into a glaze that will attach to the bread's surface. After the bread has been removed from the oven, this glaze is applied. When applying this, make sure the bread is still warm. It is usually used for sweet bread like gingerbread and so on.
Seeds as toppings	To improve the bread's look and provide nutritional content and variety to the rolls on the buffet or in a bread basket, various seeds such as cumin, fennel, poppy, sesame, nigella, and others are sprinkled on top of the bread. To guarantee that the source adheres to the surface, sprinkle it only after the wash or glaze has been applied. The amount of seed used will be determined by the intensity of the seed's flavor.
Nuts as toppings	Before baking, nuts of various kinds can be sprinkled on loaves. To be used as a topping, the nuts must be chopped equally, following the same rules as the seeds.
Herbs as toppings	Toppings can include a variety of chopped herbs. It is best to use dried herbs because fresh herbs will lose their colour when roasted in the oven. Different crusts can be made by combining herbs, seeds, and nuts to make unique toppings.
Vegetables as toppings	Specific bread, such as Italian focaccias, utilises this. Before baking, the bread is topped with an array of grilled or sautéed vegetables like onions, bell peppers, olives, olive oil and rock salt. This is not to be mistaken for dough and is not used as a topping.
Flour as topping	Before baking, several types of bread are dusted with a substantial amount of flour. Therefore, it's crucial first to glaze the bread with simple water to help the flour adhere to the surface. If bread needs to be scored, it is always done after a light dusting of flour.
Cereals as topping	Many bowls of cereal, such as oats, bream, germ, bulgur, and others, are utilised as toppings after the water wash has been applied. In some circumstances, the bread's top surface is rolled into the topping, coating the entire surface. This is done immediately after shaping. The bread is left to prove with the topping, which uniformly disperses when the bread is confirmed and ready to bake.

Table 4.2.1 Glazes and toppings for bread uses

4.2.2 Various Types of Cream and Cream Fats used

The cream is a rich, thick emulsion of dairy fat available commercially as a white or light yellow coloured fluid, or it can be whipped into a stable foam for various applications.
It is popular in baked goods such as:

- Cakes
- Pastries
- Cream filling
- Custard
- Frosting

Origin - Humans have been raising animals for milk production since 9000 B.C. The cream is a dairy product made from cow or goat milk. The cream naturally rises to the top when fresh milk is left homogenized due to fat globules' reduced density (specific gravity). The cream can then be skimmed off the top and used to make butter, sour cream, or whipping cream.
Composition - The cream is a dairy product consisting of water, protein, lipids, carbohydrates (sugars, including lactose), vitamins, minerals, and other minor components. Various types of cream are distinguished by their butterfat content, processing method, heat-treated, whipped, etc. The fat content ranges from 18-to 55%.1
The most common additives to cream are:

- Emulsifiers
- Sweeteners
- Flavourings
- Stabilizers
- Preservatives

Commercial Production - Some dairy companies add polysorbate to the formula to increase whipping and stability without adding stabilizers.
The fatty liquid that forms a layer on top of milk before homogenization is cream. The cream is separated using a continuous centrifugation technique. The fat globules naturally isolate from the milk serum due to centrifugal force. 1 After that, the cream is homogenised before being pasteurised or ultra-pasteurized.
Function - The cream is commonly used in baked goods to:

- Increase moisture absorption
- Provide lactose which gives a browning reaction upon baking
- Tenderize
- Serve as a buffering aid
- Increase protein content and nutritional value
- Enhance its foaming ability in cakes and frozen desserts

Applications - Following are some applications of cream in the food industry:

- As an ingredient in many foods such as ice creams, cakes, sauces, puddings, etc.
- As a topping in many cakes, pancakes, milkshakes, hot chocolate, fruits, etc.
- It also finds applications in hot beverages such as tea, coffee, etc.
- In pastries, it is used in cream fillings, custards, and frostings

It has a richer flavor when the cream is pasteurised and whips up with more fluff. Versions that have been ultra-pasteurized have a longer shelf life. It has a cooked flavor and is more sensitive to whipping; therefore, it's not great for peaks or foaming in recipes.

FDA regulation - FDA states that cream must contain at least 18% milkfat, and it should be pasteurized to remove any harmful pathogens. The FDA provides specific guidelines for milk and cream, including pasteurization conditions. It mandates that ultra-pasteurized cream is heated at or above 280°F (138 °C) for at least two seconds. The following table gives an account of % fat, processing steps, and contents of different types of cream.

Name	%Fat	Process	Contains
Dry Cream	40–75	Pasteurized,	Emulsifiers, Stabilizers, Anticaking agents, Antioxidants, Nutritive carbohydrate sweeteners, Flavouring
Heavy Cream Heavy Whipping Cream	36	Pasteurized, Ultra - pasteurized, Homogenized	Emulsifiers, Stabilizers, Sweeteners, or Flavouring
Light Cream, Coffee Cream, Table Cream	18 – 30	Pasteurized, Ultra - pasteurized, Homogenized	Emulsifiers, Stabilizers, Sweeteners, or Flavouring
Light Whipping Cream, Whipping Cream	30 – 36	Pasteurized, Ultra - pasteurized, Homogenized	Emulsifiers, Stabilizers, Sweeteners, or Flavouring
Half and Half	10.5 – 18	Pasteurized, Ultra - pasteurized, Homogenized	Emulsifiers, Stabilizers, Sweeteners, or Flavouring

Table 4.2.2 Different types of cream

4.2.3 Types of Fillings, Glazes and Frostings

Some cakes are ready to eat after being taken out of the oven and allowed to cool. However, many benefit from (and some require) "finishing," which means they must be blended with other ingredients to taste and look their best. Stacking layers on top of each other, sandwiched with a filling, is common for many cakes. Cakes can also be rolled up with a filling and cooked in long, thin sheets. Even single-layer cakes are frequently covered with a glaze or icing. Finally, edible decorations are used to enhance the appearance of many cakes.

Many cakes combine these techniques, such as syrup and custard between the layers, frosting around the edges, and piped decorations. However, certain methods are better suited to specific varieties of cake. One of the most creative aspects of cake-baking is mixing and matching different types of cakes and finishing techniques. The following are the most prevalent choices:

Between the Layers - The filling is anything that goes between the layers of a cake (or inside the cake if it's folded up). Many cakes contain multiple fillers, either all at once, such as whipped cream and berries between each layer, or alternately, such as Ganache between some layers and buttercream between others. Some fillings can also be used to cover the outside of the cake; several of the fillings listed below are examples.

- **Sugar syrup** - This is used to moisten the cake layers. It's essential for drier cakes like Genoese. However, even butter and oil cakes can benefit from syrup brushing to keep them fresher for longer. As a result, the syrup is commonly used in wedding cakes and other massive undertakings requiring numerous steps. The cake is made first, and by the time it's served, it could be several days old; the syrup keeps tasting fresh and moist. The syrup is rarely used as a filling on its own; instead, the layers are coated with syrup before another filling, like jam or buttercream, is put on top. Espresso, vanilla extract, liquors, liqueurs, Eaux-de-vie, and fruit juice are just a few components used to flavouressential sugar syrups. The syrup's flavor should complement or match the cake's and other finishing agents' flavors.

- **Jams and Jellies are** - delicious when combined with various fillings like buttercream or ganache. Simply whisk a jam or jelly to soften it before using it as a cake filling, or heat it slightly if it's too thick. If you prefer a smoother texture, strain the jams to eliminate the seeds.
- **Custards** - Fruit curds, such as lemon or orange curd, and pastry cream, a custard thickened with flour or cornstarch, are examples. Many European-style cakes utilise custards as fillings—they work well between layers of Genoese—but they can also be used with other layers that aren't too rich, such as white or chiffon cake. Pastry cream can be flavored with vanilla or different flavours, and whipped cream is occasionally folded to lighten it up. Custards are usually reserved for fillings since they are too rich and have the improper texture to cover the outside of a cake. A bit of custard can be folded to favour a cream cheese frosting.
- **Whipped Cream** - Whipped cream is an essential and straightforward cake filling, whether mildly flavored or left unflavored in its fluffy deliciousness. Whipped cream pairs well with strong-flavored cakes like devil's food or spice cakes because it's a bit bland. It's also excellent with lighter cakes like Genoese when paired with different fillings like fruit. Whipped cream can also be piped into soft embellishments and used to cover the outside of a cake.

- **Butter Cream** - Buttercream is a versatile frosting that may be used between layers and on the outside of a cake. It works well with both butter/oil and lighter Genoese-based layer cakes. It can also be piped into decorative shapes. Traditional buttercream begins with an egg and sugar base, followed by the addition of soft butter. Flavourings, such as vanilla extract, coffee, chocolate, lemon juice, or fruit purées, are added towards the end. There are four traditional buttercream versions—two called "meringue" varieties since they only utilise egg whites, one with yolks, and one with whole eggs:

1. **Swiss meringue buttercream** - Only egg whites are used in the Swiss meringue buttercream. In a metal dish set over boiling water, the egg whites and sugar are warmed, then beaten and cooled before adding the butter and flavouring. This is the plain buttercream to make and is probably the best for most scenarios.
2. **Italian meringue buttercream** - Italian meringue buttercream is made entirely of egg whites like Swiss meringue. The distinction is in the order in which the ingredients are combined: Sugar syrup is cooked until it reaches 245 degrees before being added to egg whites while whisked. The procedure is tricky since the mixer must run when the syrup is added; the hot syrup would cook and harden the egg parts. Also, because there is so little sugar syrup, it's challenging to acquire an accurate thermometer reading while making Italian meringue buttercream in tiny batches. However, some experts prefer it to Swiss meringue for big sets because just the syrup, not the eggs, must be heated.
3. **French buttercream** - Only egg yolks are used to prepare French buttercream, which is similar to Italian meringue. This butter cream is quite rich.Some people enjoy the rich flavor, while others find it too much. This butter cream is perishable from egg yolks and should be refrigerated.
4. **Whole-egg buttercream** - Like Italian meringue, whole-egg buttercream is created with sugar syrup. It's richer than meringue cream but not nearly as rich as buttercream from France. It's also perishable, so keep it chilled.

- **Confectioners' Sugar Icing** - This is the classic icing you'll find on old-fashioned birthday cakes called "American buttercream." It's commonly used as a filling and coats the outside of cakes. However, it's best used to top cupcakes because it's considerably sweeter and grittier than classic European buttercreams. It's simple: Combine butter and confectioner's sugar in a mixing bowl, then soften with a bit of liquid such as milk or fruit juice. Vanilla extract and chocolate can be used as flavourings.
- **Cream Cheese Frosting** - Another simple method for filling and covering a cake is to use: With confectioners' sugar and a flavouring like vanilla essence, cream cheese and butter are stirred together. This frosting is pretty sweet, but the cream cheese's tanginess helps balance off the sweetness. It's a classic match for red velvet and carrot cakes and other American oil cakes.
- **Fluffy White Icing** - This pure white marshmallow icing, often known as "seven-minute frosting," is produced by warming egg whites, sugar, and a little water and mixing the mixture until frothy glossy. (In the days before electric mixers, it was beaten for seven minutes with a rotary beater, hence the name.) The contrast between the dark cake and the white frosting makes an appealing statement; fluffy white icing is usually used between layers to cover a devil's food cake. This frosting isn't as famous these days. However, it used to be a massive hit for various layer cakes, sometimes just as a covering and sometimes with jam as the filling. Sea-foam frosting is made by substituting light brown sugar for granulated sugar in an old-fashioned recipe that begs to be revived.

- **Ganache** - This rich chocolate and cream combination goes well with various cakes. You may alter the impact of a ganache by adjusting the chocolate-to-cream ratio; for example, one-and-a-half parts chocolate to one part cream provides a thick, velvety filling for cake layers. The outcome will be a little thinner if you use equal amounts of chocolate and cream, known as "regular ganache." It still tastes fantastic, but it will be a little lighter. This mixture will be a pourable glaze at room temperature. It can also be chilled for a few minutes to thicken and put on the outside of a cake.
- **On the top and sides** - Frosting (a soft substance placed on the cake), icing (a synonym for frosting but also includes rolled icings like fondant and thinner icings that are comparable to glazes), and frost are all used to cover the top and sides of the cake (a more delicate material brushed on top of a cake or poured over it while warm and allowed to cool or harden). French and Viennese pastry cooks devised glazing cakes to preserve them by sealing them off from the air and preventing them from going stale.

In addition to the items listed above that can be used both inside the cake and on the outside, the following elements are typically used only for covering a cake:

- Water Icing - This is produced with confectioners' sugar, water or milk, and sometimes flavors like citrus juice or vanilla essence. A simple cooled cake, such as a pound or coffee cake, can be brushed with thin water icing. If you make it thicker, it turns into a white glaze that you may spread over the cake, a standard finish for many decadent cakes baked in Bundt pans.
- Rolled Fondant - This is a thick white putty-like substance made from sugar and vegetable shortening that may be rolled out like pastry dough and stretched over cakes. Cake decorators use rolled fondant because it holds up well in hot weather, can be dyed any colour, and creates a smooth, ideal surface for decorations. Unfortunately, while fondant looks excellent, it has little flavor and might taste awful if applied too thickly.
- Marzipan - Another thick material that can be rolled out and used to cover cakes is almond paste. It's delightful and off-white, so it can't be tinted, but it has a far more excellent lavour than fondant. Marzipan can also be used to make moulds for flowers and other decorations to be placed on a cake.
- Royal Icing - A heavy paste of egg whites and confectioners' sugar is mixed with a bit of vinegar or squeezed lemon juice to make the egg whites foam. The result is a bright white, sticky icing that dries hard. Royal icing is utilized for delicate piping, such as complex "string" embellishments piped from a tiny plain tube or paper cone. Because of its pure white hue, it's a fantastic choice for tinting. It has a sweet, subtle flavor, but it should not be used in excessive quantities due to its crisp texture when dry.
- Melted Chocolate - This can be piped onto a cake or drizzled as a simple decoration using a paper cone. Dark chocolate contrasts beautifully with lighter-coloured icing.

Table 4.2.1 Frosting types

- The filling you use must be stable enough, or you will have filling oozing out the sides, and your top layer will tend to move around. See the information below on Types of Filling to help you select the right cake filling type for your cake.

Many cake-filling types can be used. However, some points should be considered when choosing a filling for a cake. Some of these points are listed below.

- Consider the flavor of the cake, and be sure the filling will complement the cake's flavor.
- Take into account the storage of the cake. Do not select a filling that requires refrigeration when it will not be possible to refrigerate the cake because of its size.
- If the cake is exposed to warm temperatures, such as at a summer picnic, do not choose a filling that will melt or be a safety threat under those conditions unless it can be stored in a cooler or refrigerator.
- If the cake has to be made a day before it is eaten, be sure the filling will hold up for that period.

The amount of filling you need will vary depending on the type, the type of cake, the number of layers, and personal preference. Generally, 1/2 cup of filling per layer should be sufficient. This may be too much if the filling is vibrant, or you may prefer a little more than 1/2 cup of some fillings but be careful not to add too much, causing the cake to become unstable.

Levelling - The goal of levelling your cakes is to make a symmetrical and even base. No amount of icing will make your crooked and uneven base cake stand up straight or lay flat.

You can use an official cake leveller or a knife with a sharp serrated blade long enough to reach through your cake to the other side to level your layers. Place the cake on a cake board covered in plastic wrap to avoid sliding around. Place a tablespoon or so of icing in the centre of the cake board to 'glue' the cake in place. Next, place the first (or only) cake layer on the bottom side facing up on the cake board.

If you're lucky, your cake won't have a domed top and will have baked flat. But if it does, that'll be the first thing to go. Slice off the dome with an equal and straight sawing motion, keeping the blade of your knife parallel to the outside edge of the cake. If using a cake leveller, place the wire at the correct markings and use a gentle sawing motion to draw the leveller across the cake gently. Ensure that the leveller's two feet are flat on your work surface.

Trimming - If your cake's edges are uneven or sharp, trim them square and even with the remainder of the cake. Next, trim any unnecessary rough or uneven portions with your serrated knife, making sure to cut as straight as possible. When you've finished levelling and decorating the cake, it should be perfectly formed and ready to be filled, frosted, or both!

Sorting is slicing each cake into two or more layers before filling and stacking them. Finally,

several thin layers are carefully piled and filled with jam, custard, cream, fruit, or fillings!

Layer cakes - The more solid and hard your cake is for layering, the better. Baking your cakes a day ahead will give your cake enough time to settle down and firm up. Cakes that are firm and stable will hold heavy, gooey contents better than weak and unsettled cakes.

- Regardless of the number of layers, the following process will ensure a decadent cake that will keep any spilling fillings under control and prevent them from overflowing their boundaries.
- Start with the thickest layer on a cake board, bottom side up, to assemble your cake. When layering or torturing cakes, starting with the best side up is ideal. When stacking individually baked cakes in a layer cake, the best side is usually the bottom (unless the base is clung to the pan in places and you have plugged 'holes.) Your cake will stack more evenly if the topside is flatter and smoother.
- To contain the filling, pipe an icing dam around the outer border of each layer (with a #10 round tip or comparable big-size decorating tip). The dam will be a barrier, preventing the filling from escaping to the cake's edge.
- To prevent dragging your fingers through the icing dam, use an angled spatula to spread the filling within the icing dam borders (or the dam icing borders)
- Carefully centre the second layer over the first layer, bottom side up, matching edges and corners (for square cakes). Steps 2-4 should be repeated until the top layer is in place. It's time to crumb-coat the cake!
- A crumb coat is the initial layer of buttercream frosting on a cake. It is a crucial stage in the decorating process. It seals in the sponge, keeping it from drying out. As the name implies, it captures all of the crumbs from the sponge and acts as a barrier, ensuring that the finished icing is spotlessand crumb-free.
- It is to be noted that there are certain types of layer cakes where you want the filling to ooze out from between the layers. These layer cakes are easy to assemble since you won't need to be so precise and careful.

UNIT 4.3: Baking the Products as per Standard Work Practices

Unit Objectives

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

1. Explain oven profiling and oven operation for baking.
2. Discuss various risks involved with handling oven, temperature and humidity controls.
3. Show how to check the quality parameters such as texture, flavor, colour, odour, height, and crumbliness of the bread
4. Demonstrate the techniques used for inspecting the overfilling or under filling of cream

4.3.1 Oven Profiling and Operations

Convection ovens:

Convection ovens use fans to circulate air and quickly distribute heat throughout the interior. Foods cook faster at lower temperatures thanks to the pushed air. Convection ovens are less adaptable for bakers than other ovens because the vitalforced air can deform the shape of goods created with batters and soft doughs. The air may be strong enough to blow baking parchment off sheet pans.

Fig 4.3.1 Convection ovens

Rack Oven

A rack oven is a giant oven that can accommodate complete racks of sheet pans for baking. Everyday baker's racks can handle 8 to 24 full-size sheet pans. However, frames designed for rack ovens typically carry 15 to 20 pans. One to four shelves can be placed in a rack oven simultaneously. Steam injectors are also included in these ovens. Although not strictly precise, the phrase rack oven is commonly used to describe typical ovens in restaurant ranges. The pans are placed on racks rather than cooking directly on the bottom, as in deck ovens.

Fig 4.3.2 Rack ovens

Rotary/revolving/mechanical oven

The food in a mechanical oven is in motion while it bakes. A revolving range is the most common design, with a mechanism similar to a Ferris wheel. Because the mechanism rotates the items throughout the oven, it eliminates the problem of hot patches or uneven baking. They are instrumental in high-volume applications due to their size. Steam injectors can also be added to revolving ovens.

Fig 4.3.3 Rotary/revolving/mechanical oven

Deck or cabinet oven

Deck ovens get their name because the objects to be cooked are put directly on the oven's bottom or deck, either sheet pans or freestanding in the case of some bread. Hearth bread is loaves baked now on the floor of the ovens rather than in pans. Hence these ovens are also known as hearth ovens.

Steam injectors are installed in deck ovens for baking bread. In that items are baked directly on the oven floor, wood-fired brick ovens are similar to deck ovens in function. These ovens are found in bakeries that specialise in artisan bread and restaurants that serve pizza and other similar items. A wood fire is built inside the range to provide heat. This fire warms the solid brick floor and walls, retaining enough heat to bake things. The heat is more easily controlled in a gas-fired brick oven than in a wood-fired brick oven. In-deck ranges, there are no racks to hold pans. Because multiple deck ovens can be piled on top of one another, they are also known as stack ovens.

Fig 4.3.4 Deck or cabinet oven

Microwave Ovens:

The kitchen equipment uses microwave radiation to heat and cook meals in the electromagnetic spectrum. The oven's radiation penetrates only a fraction of the way into the food, agitating the water molecules. The friction created by the agitation produces heat, which cooks the food.

Fig 4.3.5 Microwave Ovens

Dutch Oven:

A Dutch oven is a cooking pot with a thick-walled (typically cast iron) interior and a loose-fitting lid. For hundreds of years, it has been used as a cooking vessel. English-speaking nations other than the United States are known for casserole dishes. In French, they are known as cocotte. As a traditional Balkan cast-iron oven, they are akin to the Japanese tetsunabe and the Sac.

Fig 4.3.6 Dutch Oven

4.3.2 Oven Profiling and Operations

Faults and Remedies

FAULTS	CAUSES
Poor Volume 	• Too much salt Alkaline water used • Too little yeast and poor quality yeast • Under proofing • Dough too chilled • Too little liquid • Under fermentation of dough • Dough too small for the pan Excess of salt, sug and fat • Weak/poor quality flour • Flour contains high bran • Too tight dough Under or over mixing • Oven too hot
Too Much Volume 	• Too little salt • Over fermentation • Too much yeast • Excess dough weight for the pan • Loose moulding • Too much dough scaled • Too slack adough • To low oven temperature • Over-proofed
Poor Shape 	• Too much liquid Loose moulding • To low oven temperature • Under or over mixing • Flour too weak • Too little yeast and poor quality yeast • Improper moulding or makeup • Improper fermentation or proofing • Too much oven steam
Irregular shape 	• Over ripened dough • Rough handling of the dough • Use of alkaline water • Excess of dough for the pan size • Improper fermentation or proofing • Overloading in the oven • Too strong or too weak flour • Too slack or stiff dough • Improper mixing Loose moulding

Texture and Crumb

TEXTURE	
Too dense or close-grained 	• Too much salt • Too little liquid • Too little yeast • Under fermented • Under proofed
Holes and tunnels 	• Too much salt • Scorching oven • Too weak or strong flour • Too slack dough • Too much yeast • Uneven mixing of ingredients • A high amount of chemicals used too much dusting flour • Improper knock-back, scaling, molding, etc. • Too little salt Tough and granular fat
Too coarse or open 	• Too much yeast • Too much liquid • Incorrect mixing time • Improper fermentation • Proofed Pan is too large
Streaked crumb 	• Improper mixing procedure • Poor molding or make-up techniques • Too much flour is used for dusting

Poor texture or crumbly 	• Flour too weak • Too little salt • Dough too slack • Less quantity of yeast • Improper moulding • Fermentation time too long or too short • Over/under proofed • Improper knockback given • Too many improvers used • Too much dusting flour used • Excess of fat or water • Slicing hot bread • Use of alkaline water • The baking temperature is too low
Grey Crumb 	• Fermentation time or temperature too high

Crust

Too Dark 	• Too much sugar, salt or milk • Under fermented dough • Lack of humidity in the oven • Under-fermented or over -mixed dough • Oven temperature too long • The dough temperature is too low • Too much diastatic activity in the dough • Baking time is too long • Too much steam in the oven

Too Pale 	• Under baking • Too much yeast • Under the mixing of the dough • The low diastatic capacity of the flour • Too slack a dough • Too much dusting flour used • Hot proofing chamber • Fermentation temperature high • Over proofing
Too thick 	• Too little sugar or fat • The less diastatic activity of flour • Improper/over fermentation • Poor quality or too strong flour • Baked too long or at the wrong temperature • Too little steam
Blister on Crust 	• Too much liquid • Skinning of dough before baking • Improper fermentation • Improper shaping of the loaf • Over proofing • Uneven baking temperature
Top crust shelling 	• Too stiff dough • Under proofing • Too high baking temperature • The low diastatic activity of flour • Under-fermented dough • Insufficient sugar
Leathery crust 	• Insufficient cooling before packing • Uneven fermentation • Too strong flour used • Excessive humidity during proofing and baking

Hard crust 	• Excess water used • Use of less fat • Improper fermentation • Too strong flour used • The low temperature of the oven • Long baking time • Excess of dusting flour • Excess of sugar
Split or burst crust 	• Over mixing • Under fermented dough • Improper moulding • Uneven heat in the oven • Oven too hot Insufficient steam

Flat Taste	Too little salt
Poor Flavour	• Inferior, spoiled, or rotten ingredients • Poor bake shop sanitation • Under or over fermented

STORAGE AND PACKING:

Poor Keeping Quality	• Insufficient salt, sugar, or fat • Poor quality of flour • Insufficient fermentation • Over proofing • Too high dough temperature • Too stiff dough • Too slack dough • Improper molding bread not cooled before packed • Over chilling of bread Slicing hot bread Impro ventilation in store room Improper cutting style P storage condition Humid store room Improper sanita in the storeroom

4.3.3 Checking the Quality parameters of Cakes

Some of the common faults of cake are listed below in tabular form for your better understanding.

External Appearance:

Fault	Causes
Cracked middle 	• Too many raising agents, e.g. baking powder. • The cake tin is too small • The oven temperature is too hot • Too much flour
Sunken cake 	• Oven temperature too low • The oven door opened before the cake had set • Too much of a particular ingredient • Excessive jarring or moving of the cake during baking • Excessive mixing of the batter.
The side of the cake was crunchy/burnt 	• Too much fat used to butter pan • The oven temperature is too hot • Butter is not suitable for baking • Cake left in the oven for too long • The cake tin was not sufficiently lined
Can‘t get the cake out of the pan 	• The cake tin is not well lined • Cooled too long

Fault	Causes
Cake too dark 	• The oven temperature is too hot • Incorrect amount of water • Excessive sugar
Cake burned on top 	• The oven temperature is too hot • Incorrect amount of water
The cake was shiny and sticky 	• The oven temperature is too cool • Not baked long enough • Too much sugar in the recipe
Crust too thick 	• Excessive baking time
Cake shrinks 	• Excessive liquid • The oven temperature is too hot • Improper mixing procedure • Cake baked too long

Fault	Causes
The cake rose unevenly 	• Flour was not blended well into the main mixture • Oven temperature uneven • The oven temperature is too high
Cake too small 	• The scaling weight is too low. • The oven temperature is too high. • The batter temperature is too high. • The battery temperature is too low. • Incorrect amount of water.
Sugary top or white spots on the crust 	• Too much sugar • Not enough liquid or hydration • Sugar too coarse • Batter standing too long before baking
Wet Streak at the Base of the Cake 	• Too much liquid • Not rested properly

Internal cake appearance

Cake very dense/ dense grain 	• Enough air wasn't beaten into the cake • Eggs added too quickly • Not enough raising agent • Excessive liquid • Improper mixing
Close texture 	• Insufficient raising agent • Too heavy handling of the dough • Not enough liquid • Oven too cool • Too little creaming of fat and sugar • Curdling of the creamed mixture
Coarse and irregular grain 	• Improper mixing procedures • Stiff batter • Depositing batter carelessly into pan • The oven temperature is too cool
Dry, crumbly texture 	• Baked for too long in a too -slow oven • Insufficient liquid • Too much raising agent • Over-mixing of the batter • Too little egg • Too much sugar

General faults

The batter overflowed (weeping)	• Wrong adjustments to recipes • The cake tin was too small
Poor flavor	• Improper mixing procedure • Faulty baking conditions • Improper cleaning of equipment
Cake too tough	• Excessive mixing • Batter too stiff(insufficient water) • Batter too thin(excessive water)
Cakes too tender for cutting	• Over-mixing the batter • Less egg • More sugar • Slow baking
Top crust peels and flakes off	• Over mixing • Cool oven • Insufficient steam during baking
Lacks body structure	• Excessive mixing • Insufficient liquid
Dries out too soon	• Excessive baking time • Insufficient liquid • Improper mixing procedure
Cake Staling Quickly	• The oven is too cold, so the cakes are in the range too long, and the crumb dries out • Too much baking powder • Not enough liquid in the batter to keep the cake moist
Sunk fruits	• Fruits are too large/heavy • Sugary syrup on the outside of the fruit was not washed off, causing fruits to slide through the mixture when heated • Cake mixture over beaten/ too wet, so it could not hold the fruit in place • The oven temperature is too hot
Off colour cakes	• Unclean equipment • The oven temperature is too cool • Improper mixing procedure

UNIT 4.4: Packaging of Baked Products and Post-Production Tasks

Unit Objectives

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

1. Explain the storage requirements of cakes, pastries, pies etc.
2. Describe various types of packaging materials used in the process.
3. Discuss different types and styles of packaging.

4.4.1 Storage and transportation of baked products

1. Specifications for Warehousing & Storage shall be used to describe the conditions required.
2. Where specified, temperature and humidity monitoring must be carried out using calibrated recording equipment. A reporting system with corrective action plans for out-of-range results shall be defined. Terms in everyday use are:

- Ambient Storage: Prevailing conditions with no control over temperature or humidity required or expected
- Dry Storage: Prevailing conditions controlled to avoid humidity absorption from the air. Temperature range 15 to 25°C (59 to 77 °F), relative humidity < 65%.
- Conditioned Storage: Temperature controlled within 10 to 20°C (50 to 68°F). Humidity 65% maximum.

Control of transportation conditions

These shall also apply to transportation where temperature ranges are specified for storage. Effective operation of vehicle chiller units shall be verified by temperature measurement.

Assembly & Dispatch: Documented procedures defining shipping parameters for all stages of the distribution process shall be in place. Procedures for reporting stock or delivery issues (e.g. shortages, delayed deliveries) shall be considered.

Transportation: Vehicles must be clean, free from odours, and fitted with appropriate temperature control and monitoring devices.

4.4.2 Packaging of bakery products

Packaging - Bakery product manufacture, preservation, storage, transportation, and marketing are strongly related to packaging. Packaging combines science, art, and technology, particularly for bakery goods.

The particular sensitivities of the contents, such as that moisture, oxygen, etc., determine the selection of the best packaging material.

- Dimensions and weight of the container
- Speeds of filling and sealing are affected.

- Food contamination due to material packing components.
- Storage circumstances - How long must the product be shielded?
- Possibilities for recycling and biodegradability.

Other additional peculiarities might be found to determine the packaging of bakery goods, such as the product line, market, consumer needs, and operational margins.

Product packaging for bakeries - Most bakery goods are sold fresh and kept at room temperature. Other products, such as cream, fruit-filled pies, and cakes, are stored in a refrigerator or freezer to maintain longer shelf life. Like most manufactured meals, bakery goods can degrade physically, chemically, or microbiologically.

Aluminum Foil as Packaging Material for Bakery Products - Consumers value all foil food containers' durability and adaptability. They combine all the elements required to provide consumers with fresh, healthy, and readily available products to meet the demand for quality and value. Various specially engineered lidding materials, such as coated or laminated Al foil lids that may be sealed to the container rim but peel off easily when necessary, are being employed to increase adaptability. The containers made of aluminum have unique qualities like:

- Compatibility
- Heat Resistance and Conductivity
- Hygiene
- Durability and strength
- Multi-mode heating or cooking
- Decorative potential
- Lightness and space economy
- Stainability

New packaging techniques for bakery products - Products from bakeries are vulnerable to mould growth and chemical deterioration. Problems with bread or pastries that have been packaged due to fermentation are also possible. When mould spores are in the air, a product is more susceptible to contamination and damage from handling and equipment. Using preservatives or additives is one way to avoid this problem. Mould may be effectively managed because it is an aerobic bacterium by packing the product in a modified atmosphere of carbon dioxide (C02) and nitrogen (N2), reducing oxygen concentration. MAP increases total cost-effectiveness, preserves the quality and increases shelf life.

A broad range of packaging alterations designed to lengthen food's shelf life is collectively called "active packaging." Foods' shelf lives are extended by altering the environment surrounding them to stop or delay the growth of germs.

Extension of shelf lives of bread items - Mould growth and staling are the two main issues with bread items' shelf lives. In the bread industry, mould growth is widespread and frequently affects the shelf life of bakery goods. Bread that hasn't been preserved has a shelf life of 3 to 4 days before mould becomes obvious. Cake water activity and storage temperature are essential elements that promote mould formation and shorten bakery goods' shelf life.

Stealing bread involves chemical and physical changes, such as the redistribution of moisture, drying, retrogradation of starch, increased stiffness, and deterioration of flavor and aroma. Bread staling and moulding cause significant financial losses and a decline in consumer approval of bakery goods. Most moulds are destroyed by baking, and however, surface contamination can happen during packaging.

One instance of active packaging is using natural antimicrobials to increase the shelf life of baked goods. Volatile anti-microbial substances can be found in various spices, herbs, and fruits. These substances could be added to the packaging material to inhibit or postpone the development of microbes on bakery goods. One excellent substance for preventing microorganisms' growth is essential mustard oil.

It is advised to use mustard in combination with other shelf-life-lengthening techniques at lower concentrations. However, only stronger-flavored bread like rye and pumpernickel can use it. Packaging materials also contain additional inhibiting elements. There have been reports of enzymes that control microbial development, including muramidase, lysozyme, and glucose oxidase. It has also incorporated food additives like propionic, benzoic, and sorbic acids into low-density polyethene (Sanderson, 2003). Thus, active packaging protects bread and other bakery goods against microbial deterioration.

4.4.3 Packaging materials

Requirements for packaging materials for bakery products

Bread and cakes - Since bread and buns have equilibrium relative humidity between 85 and 90 percent, they typically lose moisture to the atmosphere. The packing material for bread that is only a little water-vapour proof is necessary to keep the crust from getting soggy and susceptible to mould on slices. It is mainly required to guard against handling and dust. Using excessively water-vapor-impermeable packaging would result in interior condensation, fogging, and growth.

The preferred packaging materials include 1 5 gauges HDPE, semi-moisture-proof cellophane, and heat-sealable waxed paper with high water-vapor permeability, etc. LDPE and Polypropylene plastic films are used for packaging them instead of waxed paper (PP). Similar criteria apply to cakes and other similar goods as bread, and the packaging should also be sturdy enough to shield the interests from physical harm. Polystyrene (PS) and cellulose acetate thermoformed containers are frequently utilised.

Biscuits - Because biscuits have a low water activity (0.15-0.2), they must be packaged in highly impermeable materials. The content material needs to be rigid, 0-resistant, and fat-resistant. HDPE and PP pouches work well on machines and are appropriate for short-term storage. Adding PE or Biaxially Oriented Polypropylene (BOPP) liners in other packages is advantageous in lowering the water vapour penetration for longer storage life. BOPP films are frequently utilised for packaging biscuits, which are incredibly susceptible to oxygen and humidity. Also used are laminates such as cellophane/PE, coated foils, and metallized polyester/PE.

Flexible Packaging Materials - These are all examples of wrappers, pre-formed pouches, and form-fill pouches. Because of its superior gas barrier qualities and heat sealability, cellophane was the first flexible film to be utilised.

Packages for Biscuits

Thermoformed plastic trays - Assorted biscuits, pastries, cookies, and other baked goods are packed in thermoformed plastic trays of polystyrene or PVC with many cavities. They're either overwrapped, shrink-wrapped, or sealed with a lidding substance or overwrapped, shrink-wrapped, or sealed with a lidding material. The things sit perfectly in the compartments and exhibit themselves well. For bakery products, active packaging with oxygen absorbent and antibacterial qualities helps extend the shelf life and keep the product's original quality. Flexible packaging materials with active sachets include PVDC-coated nylon, polyester, LDPE, PP, ethylene vinyl alcohol, and polystyrene.

Cakes, Pastries, and Doughnuts - These products are available in various sizes, shapes and forms. However, since these products contain high moisture content, they are prone to mould growth. Hence, the packaging material selected should not encourage mould growth. The packaging material used is Polypropylene (PP), Cast Polypropylene (CPP), Poly Vinyl Chloride (PVC) etc. At the same time, the choice of the film depends upon the machinability and economics required.

Conclusion - Bakery products come in various packaging options, including films, laminates, and thermoformed trays, all of which can be met with different plastic materials. These materials are resistant to moisture loss and gain, retain flavor and aroma and are hygienic and safe for food contact. In addition, other characteristics such as machinability, printability, and cost-effectiveness make them an excellent package choice.

UNIT 4.5: Display and dispatch Artisanal Baked Products

Unit Objectives

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

1. Discuss various techniques and materials used to display the baked products attractively
2. Discuss the standard methods used to inspect the quality of finished products thoroughly before dispatch
3. Explain the distribution and supply of baked products to individuals and organisations
4. Explain and apply FSSAI guidelines about the finished products' production, storage, packaging, labelling and transportation.

4.5.1 Discuss the various techniques and materials used to display the baked products attractively

Two crucial points should be kept in mind when trying to increase sales. To start, your product needs to be excellent. If your bakery offers a variety of intriguing recipes, chances are good that your goods are perfect. However, a superior product is not the only factor in sales; the presentation is also essential. Make sure you use strategic planning when building the display case for your bakery and placing your products on their plastic trays.

Be active - Your display case won't get much attention if it has a uniform appearance. Give the things you have on display some variety. Try creative packaging or wrapping, like box decorations or vibrant plates.

Maintain your brand - Avoid going overboard with an ostentatious, vibrant display. Make sure the beauty of your brand is still reflected in your items. If your café has a reputation for being environmentally conscious, incorporating wood textures and green hues is a terrific option. Don't stray from the shades and fashions that your customers adore.

Engage the senses - Keep your display shelves spotless and smudge-free. To make your exhibited objects stand out, increase the illumination. Of course, you should also let the oven do its job and fill the air with the heavenly aroma of a bakery. Think about adding creative labels to your plastic trays, such as "just out of the oven!”

Prevent Vacant Space - Don't let the hotspot go unused! Make a complete product display to attract clients and boost sales. From the moment you open until the moment you close, keep the merchandise appealing and arranged, replacing it as necessary. When placing goods, use a sturdy plastic tray to make it simple to swap out one item for another.

Methods for presenting and displaying baked goods - For cupcakes, you can use flavorful, freshly made frosting. Numerous synthetic and natural flavors work nicely with the taste of moist cupcakes. Additionally, bakers can decorate their cupcakes with fun sprinkles in various colors.

Additionally, there are many different toppings available these days for baked items.

The best choice is to use chocolate chips to keep things simple. A great addition to vanilla or chocolate cupcakes is chocolate chips.

Many individuals also think of using fondant to decorate cupcakes. The fact that fondant allows you to be so very creative is one of its best qualities. Your cupcakes can be decorated in a variety of ways to stand out.

You can also use chocolate or coloured ganache to create a cupcake that combines taste and aesthetics.

Cake decorating is true art! It might be challenging to master cake decorating and design. Thankfully, most of these cake decorating suggestions also work like magic when used to top off a cake. Cakes, on the other hand, provide you with more fantastic room and creative freedom.

Three Bread Decoration Ideas - Not everyone like adorning bread. In addition, it is challenging to imagine the typical loaf of bread as anything other than its wheat hue.

For artfully slicing bread, you'll need a double-edged stainless steel razor. A scissor or serrated knife may occasionally be able to assist you in achieving perfection. Make lovely perpendicular cuts to produce a pattern resembling a leaf. The dough can be shaped after it has been proofed. You have two options: symmetrical or asymmetric for your bread design.

Using a Stencil - A different original technique involves powdered stencilling patterns onto the bread. To create those artistic designs, you can use inexpensive materials like a lace doily, lead, or pre-cut stencils. Keep in mind that creativity and imagination have no limits. Additionally, you can design patterns to adorn your bread. You can use materials like flour, dehydrated veggies, fruit powders, or chocolate to make stunning artwork. Wrapping or braiding is one of our favourite three-dimensional decorating methods for bread. At first glance, you could think that giving them a braided appearance is complex. But after a few practice times, it becomes as simple as buttering bread! The dough strands can be braided, and a batard can be latticed.

How to Present Bakery Products to Increase Sales

We could all use some ideas and tips when designing the ideal bakery store display! You need both a delicious product and something that looks appealing for a bakery to succeed.

With that in mind, we have a few sleight-of-hand techniques that will get you to dreamy baked product displays in no time! So, here are some methods for presenting and showcasing bakery goods.

Utilize accessories - Don't simply stick to display boxes and baked products when showcasing your delectable artwork! In addition to those delicious-looking baked goods, you may make the space more appealing by adding accent pieces. Keep name cards and toppers in mind.

Name cards are among the necessities for displaying bakery goods. The name cards are an

excellent method to assist international guests unaware of traditional baked goods arriving at your door. Additionally, it simplifies your job and prevents confusion.

For all the baked goods, select lovely printed name cards. Additionally, you can liven up the presentation by using cake or cupcake toppers.

Colour coding is the most effective method for all products, whether food or unique stationery. Depending on the mood and store decor, you may colour-code how you display your baked goods. For instance, if the store's logo contains greenish undertones.

4.5.2 Standard techniques used to inspect the quality of finished products thoroughly before dispatch

The laboratories have investigated relatively quick and easy sample preparation methods that don't require hazardous solvents and are used to assess the oxidative stability of the completed product, providing important insight into rancidity and shelf-life. In addition, it is possible to check whether products made without lactose include the right amount of lactose or whether alcohol, a preservative and antibacterial agent, is present.

The analysis of the final product (baked foods, spreads, and bakery items:

- Fatty Acids Free (FFA)
- Oxygen Value
- Value of p-Anisidine
- Lactose
- The alcohol content in the antibacterial solution, by volume
- The alcohol content in baked goods

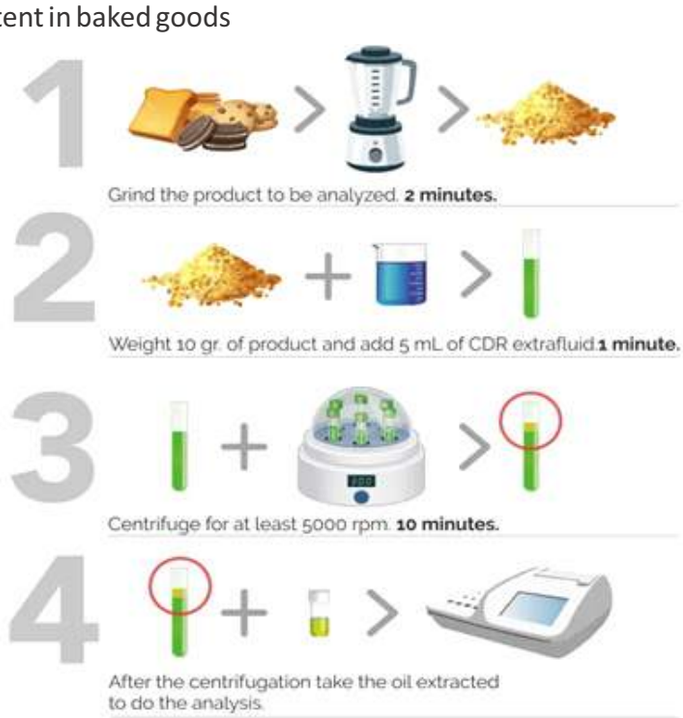


Fig 4.5.1 How to check the shelf life of spreads, baked goods, and bakery goods in 4 easy stages

Verify the lactose content of lactose-free bakery goods
CDR FoodLab ® is used to measure the lactose in bakery items to confirm the total amount of lactose contained in lactose-free products.

Simple steps are taken to prepare the sample: distilled water is correctly added to the ground product to allow solubilization.

A centrifugal force produces a distinct solution that can be easily analysed
Compared to the reference method (HPLC), which necessitates training, specialised expertise, and a significant amount of time, this straightforward procedure yields trustworthy and accurate findings in just 10 minutes.

Check the final product's alcohol content
The examination of alcohol concentration can be done using CDR Food Lab on both an antibacterial solution and a completed product.

Verify the lactose content of lactose-free bakery goods
CDR Food Lab ® is used to measure the lactose in bakery items to confirm the total amount of lactose contained in lactose-free products.
Simple steps are taken to prepare the sample: distilled water is added correctly to the ground product to allow solubilization.

A centrifugal force produces a different solution that can be easily analyzed.
Compared to the reference method (HPLC), which necessitates training, specialized expertise, and a significant amount of time, this straightforward procedure yields trustworthy and accurate findings in just 10 minutes.

Check the final product's alcohol content.
The alcohol concentration can be examined using an antibacterial solution and a completed product.

4.5.3 Explain the tasks to be performed to distribute and supply the baked products to individuals and organisations

Manufacturers of snacks and bakeries typically take pride in their high-quality goods. Even though a bakery may produce the best sourdough pieces of bread on earth, its operation will fail if its loaves are not delivered precisely and on time.

Logistics, or supply chain management, is necessary to ensure that goods are effectively delivered to clients. Although distribution plays a significant part in the baking industry, many businesses struggle to stay abreast of emerging innovations in this area. Many have entered the 21st century without altering or adapting their distribution systems.

Cost management

Correct supply chain management reduces costs as companies become more efficient at moving and loading items and ensuring that deliveries are made as promised. Customer complaints decrease as a result. By removing the significant paperwork produced by paper-based logistics programmers, logistics management can also result in administrative cost savings. Because these team members are no longer occupied with trying to repair orders that were not delivered properly, sales also benefitted.

Equipment and containers:

1. Equipment and containers that come in contact with food and are used for food handling, storage, preparation, processing, packaging, and serving shall be made of corrosion-free materials that do not impart any toxicity to the food material.
2. Equipment and utensils used in food preparation shall be appropriately labelled, kept at all times in good order and repair and in a clean and sanitary condition, and shall not be used for any other purpose.
3. Every utensil or container containing any food or ingredient of food intended for sale shall at all times be either provided with a properly fitting cover/lid or with a clean gauze net or other material of texture sufficiently fine to protect the food entirely from dust, dirt and flies and other insects.

Fig 4.5.2 Etching on containers for identification to ensure recipe

4. No utensil or container used for the manufacture or preparation of or containing any food or ingredient of food intended for sale shall be kept in any place in which such utensil or container is likely because of impure air or dust or any offensive, harmful or deleterious gas or substance or any toxic or dangerous emanations, exhalation, or vapour, to be contaminated and thereby render the food unhealthy.
5. Equipment shall be located, designed and fabricated to permit necessary maintenance and cleaning functions as per its intended use and facilitate good hygiene practices inside the premise, including monitoring and audit.
6. Appropriate facilities for the cleaning and disinfecting equipment and instruments, especially the cleaning-in-place (CIP) system.
7. All equipment, especially containers for waste, by-products and inedible or dangerous substances, shall be specifically identifiable and suitably constructed.

1. Containers used to hold cleaning chemicals and other dangerous substances shall be identified and stored separately to prevent malicious or accidental food contamination.
    1. If required, an adequate wastewater disposal system / effluent treatment plant shall be put in place as approved by State Pollution Control Board.
    2. All items, fittings and equipment that touch or come in contact with food must be:
        - Kept in good condition in a way that enables them to be kept clean and, wherever necessary, be disinfected .
        - Chipped enamelled containers shall not be used. Stainless /aluminium/glass containers, mugs, jugs, trays, etc., are suitable for cooking and storing. Brass utensils shall be frequently provided with inlining.
    3. Seams on food-contact surfaces shall be smoothly bonded or maintained to minimize food particles, dirt, and organic matter accumulation.
    4. Equipment in the manufacturing area that does not come into contact with food shall be so constructed that it can be kept clean.
    5. Holding, conveying, and manufacturing systems shall be of design and construction that enables them to be maintained in a sanitary condition.
    6. Each freezer used to store and hold food capable of supporting the growth of microorganisms shall be fitted with an indicating temperature recording device.
    7. Instruments and controls shall be accurate and adequately maintained and adequate in number for their designated uses.
    8. Equipment cleaning and sanitizing facilities: Adequate facilities and means like hot/cold water shall be provided for cleaning and sanitizing equipment.

Fig 4.5.3 Damaged containers(source of foreign matter contaminations) should not be used inside the process

Fig 4.5.4 Usage of appropriate food grade gasket

Water supply

Potable water that meets the requirements as per IS 10500, with appropriate facilities for its storage and distribution, should be used as an ingredient and food handling, washing, processing and cooking.

Fig 4.5.5 RO plant for water treatment to meet potable water requirements side the process

Cleaning utensils and equipment

1. Adequate facilities for cleaning and disinfecting utensils and equipment shall be provided.
2. The facilities must have an adequate potable hot and cold water supply.

4.5.4 Food Operations and Control

Procurement of raw materials and food ingredients:

1. All raw materials and food ingredients should be procured from approved suppliers and conform to FSSA Regulations.
2. COA/COC should accompany each received consignment.
3. An establishment shall accept no raw material or ingredient containing parasites, undesirable micro-organisms, pesticides, veterinary drugs or toxic items, or decomposed or extraneous substances that would not be reduced to an acceptable level by standard sorting and processing.
4. Where applicable, all raw materials, food additives, and ingredients shall conform to the Regulations and regulations laid down under the Act.
5. Records of raw materials, food additives and ingredients, and their procurement source shall be maintained in a register for inspection.
6. Raw materials should be purchased in quantities that correspond to storage/ preservation capacity
7. The packaged raw material must be checked for 'expiry date'/ 'best before'/ 'use by date, packaging integrity and storage conditions.
8. Receiving temperature of potentially high-risk food should be at or below 5 ^{o}C
   - Receiving temperature of frozen food should be -18 ^{o}C or below.
   - Records of raw materials, food additives and ingredients, and their procurement source should be maintained for inspection. In addition, the invoices of purchase should be kept for traceability purposes.

Storage of raw materials, food ingredients,food additives and packaging materials

1. All raw materials, food ingredients, food additives, and packaging materials must be kept off the floor and the wall; to enhance easy and adequate maintenance and cleaning and avoid any pest harbourage.
2. Pallets should be cleaned regularly to keep them free of cobwebs, dust, dirt, etc. It should be inspected periodically for any repair/ replacement if required. The best practice is to avoid wooden pallets and to use plastic pallets. In case wooden pallets are used, care should be taken to:-
   - Carry fumigation every 6 months;
   - Periodic cleaning, inspection and maintenance
   - Record keeping
3. Wrappers & Trays, before going to Production, are to be kept under fumigation and ozonisation.
4. All wrapper rolls are to be shrink-wrapped.
5. Proper segregation shall be provided to store non-food chemicals, raw, processed, rejected, recalled, returned, and recycled materials in a designated area to avoid cross-contamination.
6. All materials are to be appropriately labelled for proper identification. Adopt a First-Expired First-Out (FEFO)/ First-In-First-Out (FIFO) approach for all raw materials, ingredients, work-in-progress, processed/ cooked and packaged food products. Do not use materials beyond their expiry date.
7. Store materials at appropriate temperatures. Monitor and record temperatures of the chiller and freezer daily.
8. As far as possible, store raw materials away from ready-to-eat ingredients; in a separate chiller.
9. Always store ready-to-eat materials/ ingredients in covered containers above raw materials/ ingredients.
10. All raw materials, food additives and ingredients shall be stored separately from printed packaging materials, stationery, hardware and cleaning materials/ chemicals.

Fig 4.5.6 Raw materials should be stored on pallets.

Fig 4.5.7 Stands for keeping batch cards to identify and trace raw materials.

Distribution and Service

1. An appropriate supply chain must be incorporated into the system to minimize food spoilage during transportation. Processed/packaged and ready-to-eat food shall be adequately protected during transport and service.
2. Temperatures and humidity necessary for sustaining food safety and quality shall be maintained. The conveyances and containers shall be designed, constructed and maintained in such that they can effectively maintain the requisite temperature, humidity, atmosphere and other conditions necessary to protect food Conveyances and containers used for transporting/serving foodstuffs shall be non-toxic, kept clean and maintained in good shape to protect foodstuffs from any contamination.
3. Receptacles in vehicles and containers shall not be used for transporting anything other than foodstuffs where this may result in contamination of foodstuffs. Where the same conveyance or container is used to transport different foods, or high-risk foods such as fish, meat, poultry, eggs etc., effective cleaning and disinfection shall be carried out between loads to avoid the risk of cross-contamination. For bulk food transport, containers and conveyances shall be designated and marked for food use only and be used only for that purpose.

Waste Disposal and Drainage

1. Sewage and effluents (solid, liquid, and gas) must be disposed of following Factory/Environmental Pollution Control Board rules. Adequate drainage, waste disposal, facility systems and facilities must be provided. They must be planned and constructed to eliminate the risk of contaminating food or drinking water.
2. Waste (hazardous) storage shall be located not to contaminate the food process, storage areas, or the environment both inside and outside the food establishment. Waste shall be kept in covered containers and not allowed to accumulate in food handling, food storage, or other working areas.
3. Periodic disposal of the refuse/waste be made compulsory. No debris shall be kept open inside the premise and shall not be discharged outside the belief, on the road or drainage system.
4. Extreme caution must be exercised when disposing of non-environmentally friendly materials such as plastic, metal, glass, bags, containers, and other items.
5. Food trash and other waste products must be removed from areas where food is regularly handled, prepared, or processed to avoid accumulation. A sufficient-sized refuse bin with a pedal-operated cover must be provided for waste collection on the premises. This should be emptied and disinfected daily, then dried before subsequent use.

Fig 4.5.8 Provision of foot-operated closed waste bins

4.5.5 FSSAI regulations

As per Sub regulation 4.4 of Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011.

Biscuits, including wafer biscuits, shall be made from maida, vanaspati or refined edible oil or table butter or desi butter or margarine or ghee or their mixture containing any one or more of the following ingredients, namely: Edible common salt, butter, milk powder, cereals and their products, cheese cocoa, coffee extract, edible desiccated coconut, dextrose, fruit and fruits products, dry fruit and nuts, egg, edible vegetable products, ginger, gluten groundnut flour, milk and milk products, honey, liquid glucose, malt products, edible oilseeds, flour and meals, spices and condiments, edible starches such as potato starch and edible flours, sugar and sugar products, invert sugar, jaggery, protein concentrates, oligo fructose (max 15%) vinegar and other nutrients and vitamins:

- Provided that it may contain permitted food additives
- Provided further that it may have artificial sweetener with label declaration
- Provided also that it shall conform to the following standards, namely:

i) Ash insoluble in dilute hydrochloric acid (on a dry basis) - Shall not be more than 0.1 per cent
ii) The acidity of extracted fat (as oleic acid) - Not exceeding 1.5 per cent.

It may contain Oligofructose (dietary fibers) up to 15% maximum, subject to label declaration under Regulation 4.4.5 (43) of Food Safety and Standards (Packaging and Labeling) Regulations, 2011.

Specific Regulatory requirements for Bread

Bred - whether sold as white bread or wheat bread or fancy or fruity bread or bun or masala bread or milk bread, or of any other name, shall mean the product prepared from a mixture of wheat atta, maida, water, salt, yeast or other fermentative medium containing one or more of the following ingredients, namely:—

Condensed milk, milk powder (whole or skimmed), whey, curd, gluten, sugar, gur or jaggery, khandsari, honey, liquid glucose, malt products, edible starches and flour, edible groundnut

flour, edible soy flour, protein concentrates and isolates, vanaspati, margarine or refined edible oil of suitable type or butter or ghee or their mixture, albumin, lime water, lysine, vitamins, spices and condiments or their extracts, fruit and fruit product (Candied and crystallized or glazed), nuts, nut products, oligofructose (max 15%) and vinegar:

- Provided that it may also contain permitted food additives.
- Provided further that it may contain permitted artificial sweetening with label declaration.
- Provided also that it shall conform to the following standards, namely:-

(i)	Alcoholic acidity (with 90 percent alcohol)	It shall be no more than the equivalent of 7.5 ml. N NaOH per 100 g of dried substances.
(ii)	Ash insoluble in dilute HCL on a dry weight basis: (i) bread except for masala bread or fruit bread (ii) masala bread or fruit bread	Not more than 0.1 percent Not more than 0.2 percent

- Provided also that it shall be free from dirt, insect and insect fragments, larvae, rodent hairs and added coloring matter except for any permitted food colors present as a carryover color in the raw material used in products.
- It may contain Oligo fructose (dietary fibers) up to 15% maximum subject to label declaration under labelling regulation 4.4.5 (43) of Food Safety and Standards (Packaging and Labeling) Regulations, 2011.

Packaging and labeling requirements

The below packaging and labeling requirements are specific for bakery and bakery products. For all general conditions, please refer to - Food Safety and Standards (Packaging and Labeling) regulation, 2011.

1. The food in which hydrogenated vegetable fats or bakery shortening is used shall declare on the label that hydrogenated vegetable fats or bakery shortening used- contains trans fats.
2. Every container of refined salseed fat shall bear the following label, namely.

Refined salseed fat for use in bakery and confectionery only. '

1. Every package of Bakery and Industrial Margarine made from more than 30 per cent of Rice Bran Oil shall bear the following label: This package of Bakery & Industrial Margarine is made from more than 30 per cent of Rice Bran Oil by Wt.

2.In case of package or bottle containing sterilized or Ultra High Temperature treated milk, soya milk, flavored milk, any box containing bread, dhokla, bhelpuri, pizza, doughnuts, khoa, paneer, or any uncanned box of fruits, vegetables, meat, fish or any other like a commodity, the declaration be made as follows:—

“BEST BEFORE …….DATE/MONTH/YEAR”

OR —

“BEST BEFORE……..DAYS FROM PACKAGING”

OR —

“BEST BEFORE …….. DAYS FROM MANUFACTURE”

Note:

- Blanks be filled up
- Month and year may be used in numerals
- Year may be given in two digits

1. Every package of biscuits, bread and cakes containing Oligofructose shall bear the following declaration, namely,

Contains Oligofructose (dietary fiber) —— gm/100 gm

2. Provided that for Ingredients falling in the respective classes, the following class titles may be used, namely

Class: Cakes Class

Label: Cocoa solids (if used)

Notes

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

5. Basic Food Safety Standards

FIC/N9904

Key Learning Outcomes

At the end of this module, the trainee will be able to:

1. Describe the various hazards and contaminations present in food processing industry
2. Explain the various food safety standards to be followed during the production process
3. Prepare sample reports regarding food safety regulations, inspections, faults observation, etc.
4. Discuss the importance of workplace food safety audits

Unit 5.1 Food Hazards and Contamination- Causes and Prevention

Unit Objectives

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

1. List the types of biological, chemical, and physical hazards present in the food processing industry
2. Discuss various types of food contaminations, their causes, and ways to prevent them
3. State the importance of ensuring that the materials (such as raw materials, processed materials, finished goods, etc.) are adequately isolated to prevent them from contamination
4. Discuss various types of allergens and their management at the workplace

5.1.1 Food Safety Hazards

A food safety hazard can be defined as anything that could contaminate the food and has the potential to cause adverse health consequences to consumers. Hazards may be introduced into the food product at any time during harvesting, formulation and processing, packaging and labelling, transportation, storage, preparation, and serving. Food hazards can be categorized into the following types:

Fig 5.1.1 Types of Food Safety Hazards

Biological Hazards

Biological hazards occur when hazardous or pathogenic organisms are introduced to food and thus pose a food safety concern to consumers. For example, when microorganisms infect the food, it results in biological or microbiological risks. Microorganisms are tiny living organisms that can only be seen under a microscope. These microscopic organisms can be found in the air, soil, water, animals, and humans.

As a result, they have an effortless time infiltrating and contaminating the food along the entire supply chain. In addition, pests, such as rodents, flies, and other insects, can transport hazardous bacteria, making them biological hazards.

Chemical Hazards

A chemical hazard in food is when food gets contaminated with pathogens or toxic chemicals found in nature or created by humans. Chemical hazards can be introduced from various sources at different food production and preparation stages. For example, fruits, vegetables, root crops, and grains are usually treated with pesticides and fertilizers. Although these foods are washed during the harvesting process, some contaminants may remain.

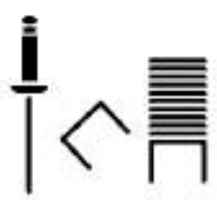
Here are some examples of hazardous chemicals that can contaminate food:

Pesticides	Antibiotics	Toxic Elements	Mycotoxins
Marine Toxins	Food additives	Veterinary drug residues	

Fig 5.1.2 Examples of hazardous chemicals

Physical Hazards

Physical hazards are foreign materials unintentionally introduced to food products, such as metal fragments in ground meat or naturally occurring objects like bones in fish, hazardous to the consumer. A physical hazard may contaminate a food product at any stage of production. The extraneous substance is another term for this. Physical risks, such as rodent droppings and plastic, can also be biological and chemical pollutants. At any level of the manufacturing process, unnatural physical dangers might arise from various causes—for example – Plastic, stones and pebbles, glass, wood, metal, etc.



Stapler pins

Stone and pebbles

Paper and plastic remenants

Hair

Bones

Fig 5.1.3 Sources of Physical Hazards

5.1.2 Food Contamination

Food contamination is generally defined as spoiled foods because they either contain microorganisms, such as bacteria or parasites, or toxic substances. The parasites that cause sickness create poisons that can cause food poisoning. Additionally, herbicides and specific cleaning agents can also contaminate the food. Therefore, it is crucial to know how food can become infected so that food product developers can take necessary safety measures.

The following are some of the most common causes of food contamination:

1. Improper food storage, handling, and preparation
2. Utensils that are not adequately cleaned or sanitized
3. Flies, cockroaches, insects, and pests contaminate the environment

5.1.3 Types of Food Contaminations

Food contamination can have severe consequences for both consumers and food producers. A variety of factors can cause food contamination.

There are four main types of contamination:

Chemical Contamination	Biological Contamination	Physical Contamination	Cross Contamination

Fig 5.1.4 Types of Food Contamination

Chemical Contamination

Chemical contamination happens when a chemical substance pollutes food. Chemicals are often used in the workplace for cleaning and disinfection, so, understandably, they could contaminate food. Contamination can occur when food is prepared on a surface that still has chemical residue on it, or when cleaning chemicals are sprayed near unprotected food. Furthermore, pesticides can affect food even before it reaches the kitchen. Fertilizers and pesticides, for example, may have been sprayed near food when it was growing.

Notes

Anyone who prepares or handles food must ensure that the food is not contaminated with chemicals. They should do the following to ensure this:

- Always store chemicals in the designated area
- Follow the manufacturers' instructions when using chemicals
- Procure raw material from approved who can guarantee the safety of the food they provide
- Adhere to SOP while cleaning and sanitation of workplace and equipment

Fig 5.1.5 Prevention from Chemical Contamination

Biological Contamination

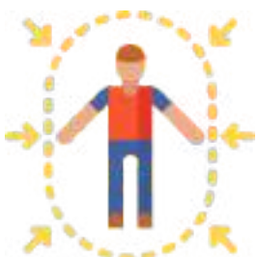
One of the most common causes of food-borne illness is biological contamination. Biological food contamination refers to the contamination of food by other living creatures. The hazardous germs spread on the foods during biological contamination. Even a single bacterium can multiply quickly when proper growth circumstances are found. Biological contamination may happen from different sources. Some of them are:

Dust

Raw Meat

Air

Continued...



Human body

Pets and pests

PPE

Equipment

Fig 5.1.6 Sources of Biological Contamination

It is essential to follow strict, high-standard food hygiene measures to avoid this form of contamination. Some of them are as follows:

- Separating raw material and ready-to-eat food at all stages of the food handling process, from delivery to transport
- Always washing raw fruit and vegetables
- Controlling pests and ensuring they are not on the premises

Fig 5.1.7 Prevention from Biological Contamination

Physical Contamination

When a foreign object contaminates food, it is called physical contamination. It can happen at any point during the delivery and preparation of food. Physical contamination can result in catastrophic consequences for consumers, such as fractured teeth or choking. Jewelry, hair, plastic, bones, stones, insect corpses, and cloth are examples of physical contaminants detected in food. Furthermore, if there are issues with the food premises or equipment, such as flaking paint or loose screws in a piece of equipment, these can go into the food. Physical impurities may transmit hazardous microorganisms, putting you at even more risk.

Physical contamination can be prevented through the following practices:

- Replacing any damaged equipment immediately
- Reporting any faults with equipment and premises without delay
- Having a thorough pest control system in place
- Following dress code principles, such as removing jewellery when handling food and wearing a hairnet

Fig 5.1.8 Prevention from Physical Contamination

Cross-Contamination

Cross-contamination refers to the contamination of a food product from some other sources. There are three main ways cross-contamination can occur:

Food-to-food

- Food can become contaminated by bacteria from other foods. This type of cross-contamination is especially dangerous if raw foods come into contact with cooked foods. Here are some examples of food-to-food cross-contamination:
  - In a refrigerator, meat drippings from raw meat stored on a top shelf might drip onto cooked vegetables placed on lower shelf.

Continued...

People-to-food

- People can also be a source of cross-contamination to foods. Some examples are:
  - Handling foods after using the toilet without first properly washing hands.
  - Touching raw meats and then preparing vegetables without washing hands between tasks.
  - Using an apron to wipe hands between handling different foods, or wiping a counter with a towel and then using it to dry hands.

Equipment-to-food

- Contamination can also be passed from processing equipment and utensils to food. This type of contamination occurs because the equipment or utensils were not properly cleaned and sanitized between each use. Some examples are:
  - Using unclean equipment, such as slicers, can openers, and utensils, to prepare food.
  - The food processing equipment handling a batch of raw meat was not thoroughly cleaned before the processing of the next batch leading to the growth of microorganisms.
  - Storing a cooked product, such as a sauce, in an unsanitized container that previously stored raw meat.

Fig 5.1.9 Cross-Contamination

Notes

The safety measures that can be implemented to prevent cross-contamination are as follows:

- Use separate utensils to prepare different types of foods.
- Avoid using the same processing equipment for ready to eat foods.
- Make sure raw foods don't come in contact with ready to eat foods.
- Cover and store raw foods below cooked foods to prevent cross-contamination.
- Store and seal garbage correctly to prevent cross-contamination.
- Clean and sanitize the waste bins to prevent infestation risk.

Fig 5.1.10 Prevention from Cross-Contamination

5.1.4 Importance of Isolating Materials to Prevent Contamination

Food product developers usually segregate factories to protect the product from the environment. For example, raw material is segregated from the finished product, and wet and dry materials are segregated. Ready-to-eat (RTE) food product developers further segregate or zone production areas for food safety or hygiene reasons.

Furthermore, a series of higher hygiene zones are created to protect the product from microbiological cross-contamination events after it has been heat-treated or decontaminated.

5.1.5 Allergen Management

Allergens are still the primary reason for product recalls in the food industry across the globe. Hence it is crucial to give proper attention to all the aspects involved in the management and prevention of allergens during the food production process.

Like many other concepts, allergen prevention and management will only work properly if each and every aspect of food production is properly controlled at all times.

A food allergy is an immune system reaction to a food that the body perceives as unfamiliar and harmful to it. For example, people might be allergic to an item as a whole or ingredients, for the most part, proteins, contained in an item. Depending on the individual, responses can go from high fevers, rashes, and influenza-like side effects to more extreme conditions like anaphylactic shock leading to death.

Some of the common symptoms of food allergy are as follows:

Fig 5.1.11 Symptoms of Allergen

Allergen management practices are crucial for good hygiene practices (GHPs), and, HACCP systems, in manufacturing, retail, and food administration. Therefore, allergens should be overseen through the supply chain and production process.

The steps of Allergen management are as follows:

1. **Cross Contact Prevention during processing:**

   In this step,

   a. Allergenic and non-allergenic production areas to be segregated

   b. The traffic of raw material supplies, employees, and packaging materials to be limited during the manufacturing of allergenic products

   c. Dedicated equipment and tools to be used for allergenic products

   d. Reuse of products like oil, and water to be avoided

   e. Allergenic products should be easily identifiable using tags or colour codes, etc. while on the processing line

1. **Validated and verified allergen cleaning**

   In this step,

   a. Appropriate cleaning and sanitizing of equipment

   b. Written protocols to be maintained

   c. No dead spots should be present in the production

   d. Cleaning validation and verification procedures should be present with their records

   e. Identification of the effectiveness of the allergen control plan to be done through internal and external audits

2. **Review of product label /packaging usage and control**

   In this step,

   a. The product should be labeled appropriately as per standards and adhere to the Food Allergen Labeling and Consumer Protection Act of 2004

   b. Labels should be reviewed prior to their receipt for their accuracy

3. **Personnel training**

   In this step,

   a. Training to be provided to personnel at all levels for allergen awareness and control

   b. Specific documented training for jobs of greater responsibilities

   c. Consequences to be highlighted if the plan is not followed during training and the reasons for the protocols followed

Notes

Unit 5.2 Food Safety – Standard Operating Procedures

Unit Objectives

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

1. Outline the standard regulations to be followed for ensuring food safety as listed in 'The Food Safety and Standards Act, 2006 that need to be followed during production.
2. Discuss the importance of following the standard procedures for ensuring food safety.
3. Discuss the role of HACCP, VACCP and TACCP as well as procedures to implement these in the food industry
4. State the significance of training the team members regarding various food safety procedures such as GMP, HACCP, etc.

5.2.1 The Food Safety and Standards Act-2006

The Act covers all kinds of food that is consumed by human beings including unprocessed/semi-processed/processed foods, genetically engineered foods, all kinds of substances, and water used in the preparation of food.

Packaged juices, drinking water, infant food, alcohol-based drinks, chewing gums, and all other primary foods are also covered by the FSSAI Act.

Furthermore, the Act considers live animals or products of agriculture, horticulture, or animal husbandry as food items when it has already been passed on from the hands of a farmer.

This Act is applicable to all persons who are manufacturing, producing, selling or handling food meant for human consumption. The Act does not discriminate between a small hawker or a huge Food Business Operator and makes it mandatory for everyone handling food to keep it safe and fit for human consumption. Be it an Individual seller or a small business, everyone is considered a Food Business Operator under this Act. Therefore, this Act applies to every person in the food business.

The basic safety standards are as follows:

1. Regulation on Food Additive

Food shall not contain any food additive or processing aid unless it is in accordance with the provisions of this Act and regulations.

2. Regulation on Contaminants or Toxic Substances

Food shall not contain any contaminant, naturally occurring toxic substances or toxins, or hormones in excess of such quantities as may be specified by regulations.

3. Regulation on Pesticides, Veterinary Drugs, Antibiotic Residue, Microbiological Counts

Food shall not contain insecticides or pesticide residues, veterinary drug residues, antibiotic residues, solvent residues, pharmacologically active substances, and microbiological counts above such tolerance limit as may be specified by regulations.

1. Regulation on Genetically Modified Foods, Organic Foods, and Functional Foods

No person shall manufacture, distribute, sell or import any genetically modified articles of food, irradiated food, organic foods, foods for particular dietary uses, functional foods, health supplements, proprietary foods, and such other articles of food that the Central Government may notify in this behalf.

2. Packaging and Labelling of Foods

The labelling and presentation of food, including their shape, appearance, or packaging, the packaging materials used, the manner in which they are arranged and the information which is made available about them through whatever medium, should not mislead consumers.

The labelling and presentation of food should not mislead consumers, including:

- shape
- appearance or packaging
- packaging materials used
- manner in which they are arranged
- information which is made available about them through whatever medium

No person shall manufacture, distribute, sell or deliver to any agent or broker any packaged food products that are not marked and labelled in the manner as specified by regulations.

3. Regulation on Advertisement and Prohibition as to unfair trade practices

- No advertisement shall be made which is misleading or deceiving or in contradiction to the provisions of this Act, the rules and regulations made thereunder.
- No person shall engage in any unfair trade practice for the purpose of promoting the sale, supply, use, and consumption of articles of food
- No unfair practice should be adopted that falsely represents that the foods are of a particular standard, quality, quantity, or grade composition.

Furthermore, there are 10 golden rules on hygiene laid down by FSSAI to ensure food safety

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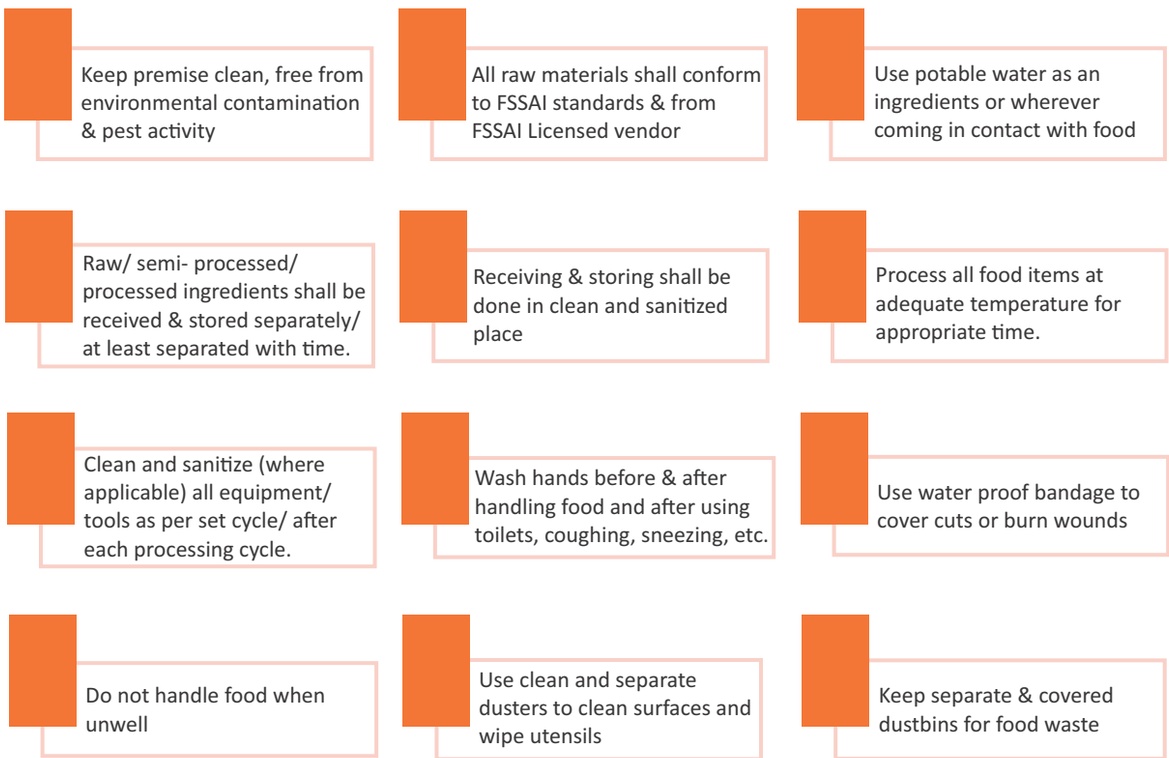

Fig 5.2.1 Golden Rules on Hygiene by FSSSAI

5.2.2 Importance of Food Safety- Standard Operating Procedure

Food safety refers to the handling, preparation, and storage of food in such a way that prevents the consumers from foodborne illness. It includes several standards to be followed to avoid any hazards affecting food. Food safety procedures are crucial to protect consumers from health risks related to common allergens and food-borne illnesses. Safe food products prevent companies and stakeholders from costly penalties and legal action. Fines and legal consequences could result in the closing down of a facility or may lead to bankruptcy.

So, we can say that following food safety procedures is highly critical both financially and ethically. The outcomes of failing to comply with food safety standards are multifarious. In addition to being extremely costly for organizations that must recall their products, revamp their processes, and manage the public relations crisis, inadequate food safety in manufacturing involves a significant human cost.

The cost of food recalls for companies

The failure in implementing an effective food safety protocol may lead to contaminated products entering the food chain. Once a defective product is noticed, food businesses are subject to dramatic disruptions in their operations as they manage and assume the cost of product recalls.

Food recalls can cost huge amounts to the companies, immediately measurable costs. In addition, the long-term effect that a product recall can have on consumer trust is conceivably even more damaging.

The human cost of unsafe food

The significance of food safety to human life is difficult to understate. Food safety problems are a prominent cause of several preventable diseases across the world. Each year, one in ten people will suffer from foodborne illness or injury. An estimated 420,000 people die every year because of eating contaminated food.

In addition to the human cost, unsatisfactory food safety comes with a greater ripple effect that obstructs socio-economic growth, especially in the developing world. The World Health Organisation states that food safety, nutrition, and food security are inextricably linked. A lack of safe food generates a "vicious cycle of disease and malnutrition" which overburdens public health services, disrupts social and economic progress, and detracts from the quality of life.

Food Product Developers can attain sufficient food safety measures by training and educating everyone who handles ingredients in a food business.

5.2.3 HACCP (Hazard Analysis and Critical Control Points)

Hazard Analysis and Critical Control Point (HACCP) is primarily an international food safety regulation followed to reduce the risk of hazards in a food-processing unit. It is a systemic and risk-based approach that aims to prevent the biological, chemical, and physical contamination of food in production, packaging, and distribution environments. The HACCP concept is designed to deal with health hazards by identifying potential food safety problems before they happen, rather than inspecting food products for hazards after the fact. The HACCP implies controlling for contaminants at several key stages in the food production process and strict adherence to hygiene practices throughout.

HACCP principles form the basis of Food Safety Plans across the globe. HACCP is applied to every stage of the food supply chain, such as production, preparation, packaging, and distribution, and is used to manage food safety across many types of food businesses. HACCP follows seven basic principles, which are as follows:

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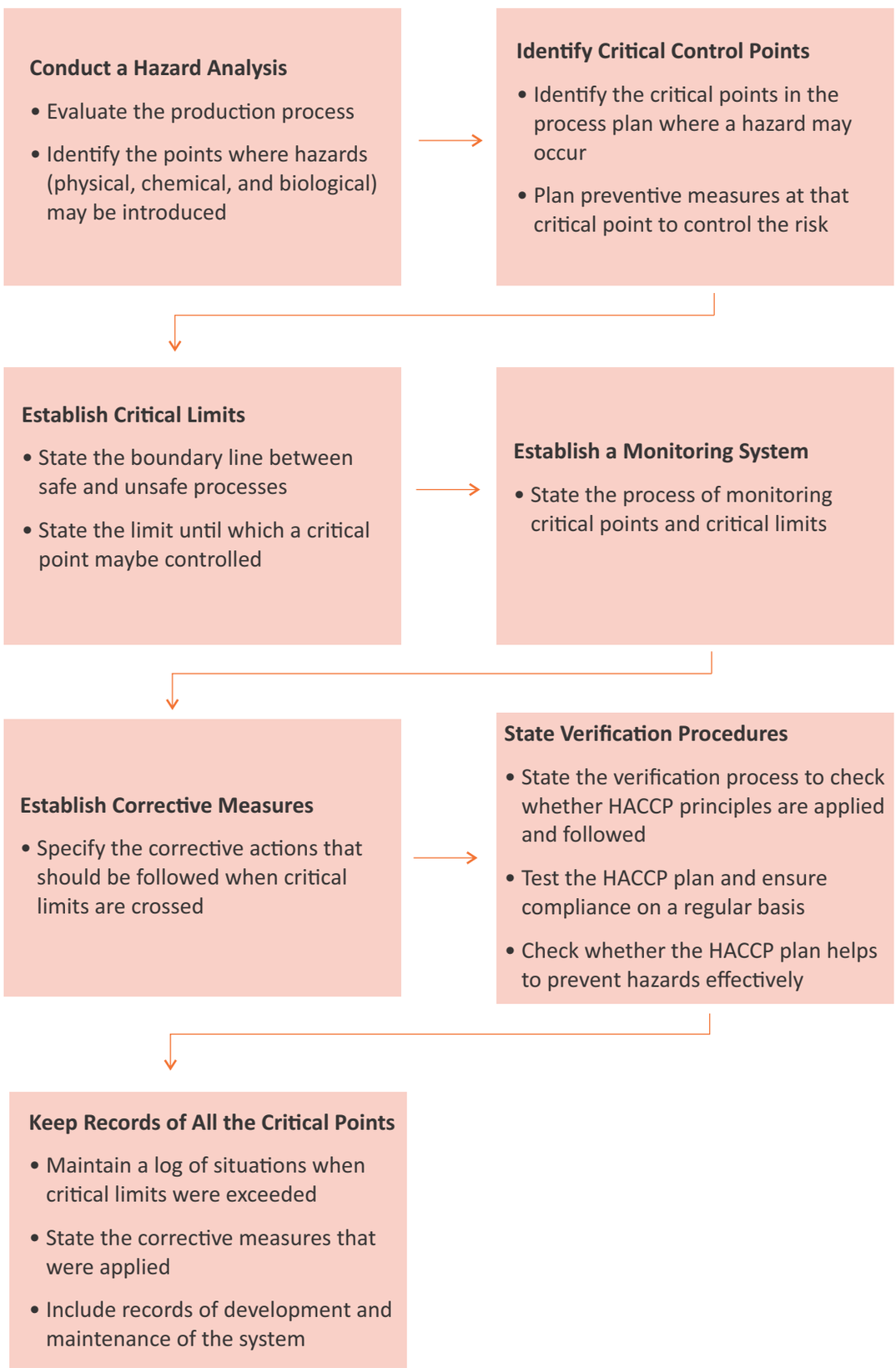

Fig 5.2.2 HACCP Principles

5.2.4 VACCP (Vulnerability Assessment Critical Control Points)

VACCP stands for 'Vulnerability Assessment Critical Control Points.' The VACCP examination is a tool to assess vulnerability in a critical control point. It is used to identify any potential weaknesses in the system and develop a plan to address them. The examination is based on a risk assessment. It considers the likelihood of an incident and the impact of that incident.

The assessment includes a review of the process, its controls, and the resources needed to implement those controls. It also includes a review of the management structure and how it supports the control process. Generally, a thorough VACCP analysis includes:

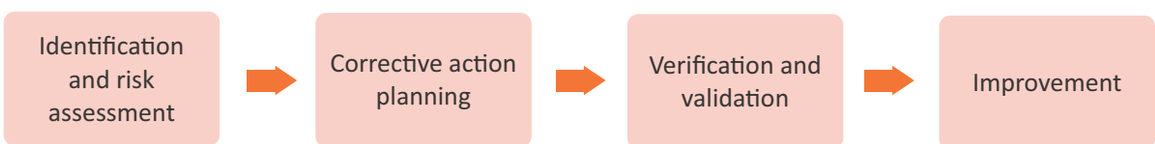

Fig 5.2.3 Steps of VACCP Analysis

The structure of VACCP is similar to the classic HACCP analysis as it also focuses on the safety of the facility. However, this approach enables the control of fake food by ensuring the quality of products and the safety of the production process.

Though, it is not a comprehensive food fraud control strategy but can be an effective tool to identify the risks in food product 'developers' supply chain.

This is not the only aspect to ensure product integrity. The implementation of several control measures along with VACCP can increase the effectiveness of preventing food fraud and other forms of food crime.

5.2.5 TACCP (Threat Assessment Critical Control Point)

With regards to food safety across the entire food manufacturing industry, food defense has been the most important element that comprises protecting businesses and consumers from internal and external threats. It encompasses a range of potential threats, like intentional contamination of food products, disruption of the supply chain, and using food or drink items for terrorism or criminal purposes

TACCP is a management process and a systematic strategy for protecting a food supply chain from deliberate contamination. Contamination is motivated by behavioral or ideological motives with the desire to damage individuals.

The key steps for an organization to follow while developing TACCP include:

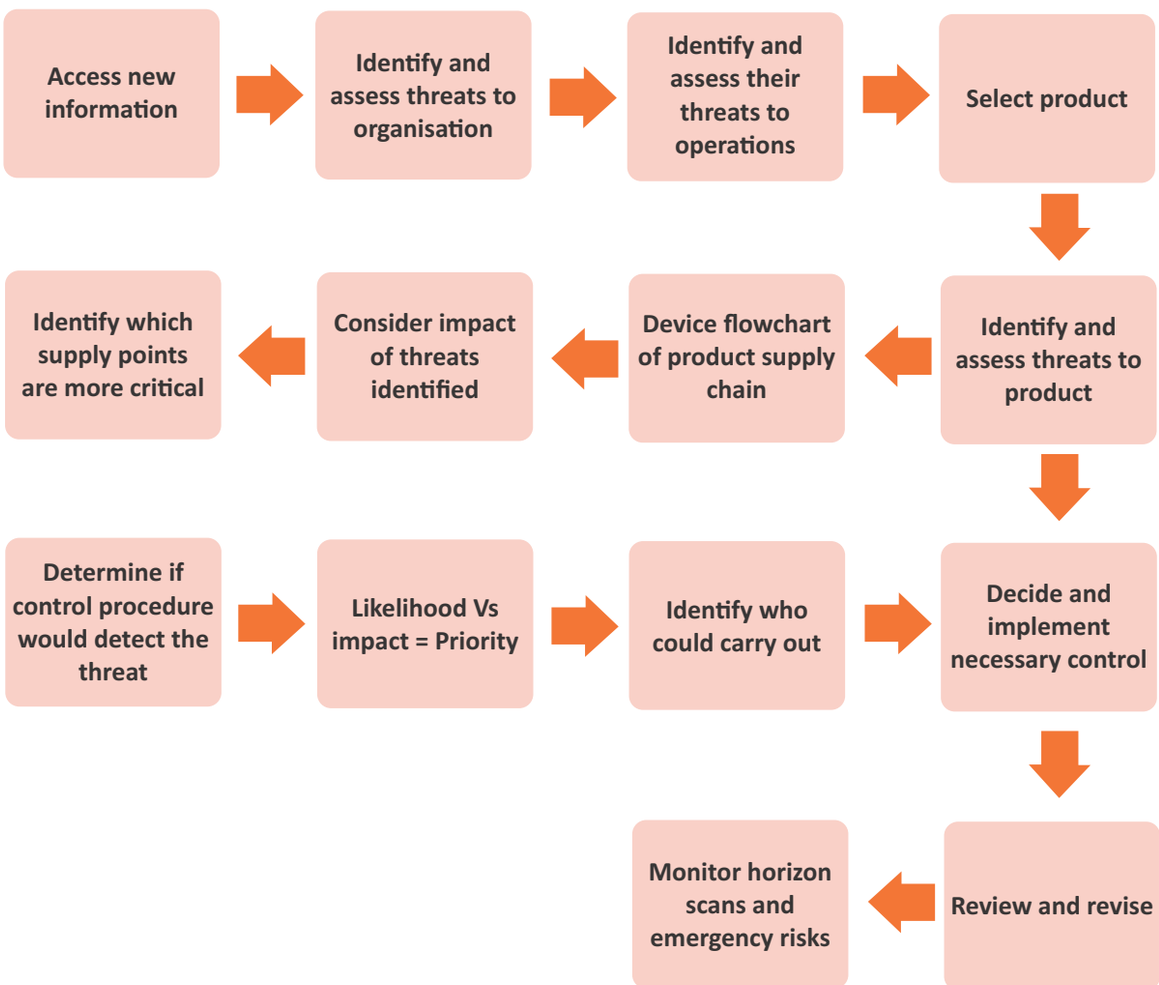

Fig 5.2.4 Steps of Developing TACCP

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5.2.6 Significance of Training the Team on Food Safety Procedures

Training staff on methods to ensure food safety will help reduce the risk of contamination. Regulations require that food handlers are supervised and well-trained in food hygiene practices suitable for their work activity.

Certain areas which staff should be trained about are:

- Safe food storage practices
- Safe food handling practices
- Good hygiene practices
- Cleaning for food safety
- Pest control
- Good manufacturing practices

Food Safety measures are crucial because foodborne illnesses and allergic reactions may cause severe health issues.

Where bacteria in contaminated food are allowed to multiply and ultimately enter a ' 'person's body, it can cause problems ranging from causing mild discomfort to a life-threatening illness. The best possible way to prevent this is by ensuring that bacteria is killed and not able to reproduce in large enough numbers and that it cannot easily be transferred between foodstuffs. Similarly, allergic reactions are life-threatening and can only be prevented if people know exactly what ' 'they're eating. And this can only be known if food producers and preparers ensure that foodstuffs 'don't come into contact or mix when they shouldn't.

This is one of the core functions and most important elements of food safety procedures and can only be learned through proper training.

Notes

Unit 5.3 Food Safety Audits– Measures & Management

Unit Objectives

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

1. Explain the procedure to conduct workplace food safety audits
2. List various issues that can arise during food production and other processes
3. Discuss the procedure of performing root cause analysis and taking corrective and preventive actions against workplace problems
4. Discuss the corrective measures to be applied to ensure food safety

5.3.1 Food Safety Audits

There are several stages during the food production process when the food product may get contaminated. A food safety audit gives food product developers confidence that safety and hygienic practices in food processing have been followed throughout the supply chain.

A food safety audit process performs a detailed inspection of the food processing facility to evaluate its compliance with established food hygiene and safety standards. Food safety audit provides food product developers with multiple benefits. Some of them are as follows:

Mitigate Risk	Save Time and Money	Inspire Confidence	Enhanced quality and productivity

Fig 5.3.1 Benefits of Food Safety Audit

Notes

Based on the type of food safety audit being performed, it includes a comprehensive assessment of:

Fig 5.3.2 Aspects of Food Safety Audit

6.3.2 Steps to Conduct Food Safety and Hygiene Audit

Discussed here are the key steps to performing comprehensive food safety and hygiene audit:

i. **Planning:** This is the initial stage of the food safety audit which consists of setting a clear objective and determining the audit scope, i.e., which areas need to be targeted. This stage also includes cost and resource considerations while planning for a food safety audit.

ii. **Execution:** Audit assesses the status of the quality management system and operations in real-time. It helps identify the problems that may arise now and encourages to take a proactive approach rather than a reactive one. Identifying areas where preventive strategies can be implemented based on audit findings can help improve operational efficiency and prevent problems in the future.

iii. **Preventive and Corrective Actions:** The gathered audit information along with problem descriptions and proper documentation can provide valuable data with actionable insights.

iv. **Verification:** In this phase, it is crucial to evaluate how efficient are the preventive and corrective actions and whether they follow regulatory standards.

v. **Audit Evaluation:** It is one of the most crucial steps of a food safety and hygiene audit – evaluating and validating the success of the audit process. Even the audit process should comply with the food developer's business objectives and statutory audit schedule.

Types of audits in food processing units:

The two types of audits carried out in food processing units are internal and external audits.

Internal audits are carried out by employees or staff from within the organisation. The employees can be from a different department or another unit of the same organisation. These audits are carried out to identify problem areas and rectify them. They can also be carried out as a pre-audit prior to the audit by external agencies to ensure that all the standard operating procedures and guidelines as per governing bodies are followed and compliant with the industry standards. Along with helping to improve processes, they also help to find deficiencies before the external audit and take corrective actions. All the findings and actions taken to resolve them are documented.

External or third-party audits are carried out by auditors from outside the organisation. They are often used to get a certification. The regulatory bodies carry out these audits to ensure compliance with the regulatory requirements. If the organisation is found to be non-compliant, then the external auditor may issue a warning letter, cancel the registration of the company, or stop the production of products/services.

5.3.3 Root Cause Analysis

Root cause analysis often referred to as RCA, is a method to analyse serious problems before trying to solve them. The main root cause of a problem is isolated and identified. It is considered one of the core building blocks in an ' 'organization's continuous improvement efforts. However, it is important to note that root cause analysis will not produce any results; it must be made part of a larger problem-solving effort for quality improvement.

Root cause analysis could be done using multiple tools and methods, including the following:

- Events and causal factor analysis
- Change analysis
- Barrier analysis
- Management oversight and risk tree analysis
- Kepner- Tregoe Problem Solving and Decision Making

Fig 5.3.3 Tools of RCA

When carrying out root cause analysis methods and processes, it's crucial to note:

- Though root cause analysis tools can be used by a single person, the output is better when a group of people works together to find the causes of the problem.
- Prominent members of the analysis team should be responsible for removing the identified root cause(s).

A typical design of a root cause analysis in an organization might follow these steps:

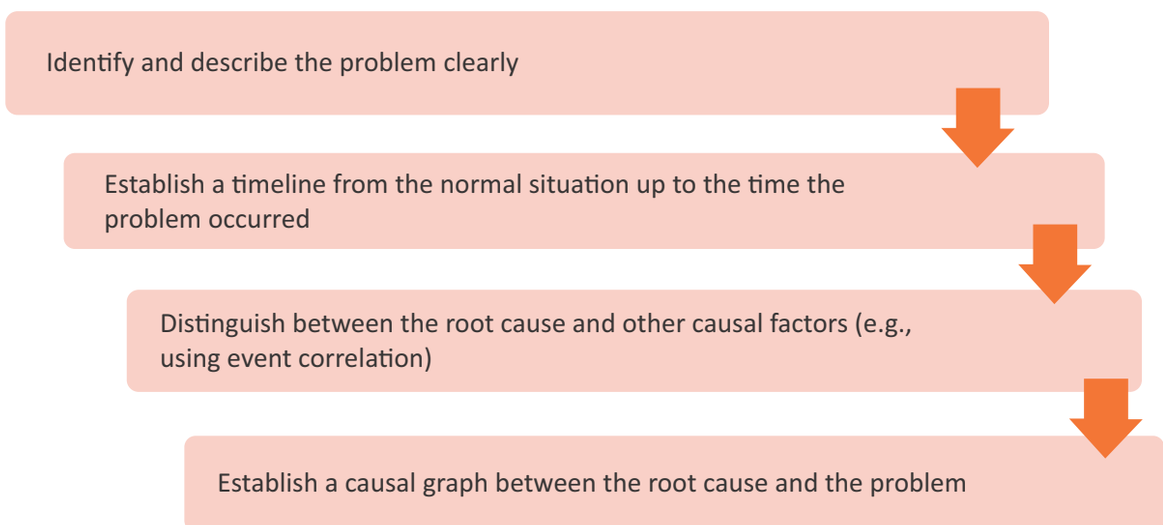


Fig 5.3.4 Design of RCA

1. A small team is formed to conduct the root cause analysis.
2. Team members are selected from the business process/area of the organization that experiences the problem.
3. During the analysis, equal emphasis is placed on defining and describing the problem, brainstorming its possible causes, analyzing causes and effects, and formulating a solution to the problem.
4. Weekly team meetings are conducted during the analysis period, sometimes two or three times a week. The meetings are always kept for a maximum of two hours, and since they are meant to be creative in nature, the agenda is quite loose.
5. One team member is assigned the role of making sure the analysis progresses, or tasks are assigned to various team members.
6. Once the solution has been designed, and the decision to implement it has been taken, it can take anywhere from a day to several months before the change is complete.

5.3.4 Corrective and Preventive Action (CAPA)

Corrective Action and Preventive Actions are derived from the 5 Whys consist of tools that can be used to address a systemic issue, and control processes to help prevent a costly food safety or quality incident.

CAPA procedure can be based on PDCA(Planned Do Check Act) philosophy as determined by Deming-Shewhart Cycle.

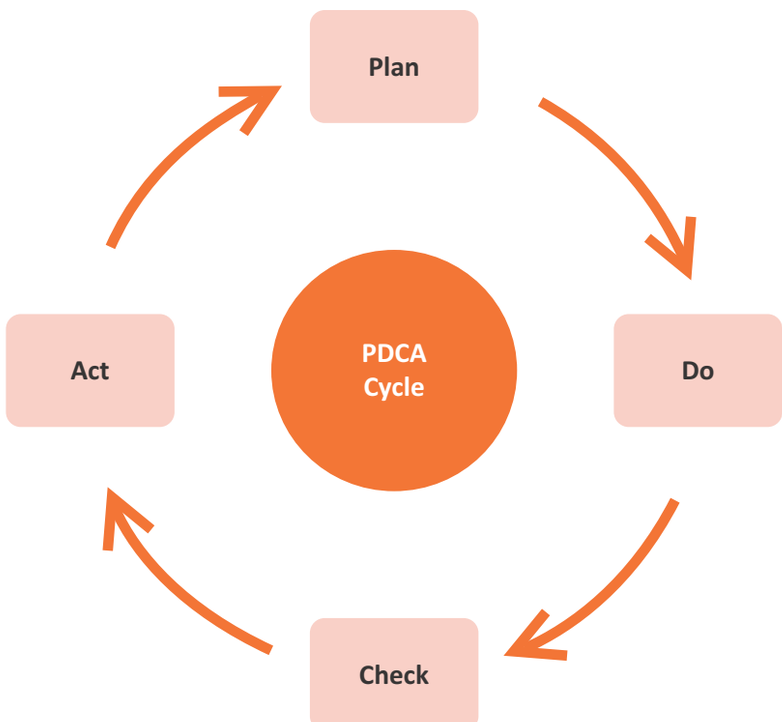


Fig 5.3.5 PDCA

The steps involved in CAPA are as follows:

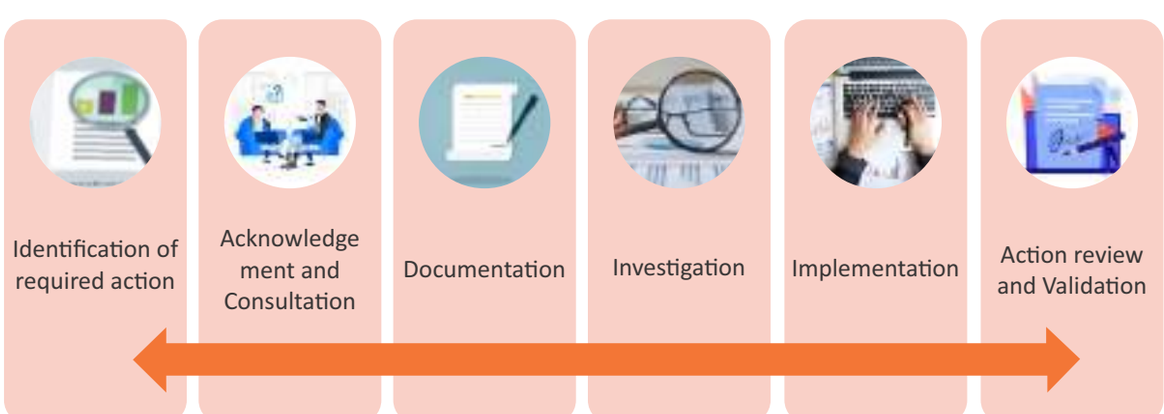


Fig 5.3.6 Steps of CAPA

A thorough and effective CAPA provides a lot of benefits. A few of them are as follows:

1. It eliminates detected conformities
2. It provides a framework for eliminating the cause of a detected non-conformance or other undesirable situation
3. It provides ways to recognize exact steps to be taken when a defect or process issue arises
4. It also helps in determining:
    - Documents or forms need to be completed
    - Who needs to be contacted?
    - Exact procedure to be followed

5.3.5 Common Issues during Food Production

Sometimes the foods that are counted on for good health are contaminated with germs that cause sickness and can even be deadly. More progress is needed to protect people and reduce food borne illnesses. New challenges to food safety will continue to emerge, largely because of:

- Changes in food production and supply, including more imported foods
- Changes in the environment leading to food contamination
- Better detection of multistate outbreaks
- New and emerging bacteria, toxins, and antibiotic resistance
- Changes in consumer preferences and habits
- Changes in the tests that diagnose foodborne illness

Fig 5.3.7 Reasons for Common Issues during Food Production

Some of the common issues during the food production processes are listed below:

Condensation on Pipes and other Equipment	Occurs when humid air contacts cold pipes in a food processing plant and resulting condensation can then drip from the pipes into the food product, causing contamination.
Contamination by Reworked Product	Using product from one product line in another product line (reworking) can cause food contamination.
Contamination During Processing	Caused when food is contaminated during processing such as not having an adequate glass cleanup policy.
Raw Material Contamination	This includes the following: 1. cases in which the raw materials arrive at the facility already contaminated and 2. cases in which the contamination occurs at the food-processing plant.
Inadequate Training of Employees	Can led to a variety of food safety problems. Food processing plants must train new employees on the minimum training requirements.
Equipment that's Hard to Clean	Some equipment is difficult to clean, either because of its own intrinsic design or because of the way it was installed at the food-processing plant.
Insufficient Cooling	It's important to keep food ingredients and products at proper, cool temperatures during processing or storage or risk contaminationThis is especially true of foods that are refrigerated or frozen.
Food Products that are Labeled or Packaged Incorrectly	Products may in some cases (wrongly) be packaged in old packages or placed in the wrong packages. In other cases, a label may not identify the presence of an allergen when it should be labeled.
Failure to Develop a Crisis Management Protocol	The lack of written procedures for how to manage a crisis at the facility, or poor training on how to carry out those procedures, can lead to food safety problems.
Inadequate Equipment Knowledge by Employees	This could be considered part of the poor training category, and it includes employees who don't know how to keep equipment clean and employees who don't know how to prevent routine equipment maintenance tasks (such as lubrication of a machine) from causing food contamination.
Failure to Reconcile Equipment Parts after Repairs	After repair to equipment in a food processing plant, it's important to reconcile equipment parts to make sure they're all accounted for when the repair is complete.

Continued...

Absence of a Protocol for Product Recovery	Not having a product recovery protocol, including no coding, traceability, or recall systems, can lead to food safety problems.
Failure to Perform Preventive Maintenance	When a machine breaks down or performs improperly, that can be a cause of food safety problems. Therefore, it's better for a food processing plant to routinely perform preventive maintenance instead of simply reacting to maintenance problems.
Poor Employee Hygiene	If employees at a food processing facility have poor hygiene, that can cause contamination in the food products.
Inadequate Pest Control	It's essential for a food processing facility to have a comprehensive and detailed pest management policy & program and to ensure it's carried out properly (be sure to document this).
Inadequate Sanitation of Plant and/or Equipment	Poor sanitation may result from poor (or absent) sanitation policies, poor sanitation procedures, and/or poor monitoring and verification that those policies and procedures are being enacted.
Improper Plant Design and Construction	Plant design and construction can have a good or bad effect on food safety within a food processing facility, and some design and construction issues make food safety problems more likely. For example, floors with poor drainage and/or cross-over between the process flows of raw and finished products.
Post-Process Contamination at Manufacturing Plant	In some cases, a finished food product can be contaminated after it's been processed. This can occur between the lethality treatment and packaging or post-packaging.
Dead-Ends in Plumbing Leading to Accumulation of Stagnant Water	Plumbing connections that don't drain into other areas and therefore result in sitting water may harbor contaminants that ultimately create food safety problems.
Using Unpotable Water During Food Processing	It's always important to use fresh, clean, sanitary, potable water for food processing.

Fig 5.3.8 Common Issues during Food Production

5.3.6 Food Safety and Corrective Actions

There are many factors that food processing businesses need to consider when ensuring food safety for consumers. A few of them are listed below:

Fig 5.3.9 Factors for Ensuring Food Safety.

Food product developers often define critical limits to ensure food safety.

Critical limits represent the minimum or maximum acceptable level of a food safety hazard at each Critical Control Point (CCP). Corrective action is taken when the critical limit is exceeded at any step of food production (e.g., delivery, storage, preparation, etc.).

There are two types of corrective action:

- Immediate
- Preventative

Immediate corrective actions are reactive, but preventative actions are proactive.

Examples of immediate corrective actions

An immediate corrective action resolves an existing problem or any deviation from a critical limit. It prevents a food safety breach that is happening at present.

Some examples of immediate corrective actions are:

- A food delivery with bite marks on the packaging (or other signs of pest infestation) being rejected
- Unrefrigerated, perishable food items being transferred into cold storage (5° C or below)
- Food items in the temperature danger zone for more than four hours are being disposed of.
- Food items that show signs of spoilage (e.g., bad smell or slimy skin) are being thrown away.
- An employee being asked to go home if they are experiencing symptoms of illness (e.g., fever, nausea, or diarrhoea)

Examples of preventative actions

A preventative, action prevents a potential problem from happening. It stops a breach from occurring in the future.

Some examples of preventative actions are:

- Broken, cracked, or chipped equipment, dishware, or glassware being repaired.
- Food preparation surfaces (e.g., chopping boards or countertops) with cracks or deep scratches being replaced.
- Change work procedures to improve food safety.
- A food safety supervisor appointed to manage food safety risks in the business

Notes

Unit 5.4 Food Production Process - Record and Documentation

Unit Objectives

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

1. List the information to be recorded in the work process such as product traceability and recall
2. Discuss about product information and consumer awareness, product recall and withdrawal, and traceability

5.4.1 Product Specification

In Quality Management, several documents and certificates related to the purchased products and raw materials are required by the buyers. One of the most important product-related documents is the product specification. This document contains a detailed description of the product, all the requirements related to the production process as well as technical and functional aspects of the product. A product specification document can be released for any kind of product, from the raw materials (raw material specifications) to the machine parts or the packaging goods.

The specification documents are useful at all stages of the production process, on the suppliers and producer sides as well as on the buying company side which can use this document as a quality standard required at the delivery.

In some industries, such as the food industry, the number of protocols and documents required during the production process can quickly skyrocket to guarantee food safety and higher food quality. To meet this goal and standard, the food product and raw material specifications sheets primarily inform about the ingredients of each product and its condition of production.

5.4.2 Product Recall and Traceability

Traceability or product tracing is defined as the ability to follow the movement of a food through specified stage(s) of production, processing, and distribution. Traceability within food control systems is applied as a tool to control food hazards, provide reliable product information, and guarantee product authenticity. Traceability systems should be capable of documenting a product's history and/or locating it in the food chain. The traceability exercise is part of the recall procedure. Traceability has two components:

Tracing : Backward	Tracking : Forward
• Tracing is the ability to reconstruct the history of a product in the food chain and identify the origin, movement patterns, and relevant associated information of a specific unit and/or batch of product located within the supply chain by referencing records held upstream.	• Tracking is the ability to trace the final destination of a product in a food chain and to follow the path of a specified unit and/or batch of product through the supply as it moves from organizations to the final point of the process, point of sale, point of service, or point of consumption.

Fig 5.4.1 Backward and Forward Traceability

In a food traceability exercise, records and documents are prepared for the following areas.

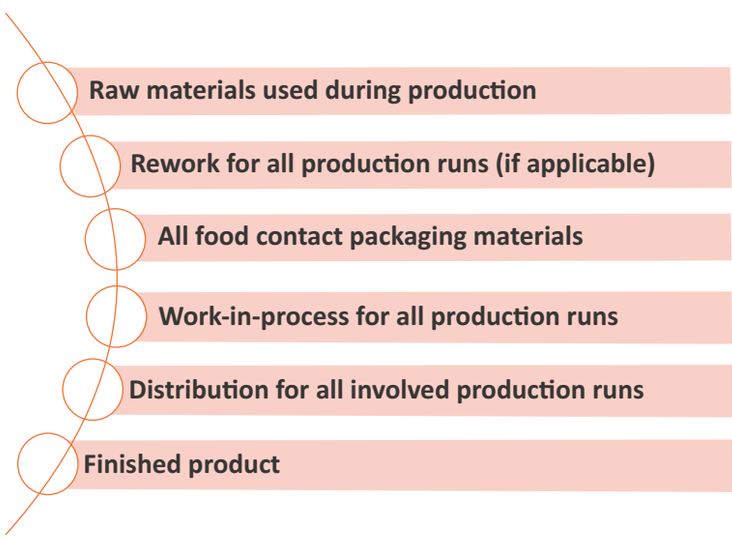


Fig 5.4.2 Document and Record Details for Traceability Exercise

The following figure below demonstrates the steps in the traceability exercise process.

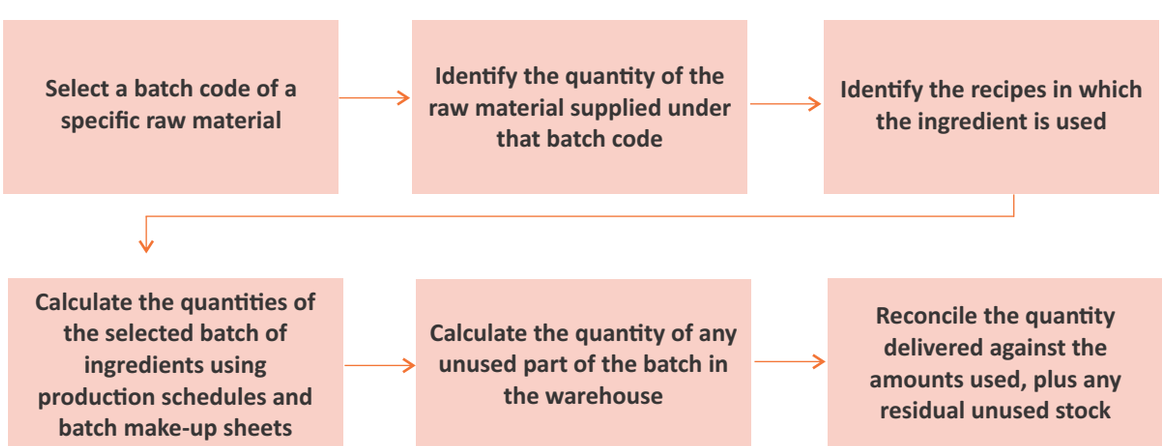


Fig 5.4.3 Traceability Process

Recall or **Product Recall** is defined as the action to remove food from the market at any stage of the food chain, including that possessed by consumers. A food recall is a fundamental tool in the management of risks in response to food safety events and emergencies. Traceability and recalls are essential components of a national food control system.

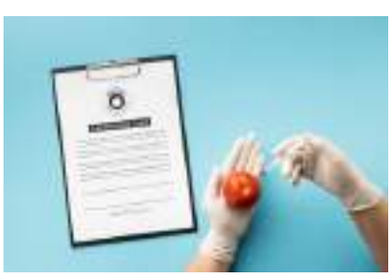
A mock product recall is an internal exercise designed to assess a company's ability to track down and remove unsafe products or ingredients from the market. The following are the goals of food recall:

1. To develop a written recall strategy
2. To conduct a food recall
3. To ensure the effectiveness of the action and to prevent a recurrence.

This is the procedure that an FBO (food business operator) must follow to remove unsafe or illegal products from the market. The goal of a food recall is to direct FBO:

1. Stop delivering and selling the product in question
2. Notify the appropriate regulatory bodies
3. Product removal from the market in a proper and timely manner

The following are the reasons for food recalls in the food industry:



Adulteration

Ambiguous allergy information

Misbranding

Missing Labels

Fig 5.4.4 Reasons for Food Recalls

The scope and benefits of food recall are as follows:

1. Trace a product's journey through the supply chain to evaluate the company's traceability system
2. Check the communication systems (contact information of recall personnel, suppliers, and consumers)
3. Determine and modify aspects of the recall plan that are problematic or difficult
4. Whose quality does not comply with the Act and the Rules and Regulations promulgated thereunder
5. All food businesses regulated by the Food Authority that engage in the wholesale supply, manufacture, or importation of food must have an up-to-date recall plan

The following are included in the Mock Recall Plan and Procedure:

1. Designated recall team
2. Random product for mock recall and traceability exercise
3. Tracking of the products using traceability procedures
4. Reconciling the affected product with current inventory
5. Rapid Recall Exchange to simulate the communication of the event
6. Assessment of mock recall results

The designated recall team includes:

Recall coordinator

- Oversees all activities relating to the recall and manage other team members

Quality assurance specialist

- Identifies the root causes and issues that led to the recall

Communications expert

- Handle public relations (press releases and media statements)

Sales/Customer representatives

- Communicates with consumers

Legal counsel

- Advise on the legal requirements for a recall

Fig 5.4.5 Recall Team

The following figure explains the standard procedure of food recall exercise in the food industry.

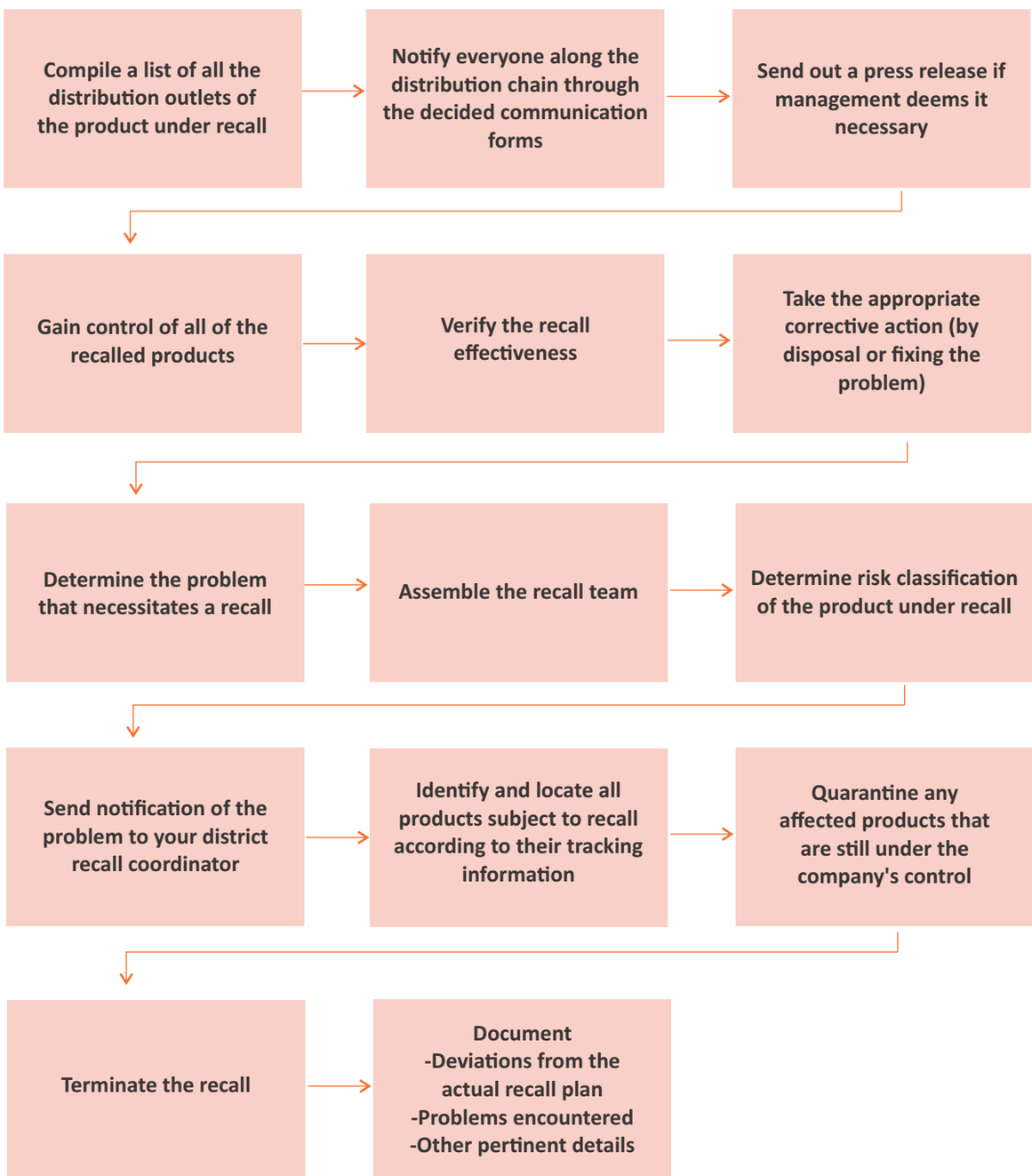


Fig 5.4.6 Standard Process for Food Recall

After the food recall process, it is essential to conduct a proper Key Assessment. The figure below explains the steps to be taken following the food recall exercise.

Key questions to ask after the recall:

- Was the recall team able to convene quickly and reach a decision regarding the recall?
- Was the contact information of all stakeholders (recall team members, suppliers, retailers, consumers) available and up-to-date?
- How difficult was it to:
  - Trace the recalled product?
  - Gather the information necessary to activate the recall?
  - Contact regulatory agencies?
  - Prepare documents for media correspondence (press releases and media statements)?
  - Maintain a log of activities?

Fig 5.4.7 Key Assessment for Recall Process

Notes

Summary

- Types of biological, chemical, and physical hazards present in the food processing industry
- Various types of food contaminations, their causes, and ways to prevent them
- Importance of ensuring that the materials (such as raw materials, processed materials, finished goods, etc.) are adequately isolated to prevent them from contamination
- Various types of allergens and their management at the workplace
- The standard regulations to ensure food safety are listed in 'The Food Safety and Standards Act, 2006' that need to be followed during production.
- The importance of following the standard procedures for ensuring food safety.
- The role of HACCP, VACCP, and TACCP, as well as procedures to implement these in the food industry
- The significance of training the team members regarding various food safety procedures such as GMP, HACCP, etc.
- The procedure to conduct workplace food safety audits
- The procedure of performing root cause analysis and taking corrective and preventive actions against workplace problems
- Corrective measures to be applied to ensure food safety
- Information to be recorded in the work process
- Product information and consumer awareness, product recall and withdrawal, and traceability

Scan the QR Codes to Watch the related Videos

https://www.youtube.com/watch?v=_scyr4DlENA&t=97s
Food Hazard

https://www.youtube.com/watch?v=sbNDnODWTbA
Allergen Contamination

https://www.youtube.com/watch?v=_JrsKqORzDo
Food Intolerance & Allergies

https://www.youtube.com/watch?v=3QuKCYfHHow
Audit and Documentation

https://www.youtube.com/watch?v=w0oA7lRBUf4
Food Alert, Food Traceability and Food Recall

Exercise

I. Answer the following questions:

1. List the types of different hazards in the Food Processing Industry.

2. List down different types of Food Contamination.

3. What are the steps involved in CAPA?

4. What are the symptoms of Allergen?

5. Write down the key steps for an organization to follow while developing TACCP.

6. What is backward traceability?

7. Explain the food recall process.

8. List the steps for traceability exercise.

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National
Skill Development
Corporation
Transforming the skill landscape

FICSI
Food Industry Capacity and Skill Initiative

6. Ensure Workplace Health and Safety

FIC/N9903

Key Learning Outcomes

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

1. Recognize the types of hazards, risks as well as accidents
2. Categorize the standard precautions and practices
3. Examine the utilization of the electrical equipment
4. Explore the usage of personal protective equipment
5. Recognize the organizational protocols
6. Monitor the ways to handle the toxics
7. Identify fire prevention and fire extinguisher
8. Evaluate CPR as well as the artificial respiration
9. Discuss the evacuation and rescue
10. Catalogue the first aids
11. Understand the ill health as well as potential injuries
12. Demonstrate the precautions in mobility
13. Discuss the significance of various types of hazard and safety signs

UNIT 6.1: Hazard, Risk and Accidents

Unit Objectives

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

1. Identify the types of hazards, risks as well as accidents

6.1.1 Types of hazards, risks and accidents

Hazard is considered a sort of incident or source that can fundamentally harm something, whether in a living or non-living state. It states to be significant to identify the hazard and the amount of risk or impact it would create on its surroundings. Thus, an individual must be prepared from the initial stages to manage such occurrences.

It is important to control workplace hazards by eliminating and identifying the capable risks. This is required as it is capable of causing accidents or hazards, along with finding the access based on the ways to isolate the risk which can lead to the hazard.

To ensure the safety of an individual and the workplace surrounding, an individual requires to regularly participating in the safety drill, which is conducted at their specific times.

Types of Hazards:

- **Safety Hazard:** A safety hazard is among the most common dangers found in every workplace. A safety hazard is capable of causing specific serious injuries or damage to the industrial workers. The safety hazards perform a practical part on the employees who have regularly contacted the heavy equipment or machinery throughout their working hours.

  Some of the safety hazards which lead to accidents in the workplace tend to include:

  - Anything capable of causing a fall, such as floor holes or opening walls, slippery surfaces, unprotected edges, and ladders which is unsafely situated.
  - Heavy-duty mechanisms, which is seen to be usually present in every industry, such as construction, manufacturing, mining and so on, can sometimes be the cause behind the accident. It is due to loose machinery parts, sharp edges, hot surfaces causing severe cuts, burns and wounds.
- **Chemical Hazards:** Chemical substances are seen to include but are also not restricted to acidic substances, petroleum products, reagents, acids, flammable liquids and many more.
  - Acidic substances are firmly alkaline in their state as they tend to possess properties to damage the accidental arrival in contact with the other substances by forming a chemical reaction.
  - The petroleum products generate gasoline such as Butane, Propane, Kerosene, and LPG as they are incredibly flammable hazards and can damage on a larger scale.
  - Acids occur to be more hazardous, relying on their corrosive materials. The common acid includes Hydrochloric Acid, Sulphuric Acid, and Nitric Acid.
- **Biological Hazards:** Biological hazard is also known as the biohazard and is connected to the biological substances that lead to sickness and illness in humans during its occurrence in direct contact.

  Sources through which the biological hazard might include are:

  - Bacteria, viruses, insects, plants and humans are capable of being the hazard carrier that adversely impacts their health, causing skin irritation and can also lead to serious infections, like Tuberculosis, AIDS, and carcinogenic infection.

- Toxins from biological sources stand to be extensively poisonous in their state as they are manufactured by harmful animals and plants, such as snake venom toxins and botulinum toxins.
- The most recent example of the biological hazard is the outbreak of Covid-19.

- **Physical Hazard:** A physical hazard is the least common hazard at the workplace and is not limited only to physical presence. Extreme weather conditions or unfavourable working environments are the major causes of physical hazards.

  Physical hazard has a prolonging effect on the health of the workers. These types of hazards are generally unrecognizable, like:

  - The temperature can also be a cause of danger for the workers who attempt to work indoor as well as outdoors, having the factors such as overexposure to heat and cold leading to some serious illness like heat stroke, sweaty palm increasing the risk of accident, frostbit hypothermia which can eventually lead to death also.

Fig. 6.1.1: Examples of physical, Chemical, Biological hazards

  - Harmful radiation like micro-waves, radio-waves, electro-magnetic waves, and so on.

- **Ergonomic Hazard:** An ergonomic hazard is a type of hazard that adversely affects the workers' physical health, having continuous work leading to lower back pain, joint pains, muscles ache, and ligaments pain.

  Ergonomic hazards may include:

  - Poor sitting or standing postures.
  - Improperly adjusted chairs and workstation height.
  - Too much vibration or loud noise in the workplace.
  - Frequent lifting of heavyweights.
  - Prolong working conditions demanding physical force

- **Work Organization Hazard:** Work organization hazard usually defines the issues related to the workplace such as;
  - Excessive workload
  - Inappropriate behaviour of peers
  - Bullying
  - Lack of mental support
  - Work-related stress

Fig. 6.1.2: Sources of different types of hazards

6.1.2 Hazard Identification and Risk assessment

Risk Assessment (RA) and environment review (ER) were done for hazard and environmental impact. It is done from different stages, from evaluating a new operation, modification to the existing facilities, maintenance work and others.

RA identify all safety and health hazards – Including Operational, mechanical, electrical, chemical, biological and ergonomic for ER indicate the environmental aspects and impacts taken into consideration.

Review and update of R.A and ER to be done under following circumstances: -

- Amendments/addition in legal, corporate and other voluntary requirements.
- Change in process or product handled or new developments/ modifications in activities/ products/ services.
- Occurrence of the accident, emergency
- While initiating any corrective and preventive actions
- While purchasing and erecting any new equipment/ machinery/ building

UNIT 6.2: Standard Practices and Precautions

Unit Objectives

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

1. Categorize the standard precautions and practices

6.2.2 Standard Practices and Precautions

- Hand hygiene- Physical, Chemical or Biological hazard
- Usage of personal protective equipment- Safety hazard
- Respiratory hygiene/ Cough Etiquette- Biological hazard
- Sharp Safety- Safety hazard
- Safe injection practices- Biological or Physical hazard
- Sterile instruments and Devices- Biological or Physical hazard
- Avoiding ergonomic hazard

- **Hand hygiene:** Washing hands regularly is a significant step towards cleanliness, protecting us from various diseases and infections. Washing hands can keep us healthy well as it protects us from viruses capable of travelling from one person to another person. Germs and bacteria are the only host which comes from touching the nose, eyes with dirty hands, or eating/cooking food with smeary hands.
- **Usage of Personal Protective Equipment**
  - Personal protective equipment, or PPE, protects its user against any physical harm or hazards that the workplace environment may present. It is important because it exists as a preventative measure for industries that are known to be more hazardous, like manufacturing and mining. Some of the personal protective equipment are: gloves, masks and eyewear.
- **Respiratory Hygiene / Cough Etiquette:** One should follow the below guidelines to maintain respiratory hygiene.
  - Covering the mouth and nose with a cloth or elbow while coughing or sneezing.
  - Throw the used tissues in a separate bin.
  - Washing of the hands or sanitizing before touching the nose or mouth
- **Sharp Safety:** Sharp objects such as needles, lancets, and surgical knives must be handled with utmost care to prevent injury or spread of infection.
- **Avoiding ergonomic hazard:** Headsets, monitor stands, and adjustable chairs are just some devices that can be easily integrated into a workspace to diminish the risk of injury from repetitive motions. Awkward locating refers to positions in the body when a person deviates significantly from a neutral position while performing tasks.

UNIT 6.3: Uses of Electrical Equipment

Unit Objectives

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

1. Examine the utilization of the electrical equipment

6.3.1 The Utilization of the Electrical Equipment

Electrical equipment is generally that equipment that requires electrical supplies for their operations. It generally consists of several small components in an enclosed form and is controlled by a power switch. It tends to include:

- Electric switchboard
- Distribution board
- Circuit breakers and disconnects
- Electricity meter
- Transformer

Fig. 6.3.1: Different type of electrical equipment's

Hazards Related to Electrical Equipment's

The five hazards described here are very common and easily preventable.

- Working on live circuits
- Skipping Lockout/Tagout. It is also known as LOTO, which disconnects electricity and avoids electrical hazards.
- Forgetting PPE.
- Improper grounding.
- Damaged extension cords.

Fig. 6.3.2: Electrical hazard symbols

UNIT 6.4: Usage of Personal Protective Equipment

Unit Objectives

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

1. Explore the usage of personal protective equipment

6.4.1 The Usage of Personal Protective Equipment

Personal protective equipment is majorly used to protect oneself from serious accidents or illnesses originating from the workplace's physical, biological, chemical, and mechanical hazards.

Personal protective equipment includes:

Fig. 6.4.1: The usage of personal protective equipment

Importance of PPE in Food Industry

Protective Clothing Reduces Injury and Contamination Risks. In the food manufacturing units, workers are at a surprising risk of exposure to harsh and toxic chemicals, which can cause further contamination of the food product. Also, PPE importance can be identified during working at height to avoid slip, trip and fall.

UNIT 6.5: Organisational Protocols

Unit Objectives

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

1. Recognizing the organizational protocols

6.5.1 The Organizational Protocols

Accidents are unplanned experiences resulting in injuries, illness, death, and loss of property and/or production. While there is no way to avoid accidents, some actions, plans, and preparations are capable of being taken to diminish them.

Knowledge of the Hazards

- Be aware of the environment. Look around and recognize workplace risks that are capable of causing harm.
- Look for manners to diminish or eliminate hazards and implement them.
- Report unsafe areas or practices.
- Dress for the weather.
- Use the EHS (Environmental Health & Safety) Job Hazard Analysis devices to recognize hazards linked with job sorts.

Originate a Safe Work Sector

- Keep an orderly job place. Poor housekeeping is capable of causing safety hazards and serious health. The workplace's layout requires to have accurate egress routes as well as be debris' free.
- Take breaks as well as mobilize around regularly all through the day. Short breaks (moving around and standing up) can make a big distinction in combating the threats of residing in a static position all day long.
- Pay attention to workstation ergonomics.

Use Safe Lifting Techniques

- Follow the following safe lifting practices:
    - Lift from a position of power
    - Keep the load close
    - Use a staggered stance
    - Cable/Rope/Slings in good repair
    - Hoist chain/Rope free of kinks and twist
    - Hooks not deformed or damaged and safety latches intact
    - Display of testing date, capacity and safe working load
    - Do not attempt to twist while lifting
- Training in body mechanics can reduce strain injuries and keep employees safe during moving and lifting.
- Regular Interaction
    - Notify supervisors regarding the safety hazards
    - Speaking up as well as being included in safety strategizing.
    - Constantly cultivate a safety level
- Training as well as Education
    - Make sure for everyone who possesses the appropriate safety training linking to the job's

threats.

- Take benefit of Environmental Safety and Health online training events.
- Each employee's responsibility is to take an active role in maintaining safety.

Emergency Preparedness Plan

Nowadays, many organizations, including the food industry, also implement their emergency preparedness plan, which includes hazards identified during their past years of operation; possible weather or climatic condition; spillages during operational activities, etc. Hazards can be classified as low, moderate and significant impact on the organization based on the geolocation of the unit.

Incident Reporting and Investigation

Incident

It is an event that causes damage to equipment material or other property. It may or may not be accompanied by human injury. It can be categorized as: -

- **No Injury Incident / Dangerous Occurrences**

  Fire– An incident in which a fire broke out which has the potential of causing burn injury to humans or damage to property.

  Near Miss– An incident that has the potential for causing an injury to humans or damage to property but narrowly escapes
- **Industrial / Injury incident:** An incident is a sudden and unforeseen event, attributable to any cause, which happens to the person, arising out of or in this course of his or her work and resulting in an employment injury to that person.
- **Major Incident** An incident results in a human fatality, permanent disability or extensive loss of equipment or materials.
- **Lost Time Incident**- Human injury incident prevents the person from doing his work for more than 48 Hrs.
- **Minor Incident–** An incident that causes minor injury to a human which may prevent him from undertaking his work up to 48 Hrs.
- **First Aid Case–** An injury incident that requires a person to go to a dispensary for a one-time treatment and/or any follow-up visit for observation of minor scratches, cuts, burn, splinters or other minor industrial injuries which do not ordinarily require medical care.
- **Unsafe Act:** The violation of a commonly accepted safe procedure or practice which resulted in the incident or was against the safety guidelines. Examples are operating without authority, operating at an unsafe speed, making safety devices inoperative, posture or unsafe position, failure to use personal protective equipment. Etc
- **Unsafe condition:** The condition which has the potential to cause injury/harm & damage to property material/ environment or process, improper guarding, defective tools/ equipment, hazardous arrangement or process, Improper ventilation, high temperature/dust Noise.

Incident Investigation

- Persons investigating any incident should collect all information, evidence regarding the situation under which the incident; this shall also include the condition of the persons, physical and mental conditions.
- The investigation should be based on fact-finding, and immediate causes of incidents are listed in two groups (Unsafe Condition and Unsafe Act). The investigating team shall find out and note down. The investigation team shall attempt to list all unsafe conditions and all unsafe behaviours on personnel.

UNIT 6.6: Dealing with Toxics

Unit Objectives

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

1. Monitor the ways to handle the toxics

6.6.1 The Ways to Handle the Toxics

Toxics are chemical substances that can cause serious harm to the person if he/she comes directly in its contact. One should be extra careful while handling such substances and an organisation must have clear labelling, separate storage rooms and proper guidelines for its usage.

- **Exposure hazards:**
  - **Contact or Absorption:** It can cause when a person comes in direct contact with toxic substances. It can result in drying or defatting of skin, skin irritation, or redness.
  - **Inhalation** occurs when a person inhales the fumes or vapour of toxic substances. It can cause shortness of breath, sore throat, coughing, an effect on the nervous system, and irritation during the breath.
  - **Ingestion:** It occurs when people accidentally consume toxic material. It can result in diarrhoea, vomiting, indigestion, effect on the functioning of the liver and kidney.

- **Storage requirement:**
  - Toxic substances must be stored in designated storage compartments only.
  - It should be stored under the optimum condition as prescribed. Always take the material in desired quantity and never put the used or remaining material in the original container.
  - One should always look for an alternative before using the toxic agent.
  - Only authorised
  - Personnel should be given access to the storage compartment.

- **Labelling requirement:**
  - Toxic substances or materials should be labelled in clear and readable format and proper usage instructions.
  - Work areas should be labelled properly where toxic substances are used regularly or excessively.
  - Always label the emergency contact number near the storage and the work area.

- **Spill and accident procedures:**
  - In case of a spill or accident, immediately alert the people in that area and inform the supervisors.
  - Evacuate the area and seize the entry.
  - Inform the relevant authority in case of leakage or spillage in larger quantities.
  - The trained professional of designated staff should only perform cleaning of toxic spillage.
  - Usage of absorbent while cleaning the corrosive or other harmful liquid.
  - Usage of neutralizing agent while cleaning the acidic, toxic substances.
  - Never touch the toxic substance with naked hands.

- **Waste management:**
  - Toxic waste must be segregated separately in accordance with its nature.
  - It should be managed separately from other wastes.
  - Flammable chemicals, acids should be disposed of carefully and separately in order to prevent any type of accident or injury.
  - Never dispose of the toxic substance in an open area.
  - It should always be disposed of in a leak-proof and airtight container.

Fig. 6.6.1: Waste disposal process for a different type of waste

UNIT 6.7: Fire Prevention and Fire Extinguishers

Unit Objectives

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

1. Identify fire prevention and fire extinguisher

6.7.1 Fire Prevention and Fire Extinguisher

Prevention from fire is necessary to avoid excessive damage. Their major goal remains to educate the workers on the ways to prevent the environment from fire.

To prevent the workplace from fire, we must enforce the following measures:

- Workers should be highly trained for the mock drill.
- No smoking signs around the highly flammable liquid and gases.

Causes of fire

- **Flammable and combustible liquids:** This requires proper storage and handling in order to prevent the occurrence of fire which must be stored under a well labelled and closed container to avoid any accident.
- **Liquified Petroleum Gases:** LPG gas has a low density and is heavier than air. It usually accumulates in low lying areas so that the workers are warned if they tend to find any leakage or hole in the cylinders. Moreover, they must not use fire; instead of that, they are capable of utilizing soapy water and finding out the bubbles.

Prevention of the Casualties from Fire

- **Fire Alarm Devices:** These are the devices used to warn people during fire and smoke or any other types of fire emergencies. These alarms are automatically activated once smoke and heat are detected. It should be installed on the telephone desk and the employer's entrance in order to evacuate promptly.
- **Fire Extinguisher:** It is a lifesaver device that is used to control small fires as well as in emergency situations. It should not be used in indented fire issues if it is reached to the walls, ceiling or where there is no route for escape.

  Placement of fire extinguishers at workplace or organization must include.

  - The fire extinguisher should always be placed or mounted on a wall and should be properly marked.
  - Employees should be well trained with PASS methods or firefighting.
  - The fire extinguisher should always be kept at the ease of location to all employees.
  - Vehicles should also carry out one ABC rated extinguisher in case of emergency.
  - All extinguishers should be well marked and labelled and should be clearly visible.
  - All extinguishers should be inspected on a monthly basis, and their place it has not tampered with.
  - For the point of safety, all extinguishers should be examined yearly or required to be refilled in order to ensure operability.
  - A tag should also be attached to ensure its maintenance or refilling date and the signature of the authorized person.

- **Fire Extinguisher Classes:** There are four types/classes of fire extinguishers, which are most common, i.e., A, B, C and D, where every class is capable of putting out a varied sort of fire.
  - Class A extinguishers would be capable of putting out fires in ordinary combustibles such as wood and paper.
  - Class B extinguishers are utilized for flammable liquids like grease, gasoline and oil.
  - Class C extinguishers are used only for electrically energized fires.
  - Class D extinguishers are used on flammable metals.

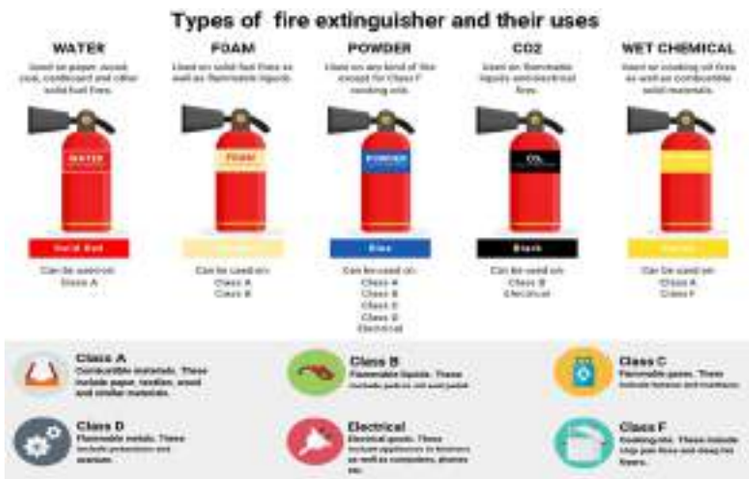

Fig. 6.7.1: Types of fire extinguishers

Uses of Fire Extinguishers

Once it is installed in the workplace or industry, it is important for every employee to get familiar with the usage and the direction of fire extinguishers so as to be well prepared for the sudden occurrence of any hazardous incidents and accidents. Fire extinguishers are relatively easy to use in case of small fires by using some simple technique called PASS.

Fig. 6.7.2: Pass technique for Fire Extinguisher use

Fire Hydrant/ Fire Hydrant Pump

Fire hydrant consists of a system of pipework connected directly to the water supply mainly to water to every hydrant outlet as well as is attempted to present water for the firemen in order to fight a fire. The water is seen to be discharged into the fire engine, from which it is then pumped and sprayed over the fire. Where the water supply is not inadequate or reliable, hydrant pumps requires to be presented to pressurize the mains of the fire.

UNIT 6.8: Artificial Respiration and CPR

Unit Objectives

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

1. Evaluate CPR as well as the artificial respiration

6.8.1 CPR As Well As the Artificial Respiration

Artificial respiration and CPR is an act (or) technique used for stimulating respiration when there is a sudden stoppage of breathing or lung functioning.

Techniques used to provide artificial respiration are:

- Mouth-to-mouth breathing
- Prone-pressure method
- Cardiopulmonary resuscitation (CPR) or external chest compression

There are two types of ways to provide Artificial respiration. They are:

- Manual and,
- Mechanical

Manual ways consist of:

- Mouth-to-mouth breathing
- Prone Pressure Method
- Back Pressure Arm-Lift

Mouth-To-Mouth Breathing

The steps to perform in this specific process are:

		
Position your hand	Interlock fingers	Give chest compressions

		
Open the airway	Give rescue breaths	Watch chest fall
		
Repeat chest compressions and rescue breaths		

Table 6.8.1: CPR steps

Prone Pressure Method

This method, additionally known as the Schafer method, stands to be a type of artificial respiration which is used for a patient in case of drowning. In this, the patient is placed in a prone or placed in a face-down position allowing rhythmically pressure with the help of hand on the thorax by means of which the water present would get expelled from the lungs allowing air to enter by clearing the passage in order to breath.

Back Pressure Arm-Lift

This particular method is used as an alternative when other methods are not possible or are not working out.

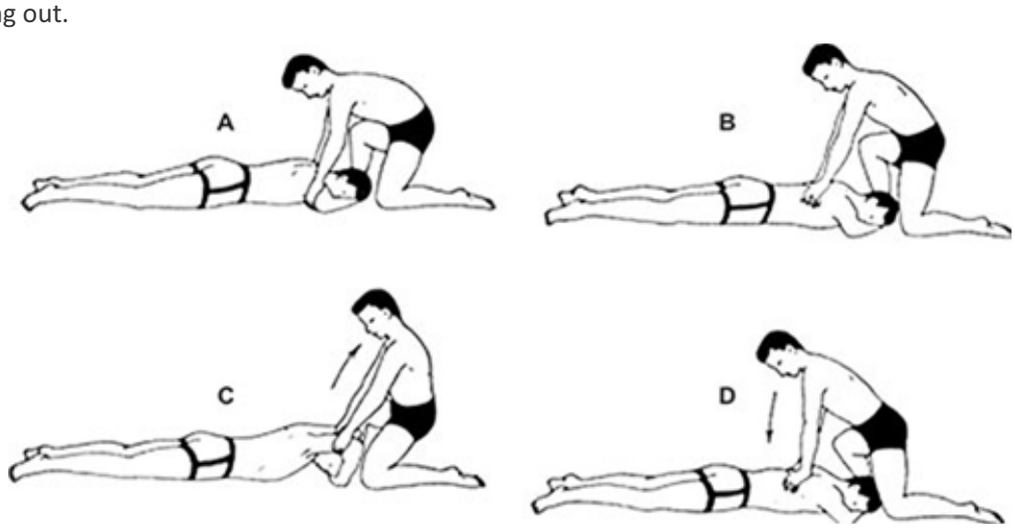

Fig. 6.8.1: Back Pressure Arm-Lift

A Mechanical Method of Artificial Respiration

These types of artificial respiration methods are generally performed by highly trained professionals such as a doctor, nurses, and paramedic forces. The mechanical method often uses machine-like ventilators. Another device that is used in the mechanical method is a bag valve mask. It has the self-inflate and deflates mechanism as well as has an air supply that is controlled by the valve.

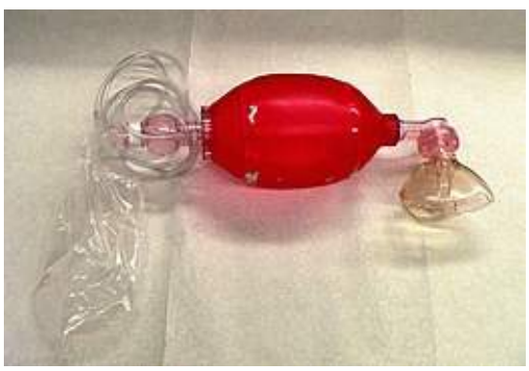

Fig. 6.8.2: Big Valve mask

Fig. 6.8.3: Ventilator

UNIT 6.9: Rescue and Evacuation In Case Of Fire

Unit Objectives

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

1. Discuss the evacuation and rescue during a fire incident

6.9.1 The Evacuation and Rescue during a Fire Incident

A "Fire Emergency Evacuation Plan (FEEP)" stands a scripted document that involves the activity to be adapted by all staff in the event of a fire and the sequences for calling the fire brigade.

Staff Fire Notice High fire threats or extensive premises that would be required a more illustrated emergency evacuation strategy which takes account of the findings of the assessment of fire risk, e.g. the staff importantly at threat and their spots. In addition, notices providing transparent and concise routine's instructions to be followed in the instance of fire that requires to be appropriately showcased.

In some instances, the inidviduals requires to be nominated inidviduals in order to conducr the fire action plan as well as provide them enough training in firefighting as well as procedures for evacuation. The following items require to be taken into consideration where appropriate:

Fig. 6.9.1: Staff Fire Notice

Fire Evacuation Plan

You require taking into consideration of how you would tend to arrange the premises' evacuation in the light of your risk evaluation as well as the other fire precautions that the individuals possesses or intended to put in spot.

Simultaneous Evacuation

In most premises, the evacuation in the instance of fire would easily be by means of each one responsing to the warning signal given when a fire is discovered, then making their way, by regards of escape, to a spot of safety away from the boundaries. This is referred as a simultaneous evacuation and would generally be initiated by the sounding of the normal alarm over the system of fire warning.

Vertical Phased Evacuation

In certain larger complex premises, the emergency arrangements are designed to allow people who are not at immediate risk from fire to delay initiating their evacuation. It might be accurate to start the evacuation by initially performing the evacuation by only the sector closest to the fire as well as warning other individuals to stand by. This is generally done by suddenly evacuating the floor where the fire is spotted as well as the floor located above. The other floors are then evacuated among the individuals to neglect congestion on the escape paths. The rest of the indivdiuals are then evacuated if it is important to do so. The fire warning system requires to be capable of providing two distinctly different signals (warning and evacuation) or giving accurate voice messages. Horizontal phased evacuation in hospitals as well as care homes: the floor may be divided into a number of fires resisting compartments, and the occupants are moved from the compartment involved in the fire to the adjacent compartment as well as, if required, moved again. Depending on the fire situation, it might eventually be significant to take into consideration vertical evacuation.

Other Fire Precautions

- systems of voice alarm
- fire control points
- compartmentation of the premises using fire-resisting construction
- sprinklers in buildings where the top floor is 30 meters or more above ground standards

Staff Alarm Evacuation (Silent Alarm)

In certain instances, it might not be accurate for a normal alarm to start immediate evacuation (Cinemas and Theatres). This could be as of the number of members of the public provided and the requirement for the staff in order to put pre-arranged strategies for the safe evacuation of the premises into action. In the mentioned situations, a staff alarm is capable of being provided (by fire records, personal pagers, discreet sounders, or a coded phrase on a public address system etc.). Following the staff alarm, a more normal alarm signal is capable of being provided, as well as a phased or simultaneous evacuation initiated. The general alarm might be activated automatically if manual initiation has not taken place within a pre-determined time.

Defend in Place

This strategy might be taken into consideration in blocks of flats where each flat is a minimum 60-minute fire-resisting compartment. It might additionally be considered in hospitals or nursing homes where patients are connected to life-supporting equipment as well as is not capable of being moved. The concept authorises the occupants to stay put as well as authorise the fire facility to extinguish the fire. If the fire spreads as well as it is not capable of being controlled, then they would tend to initiate an entire evacuation. In the instance of patients connected to life-supporting equipment, a decision has to be made which choice stands to be the best, stay or move; in either manner, the patient would be at grave threat.

You should only strategise in order to utilise defend-in-place, phased evacuation schemes or a alarm system for the staff if the individuals have sought the suggestion of a competent individual as well as the fire and rescue service.

Action on Hearing the Fire Alarm

On discovering a fire, it is the duty of every person to sound the nearest fire alarm immediately. The plan should include the method of raising the alarm in the case of fire.

People, on hearing the alarm, should proceed to pre-determined positions to assist members of the public and staff in leaving the building by the nearest safe route.

Lifts and escalators should not be used due to possible electrical failure unless they are part of a Personal Emergency Evacuation Plan.

Calling the fire brigade

The Fire Service should also be informed to combat from fire.

Power/Process Isolation

Close Down Procedure – Adopt your own 'Close Down' procedure as appropriate.

Fig. 6.9.2: Fire evacuation process

UNIT 6.10: First Aid

Unit Objectives

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

1. Cataloguing the first aids

6.10.1 First Aids

First aid, as the name suggests, stands to be the first and immediate care or assistance provided to the person in case of either minor, serious injury or illness. First-aid provided on time can save the life in case of life and death kind of situation as well as additionally assists to control the condition from worsening further.

First aid is often controlled by the 3 P's principle:

- Prevent further injury
- Preserve life
- Promote recovery

It is necessary that each floor or manager should have the first aid box handy with them and can be easily accessed by the employees in case of emergency or need.

Fig. 6.10.1: First Aid Kit

UNIT 6.11: Potential Injuries and Ill Health

Unit Objectives

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

1. Understanding the ill health as well as potential injuries

6.11.1 The Ill Health As Well As Potential Injuries

The major role of work is based on enhancing self-esteem, wellbeing and social mobility. However, work-related accidents or illnesses can impact the employees' health in longer or shorter terms and may result in economic as well as social repercussions for the employer.

It is mandatory for an employer to have precautionary measures in place to avoid such incidents. A few common work-related injuries and illnesses are:

- **Slips, trips and falls:** One of the most common causes of injury are slippery surface, fall from ladder or height. It can be avoided through a safety grill or safety bars.
- **Muscle strains:** Muscle strain occurs at the workplace due to lifting heavy items regularly and long-standing or sitting hours. This can be prevented easily through exercise, training and guidance.
- **Being hit by falling objects:** Employees working in warehouses often encounter injuries caused by fall-ing objects. It can be controlled by providing adequate storage and encouraging staff to store the item safely.
- **Cuts and lacerations:** It generally occurs by inappropriately handling sharp objects and is capable of being controlled by delivering the proper training to the staff, wearing proper protection and providing safety equipment to the workers.
- **Inhaling toxic fumes:** Workers who are dealing with chemicals are more likely to become a victim of an injury caused by toxic materials like inhaling dangerous gases or fumes. It is mandatory for the em-ployer to provide adequate safety gear to its worker who regularly meets such kinds of substances.
- **Crashes and collisions:** It can happen in warehouses and construction sites due to vehicle movement, and prevention can be done through necessary safety measures such as PPE, sufficient light, safety alert etc.
- **Exposure to loud noise:** Industrial deafness can occur to employees working in loud noise areas, and it can be avoided by wearing earplugs or earmuffs.
- **Fights at work:** Disagreement or tension may lead to fighting at work. It is a must to have an employee grievance department in order to deal with such cases.

UNIT 6.12: Precautions in Mobility

Unit Objectives

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

1. Demonstration of the precautions in mobility

6.12.1 The Precautions in Mobility

For the safety of the workers or employees at the workplace or any industry, one should always take the necessary precautions.

All manufacturing owners need to comply with the legal requirements to order to ensure that their industry and workplace is safe to work for everyone, from the customers to employees, suppliers, visitors, contractors and others.

In order to provide better productivity for a workplace, the management of the organization:

- Should minimize illness and injury of employees.
- Should reduce the risk of accidents.
- Should maximize productivity.
- Should reduce the cost of injuries and workers compensation.
- Should meet their legal requirements and responsibilities.
- Should retain their staff for better performance.

Precautions at the workplace may include.

- Keep every corner organised, clean and clutter-free
- Usage of mats on slippery floors
- Properly stored combustible material
- Ensure proper training while handling equipment and machinery

It is very important to have medical facilities and proper first aid for the employees working with heavy equipment and machinery.

1. **Clothes for each different appropriate task:** The people who are working with tools or with machinery must have proper clothing while operating the machinery. They must wear the right size of gloves according to the type of work and must wear safety shoes as well as all protective equipment while handling the tools, machinery and chemicals.

   Different industries have different types of personal protective equipment based on their mode of work. Those are:

   - **The food processing industry:** In this particular industry, they do not require special types of uniforms unless they require antibacterial head caps, clothing or aprons in order to prevent bacterial contamination.

2. **Implementation of emergency procedures:** This procedure usually contains emergencies that do not announce themselves, and there can be the expectation of fire and accidents. For this, there is a need to be prepared beforehand for such emergencies in order to ensure the safety of the employees, workers, visitors as well for business.

3. **Reduce workplace stress:** The common cause of stress during work is working for long hours, insecurity of job and conflicts between employees, which can sometimes lead to depression, difficulties during work and affects the concentration of the employees. Employers must avoid excessive workload on their employees as it may lead to employee's frustration which will provide a direct impact on employee productivity.

In order to promote a healthy and stress-free environment at the workplace, it is the employers' duty to take care of both the physical and emotional well-being of its employees by conducting regular training on time management, outdoor activities, small group discussion and many more.

UNIT 6.13: Significance of various types of hazard and safety signs

Unit Objectives

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

1. Understanding the impact of various types of hazard and safety signs

6.13.1 The Impact of Various Types of Hazard and Safety Signs

Safety Hazard Significance

A hazard is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural in origin.

Safety hazards are number one on the list of 6 types of workplace hazards. These hazards play an effect on employees who work directly with machinery or on construction sites. Safety hazards are the most common workplace risks. They include:

- Anything that can cause spills or trips such as cords running across the floor or ice
- Anything that can cause falls, such as working from heights, including ladders, scaffolds, roofs, or any elevated work area.
- Unguarded and moving machinery parts that a worker can accidentally touch.
- Electrical hazards like frayed cords, missing ground pins, and improper wiring
- Confined spaces.

Safety Hazards Symbol

Safety symbols, hazard symbols or safety labels are meaningful and recognizable graphical symbols that warn of or identify hazards associated with the location or item.

Fig. 6.13.1: Role of hazard in Risk assessment

Chemical Hazard Significance

A chemical hazard is a (non-biological) substance that has the potential to cause harm to life or health. Chemicals are widely used in the home and in many other places.[1] Exposure to chemicals can cause acute or long-term detrimental health effects. In the workplace, exposure to chemical hazards is a type of occupational hazard. The use of personal protective equipment (PPE) may substantially reduce the risk of damage from contact with hazardous materials.

Chemical Hazards Symbol

Hazard pictographs are a type of labelling system that alerts people at a glance that there are hazardous chemicals present. The symbols help identify whether the chemicals that are going to be in use may potentially cause physical harm or harm to the environment.

These pictographs are also subdivided into classes and categories for each classification. The assignment for each chemical depends on its type and severity.

Fig. 6.13.2: Chemical hazard safety signs

Biological Hazard Significance

Biological health hazards include bacteria, viruses, parasites and moulds or fungi. They can pose a threat to human health when they are inhaled, eaten or come in contact with skin.

Fig. 6.13.3: Biological hazard safety signs

Biological Hazards Symbol

The biohazard symbol is used or displayed only to signify the actual or potential presence of a biological hazard. Appropriate wording may be used in association with the symbol to indicate the nature or identity of the hazard, the name of the individual responsible for its control, precautionary information, etc., but never should this information be superimposed on the symbol.

Ergonomic Hazard Significance

Poor ergonomics contributes to muscle strain, muscle imbalances, and fatigue. Many muscle strains result from performing the same motion over and over again. These become repetitive stress injuries, which are some of the most common workplace injuries.

Ergonomics alone won't eliminate this type of injury. However, proper ergonomics will significantly reduce fatigue and strain.

Ergonomic Hazard Symptoms

Signs and symptoms of ergonomic injuries include pain which may be dull and aching, sharp and stabbing or a burning sensation—tingling or numbness; swelling, inflammation, stiffness. Muscle weakness or discomfort; extremities are turning white or cold.

Work Organization Hazard Significance

A few examples of work organization hazards and it is effective they are defined below.

- Falls and Falling Objects- It can result in serious injury or fatality
- Fire Hazards- It can result in loss, serious injury or fatality
- Electrical Hazards- It can result in loss, serious injury or fatality

Work Organization Hazard Symbol

There are multiple signs or symbols used in an organization to alert the people in their workstations.

Fig. 6.13.4: Work organization related hazard safety signs

Summary

- Hazard can be identified as an extended-term as it is capable of causing severe disruption to the environment or surroundings.
- Risk Assessment (RA) and environment review (ER) were done for hazard and environmental impact. It is done from different stages, from evaluating a new operation, modification to the existing facilities, maintenance work and others.
- Electrical equipment is generally that equipment that requires electrical supplies for their operations.
- Personal protective equipment is majorly used to protect oneself from serious accidents or illnesses originating from the workplace's physical, biological, chemical, and mechanical hazards.
- Accidents are unplanned experiences resulting in injuries, illness, death, and loss of property and/or production. While there is no way to avoid accidents, some actions, plans, and preparations are capable of being taken to diminish them.
- The "Occupational Safety and Health Administration (OSHA)" needs to implement the organization with a fire prevention event in order to prevent injuries and accidents from the occurrence of fire in the workplace. Prevention from fire is necessary to avoid excessive damage.
- Fire hydrant consists of a system of pipework connected directly to the water supply mainly to water to every hydrant outlet as well as is attempted to present water for the firemen in order to fight a fire. The water is seen to be discharged into the fire engine, from which it is then pumped and sprayed over the fire.
- Artificial respiration and CPR is an act (or) technique used for stimulating respiration when there is a sudden stoppage of breathing or lung functioning. It requires metabolic processes to exchange the gases which tend to be present in the body by external or pulmonary ventilation.
- Fire drills can be initiated with a defined frequency in a surprising manner to ensure employees are well aware of the fire evacuation process. Attendance can be taken in assembly points, and briefing also can be arranged to further train the staff.
- First aid, as the name suggests, stands to be the first and immediate care or assistance provided to the person in case of either minor, serious injury or illness. First-aid provided on time can save the life in case of life and death kind of situation as well as additionally assists to control the condition from worsening further.
- The major role of work is based on enhancing self-esteem, wellbeing and social mobility. However, work-related accidents or illnesses can impact the employees' health in longer or shorter terms and may result in economic as well as social repercussions for the employer.
- A hazard is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural in origin.
- Poor ergonomics contributes to muscle strain, muscle imbalances, and fatigue. Many muscle strains result from performing the same motion over and over again. These become repetitive stress injuries, which are some of the most common workplace injuries.

Exercise

A. Answer the following questions briefly.

1. Is Covid -19 a biological hazard?
   A True B False
2. Which of the following is included in Personal Protective equipment?
   A Spectacles or clear goggles B Earmuffs
   C Hard hat D All of them.
3. Can toxic substances spillage be wiped off with a normal cloth and with bare hands?
   A True B No
4. A simple technique for using fire extinguisher_____.
   A. PASS method B Installation on telephonic desk
5. Which is not a part of potential injury at the workplace?
   A Muscle strain B Cuts
   C Slip or fall D Drowning

B. Answer the following questions by choosing the correct option:

1. Explain the golden rule of “First Aid”.
2. Why is Organisational Protocol necessary for an organisation?
3. Describe any two types of electrical equipment?
4. Explain why hand hygiene is necessary for oneself.
5. Describe the various types of hazards involved while handling or dealing with toxic?

Notes

NCVET

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

FICSI
Food Industry Capacity and Skill Initiative

7. Working Effectively in an Organization

FIC/N9902

Key Learning Outcomes

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

1. Categorize the organizational policies
2. Catalogue the Legislations, standards, policies, and procedures
3. Analyse the reporting structure
4. List the inter-dependent functions
5. Discuss the impact of harassment and discrimination
6. Monitor the ways of prioritising the task
7. Record the types of communication skills
8. Evaluate the ways of carrying out teamwork
9. Highlight the ethics and discipline
10. Illustration of the grievance's solution
11. Recognize the interpersonal conflicts
12. Identify the disabilities and challenges
13. Outline the gender sensitivity and discrimination
14. Discuss the applicable legislations, grievance redressal mechanisms
15. Analyse the process of transacting with others without personal bias

UNIT 7.1: Organizational Policies

Unit Objectives

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

1. Categorize the organizational policies

7.1.1 The Organizational Policies

Organizational policy or work place policy is a type of statement which provides the outlining of any organization that practices out the procedures. This eventually leads to its business which covers and everything, starting from the operations to concerns and compliances along with the employee's legislation. It also protects the organization from risks and hazards. It consists of a group of statements that could showcase the purpose for one or more guidelines and actions that are required to be taken against it in order to achieve the goals. The statements are required to be written in simple formats for providing efficiency, depending on the type of issues in which the length of policy is stated.

Benefits of Organizational Policies:

- It stands to be in line with organizational values
- It tends to have the list of complaints with the employment and associated legal requirement
- It provides proper clarity on the roles and responsibilities
- It ensures that an organization operates efficiently and in the specified business manner
- It helps in strengthening the staff position during or in the legal situation
- It enforces consistency and uniformity in the operational procedure and in the processes of decision making
- It saves time for the employees while the problems can be resolved rapidly and effectively through the existing policy

Types of organizational or workplace policies:

- Workplace health and safety policy
- Non-discrimination and anti-harassment policies
- Equal opportunity policy
- Employee code of conduct policy
- Leave policy
- Employee time-stamping policy
- Employee disciplinary and termination policy
- Employee grievance policy
- Social media policy
- E-mail policy
- Mobile phone policy
- Temporary policy

1. **Workplace health and safety policy:** It is very essential for a recruiter to provide safe and healthy work environments to their employees since the hazards might arrive without alarming anybody about the risks.
2. **Non-discrimination and Anti-harassment policy:** The principle behind this policy highlights its providing of guarantees in which human rights are exercised without any discrimination. These discriminations stand to be against individuals on the basis of their race, colour, gender, age, language, national origin, religion, gender identity, sexual orientation, property, marital status, family status, and citizenship. The proposal of this policy is mainly to inhibit any kind of harassment, whether it could be verbal or nonverbal and any kind of physical conduct which is designed to threaten the co-workers and to intimidate the employees or any person working on behalf.
3. **Equal opportunity policy:** This policy ensures that the employees are hired irrespective of their gender, religion, colour, age, caste, marital status, or physical ability.
4. **Employee code of conduct policy:** The policy sets the guidelines for all the employees and various stakeholders in which they are expected to follow in their professional and personal behaviour at the workplace.
5. **Leave policy:** This policy recognises that employees require time off from their works in order to maintain the work-life balance. It also understands the various other needs, like personal commitment, medical exigencies, relaxes time and so on of the employees.
6. **Employee time-stamping policy:** This policy describes the rules and regulations related to the working hours of an employee. It additionally assists the guidelines related to their reporting time, work duration/hours and breaks time.
7. **Employee disciplinary and termination policy:** The major objective of the mentioned policy is to define the procedures and protocols in case of any breach of the company's policy, employee misconduct or any in-disciplinary behaviour.
8. **Employee grievance policy:** The aim of this policy is to make sure that every employee has a formal way to raise their concern or complaint to their senior management. It has a clear structure and point of contact details in a case in which the employee wants to raise a concern.
9. **Social media policy:** It is expected from every employee who is engaged or involved in social media sites, like Facebook, Instagram, and Twitter, LinkedIn and several other similar platforms, to understand and follow the guidelines of the company's social media policy. This mainly stands to be the concern for the company if their action or engagement involves the company name. Failing to do so can put their employment with the company at risk.
10. **E-mail policy:** This policy describes the guidelines and uses of corporate e-mails to meet business requirements. One should follow the corporate standards, including copyrights, logos and signatures, while sending the e-mail within or outside the organization.
11. **Mobile phone policy:** This policy implies restrictions or limitations on the usage of mobile phones at the workplace.
12. **Temporary Policies:** These policies are added to the main body of company's policy guides and could be changed or removed as needed example during the COVID-19 pandemic organization implemented policy to handle social distancing, masking, disinfecting and other safety procedures for keeping employee's and workplace safe for smooth running of organization or business.

UNIT 7.2: Legislations, standard, policies, and procedures

Unit Objectives

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

1. Catalogue the Legislations, standards, policies, and procedures

7.2.1 The Legislations, Standards, Policies, and Procedures

It is the legal requirement of an organisation to comply with the local laws as well as regulations and keep them updated time-to-time. The HR department is mainly responsible for continuously updating the regulations and making sure that it is communicated across the organisation. It also states that the laws and regulations of local authorities take over the organisational policy when required.

Standard practices at a workplace must have:

- Employers to define clear expectations from their employees.
- Provide a chance to utilise one's skills to perform a task.
- Support one's employees
- Motivate employees to collaborate and participate in decision making
- Welcoming nature for the feedback from the organization's employees.
- Investment in the employees learning and development process.
- Feedback received from employees and attempts to make a great workplace.

Policies and procedures at the workplace:

A policy is a general set of guidelines that are designed in line with the company's objective for dealing with an issue. Policies communicate the connection between the organization's vision and values.

A procedure sets out the specific task or action plan for implementing or carrying out a policy. Procedure tells employee's how to deal with a situation and when.

Importance of Policies and Procedure:

- It makes sure of the smooth functioning of the business and its day-to-day tasks.
- It clearly sets out the instruction for the employees which is expected from them.
- Having policy and procedure in place become handy at times while dealing with any kind of issue.
- It improves the overall image of an organisation in the market.
- It sends out a clear message to its external stakeholders and helps the organisation to build trust among its stakeholders.
- It enhances the goodwill of an organisation and, in turn, increases the market value.

The difference between policy and procedure is described below:

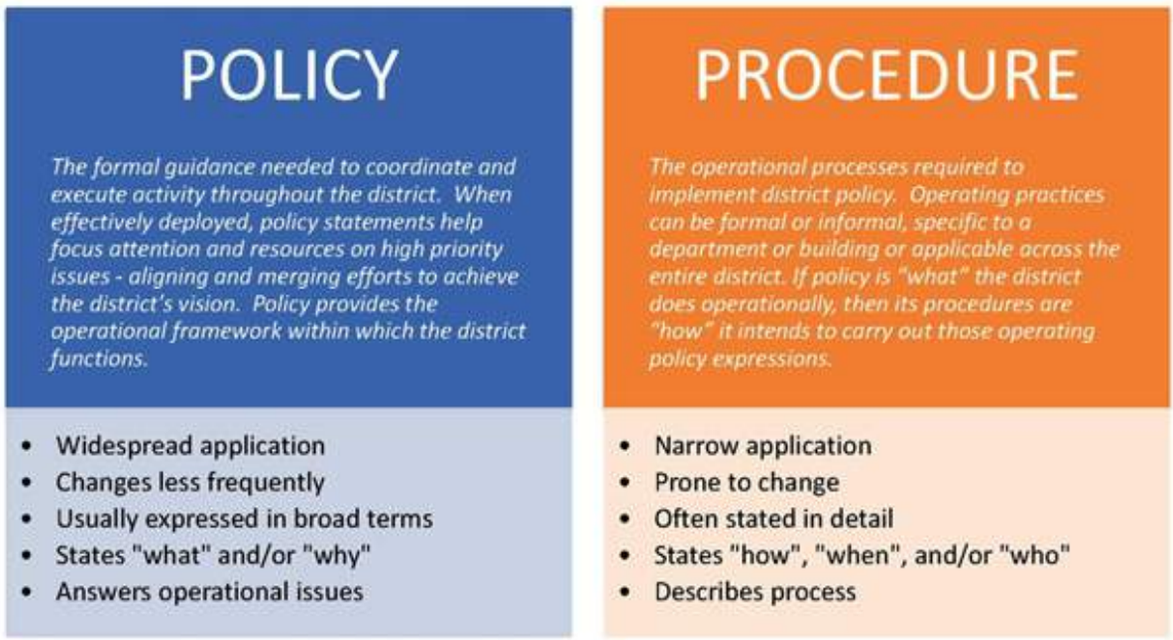

Fig. 7.2.1: Difference between Policy and Procedure

UNIT 7.3: Reporting Structure

Unit Objectives

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

1. Analyse the reporting structure

7.3.1 The Reporting Structure

Reporting structure refers to the relationship between the employees' position in terms of authority –"who reports to whom". The reporting structure acts as a command it is hierarchal within every employee report to another employee who resides to be one level higher in their authority or position within the organisation including communication and decision channels.

Types of Reporting Structure

- **Vertical Structure:** The vertical organizational structure is a pyramid like top-down management structure. It creates a powerful hierarchical structure that emerges from top highest level of leadership CEO/owner followed by middle management then regular employees at bottom. Every employee has the authority to do their individual task or jobs. Every employee has to report to their supervisors in case of any issue. Here decision making often work from top to bottom, but work approval will work from bottom to top.
- **Horizontal Structure:** The flat structure or horizontal structure is an organizational structure having only a few layers of management into which the managers have a very wide span to control with one or more subordinates as it does not have many chains of command. The top layer of the structure is the owner of the business, whereas the second layer contains team leaders or managers who will report to the business owner. The third layer of team members is supervised by the team leaders or the managers of the second layer.

The company's reporting structure is generally prepared to keep the company's strategic goals and missions in mind. The authorities and work are delegated among the employees of the various departments according to various business functions.

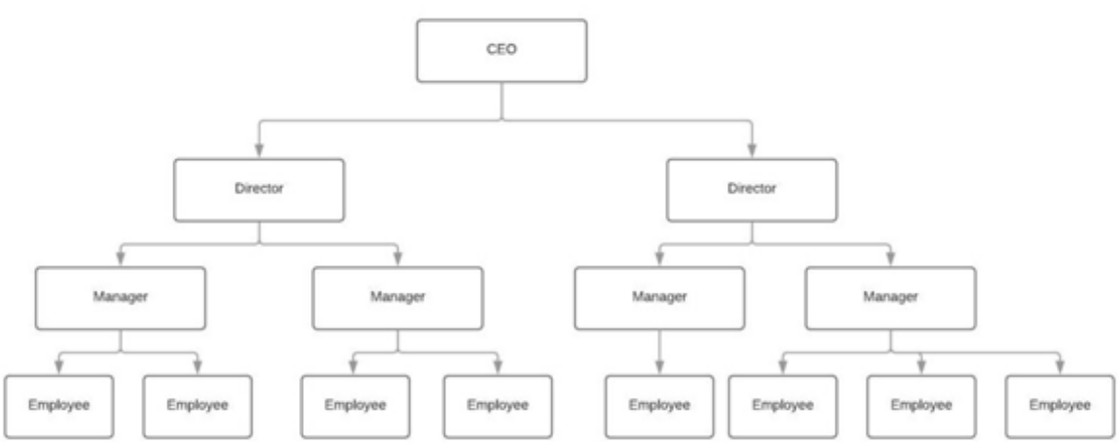

Fig. 7.3.1: Company's Reporting Structure

UNIT 7.4: Inter-Dependent Functions

Unit Objectives

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

1. List the inter-dependent functions

7.4.1 The Inter-Dependent Functions

Interdependence stands to be the key aspect of creating a healthy work environment and a sense of unity among the workers in order to achieve a common organizational goal. Teams of employees working together in hierarchy of organizational structure tend to demonstrate high chances of success rather than working individually. It also ensures the everyone is in line with the company's overall progress and are working towards the same objective.

The two main components of Inter-dependence are:

1. Collaboration
2. Delegation

Types of Inter-dependence:

- **Pooled inter-dependence:** In an organisation, each vertical or or horizontal department may not directly interact and do not directly depend on each other and perform completely separate functions having their own set of tasks, which stands to be different from each other, but they offer a contribution to the overall goal of an organisation as well. This type of inter-dependence is known as pooled inter-dependence. It means if any department fails to achieve its objective, the entire project or goal will collapse.
- **Sequential inter-dependence:** Sequential interdependence is a kind of inter-dependence when one department is witnessed to depend upon the functioning of the other department. As an instance, the procurement department must purchase the raw materials in order to ensure the proper functioning of the production department.
- **Reciprocal inter-dependence:** Similar to Sequential inter-dependence, Reciprocal inter-dependence also defines output of one department becomes input of other department in order to efficiently complete the task or project.

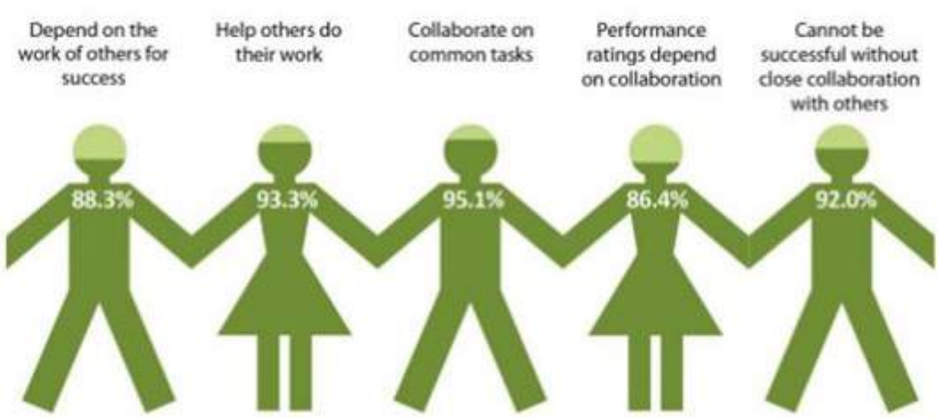

Fig. 7.4.1: Process of the concept of Inter-dependence

UNIT 7.5: Harassment and Discrimination

Unit Objectives

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

1. Discuss the impact of harassment and discrimination

7.5.1 The Impact of Harassment and Discrimination

Any objectionable behaviour of someone towards an individual during professional or personal communication, whether on verbal or non-verbal terms, is referred to as harassment.

Harassment can include behaviours, such as:

- Telling abusive jokes about a particular group of members.
- Forwarding obvious or sexually suggestive emails or texts.
- Making disrespectful comments or taunts about a person's appearance and disability.
- Asking unwanted questions about someone's life.
- Displaying ethnic offensive screen savers.

Discrimination refers to a treatment when one person or a group of members are treated unfairly based on the factors such as race, colour, gender, sexual orientation, age, religion, and disability.

Discrimination that occurs in the workplace is of different types:

It occurs when an individual is discriminated against a number of factors. In addition to the reasons, job applicants and workers are also discriminated against because of their relationship with any other person.

The different types of workplace discrimination are.

- Gender Discrimination
- Age Discrimination
- Race Discrimination
- Skin colour Discrimination
- Mental and physical disability
- Genetic information
- Religion Discrimination

Pregnancy and parenthood: Harassment and Discrimination at workplace is illegal and unethical. It is not only treating your employee's equally the right thing to do but also avoiding any type of harassment and discrimination can also improve company's reputation and will also improve working environment in organization.

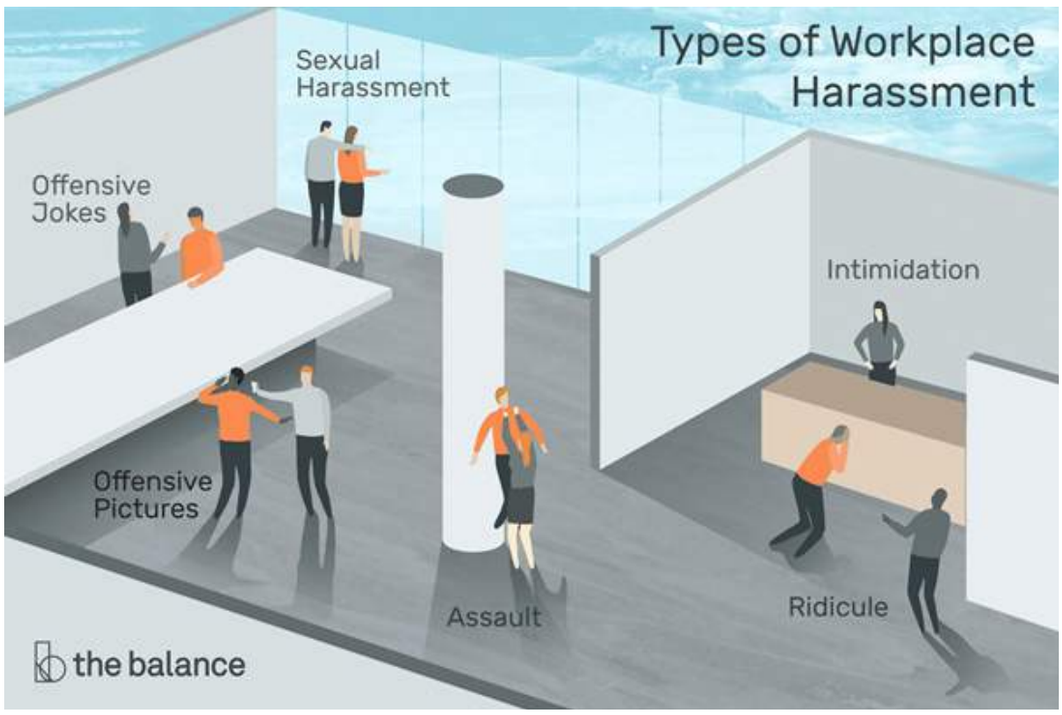

Fig. 7.5.1: Types of Workplace Harassment

UNIT 7.6: Prioritising Tasks

Unit Objectives

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

1. Monitor the ways of prioritising the task

7.6.1 The Ways of Prioritising the Task

Prioritizing a task or work is a process of having an understanding of which task requires to be achieved first by determining the level of importance and urgency of task, thing or event. However, each task or work appears to be equally vital. Prioritization also helps the employees to attain more work or tasks in a less amount of time. It is very important for the employees and workers to prioritize their work in order to be productive rather than being reactive, which will indirectly decrease their efficiency of providing productive work.

How to Prioritize Task on Workplace When Everything's Important?

Seven strategies for prioritizing tasks at the workplace:

- Having a list that contains all tasks or works in one place
- Identify what's important
- Highlight what is necessary
- Prioritize based on importance
- Avoid competing with priorities
- Consideration of the efforts made in the tasks
- Constantly reviewing task and be realistic

UNIT 7.7: Communication Skills

Unit Objectives

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

1. Record the types of communication skills

7.7.1 The Types of Communication Skills

Communication skill mainly addresses to the ability of the ways in order to communicate effectively with managers, colleagues and staff. It is an essential part for every industry. Communication is the act of transferring information from one place to another. It may be vocally (using voice), written (using printed or digital media such as books, magazines, websites or emails, visually (using logos, maps, chats or graphs), nonverbally (using body language, gestures, tone and pitch of voice). In practice it is often a combination of several of these. Productive communication skills in the workplace can reduce conflicts, lower the risk of projects indirectly and thus would make the work more agreeable.

In today's scenario having technical skills is not only enough to get the work done in the workplace. Completing the task must require the support of the whole team, and without proper communication, things will remain stringent in order to get better communication in the workplace. Communication skills are absolutely necessary for successful communication both in the workplace and in private life.

Fig. 7.7.1: Essential Communication Skills

- **Body Language (non-verbal):** When there is a discussion about body language, it refers to the ways by an individual presents themselves while interacting with someone. It includes body posture, hand movements or gestures, the type of eye contact that is made, and the voice tone.
- **Listening:** Communication in the workplace is not entirely about speaking; it mainly represents atwo-way channel. Onehas to pay close attention while talking, as this allows the team members to ask and clarify their doubts as well asinquiries to ensure that they are on the same page or track.

Fig. 7.7.2: 7 Key Active Listening Skills

- **Clarity and Conciseness:** One of the major ingredients for effective communication in the workplace is clarity, which mainly stands to be responsible to expresses the attempt of conveying an individual's message in the simple way possible. Before you start a conversation, type an email or being a discussion, have in mind what the purpose of the communication is and what information you hope to obtain as a result.
- **Friendliness:** In order to engage with the team members in an open or honest discussion, a person needs a friendly tone, a personal question, or simply a smile. It is important because the team members would not hesitate to contact the individual as they would be easily approachable for the conversation.

- **Empathy:** Showing compassion or empathy even when the individual disagrees with an employer, co-worker, or employee state to be very important as it helps in understanding their point of view and also respects their decision.
- **Confidence:** It is an important step to be confident when an individual tends to interact with others. As in all interactions, confidence (but not overconfidence) is crucial part. Conveying with confidence will give you peoples, faith in your abilities and will take you seriously.
- **Respect:** The employee must respect their co-workers' roles, skill set and ideas in order to meet the company's overall goal as a team.

  The team must communicate with each other in a respectful manner every time. Conveying them with respect through email by taking the time in order to edit their message is also required. If the individual would send them a sloppy written, confusing email, the recipient will think them to be disrespectful and also encourage them to think through the person's communication.

Summarizing the concept:

Effective and clear communication at the workplace ensures that the healthy work environment supports the overall team development, engagement of employees, innovative idea, which in turn help the overall company's growth, enhancing the goodwill and trust of its customers.

UNIT 7.8: Teamwork

Unit Objectives

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

1. Evaluate the ways of carrying out a teamwork

7.8.1 The Ways of Carrying Out Teamwork

Teamwork is a cumulative effort done by a team or a group of members in order to acquire a common goal or to complete a given work or task in the most effective and powerful way. Good teamwork helps in building a strong relationship as well as provides morale in the workplace, which makes the workers more productive, leading to an increased profit.

Tips to improve teamwork in the organization:

- **Encourage informal social events:** In an informal environment, employees feel free to communicate with each other, and they also try to understand the personal behaviour of everyone.
- **Clarify Roles:** In order to work efficiently at the workplace, every employee should have a proper understanding of their roles and responsibilities according to their work demand.
- **Specify long-term as well short-term goals:** Specifying goals help in streamlining the communication and makes the teamwork more purposeful.
- **Reward and recognition:** It is necessary for an employer to recognise the best performing employees as it will keep them motivated and also provide a sense of accomplishment.
- **Avoid micro-management:** One of the significant drawbacks of micromanagement is that the employee tends to focus on the small or less relevant thing which they think is required to please the immediate supervisor.
- **Establish Effective Communications:** It is not necessary that an employee needs to be friends with all the co-workers, but the thing which is necessary states the establishing and practising of effective/good communication.
- **Respect Individuality:** Every individual has their own personality, skill and preferential ways of working, which is a necessity of the employer in order to recognise these.
- **Seek feedback:** Seek feedback not only from the managerial staff but also from the ground level staff in order to gain the proper insights and scopes of improvement.

UNIT 7.9: Ethics and Discipline

Unit Objectives

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

1. Highlight the ethics and discipline

7.9.1 The Ethics and Discipline

Work ethics refers to the ways by which the employees govern themselves and their attitude towards their work. It also refers to morality in the workplace.

A person having a good work ethic tends to create a healthy workplace environment for him/her as well as for their fellow co-workers.

It is mandatory for an employer to develop strong work ethics among the employees. It can be done in various ways.

- Setting clear goals and objectives
- Mentoring
- Set example
- Need of right work environment
- Encourage professionalism
- Discipline
- Listen to your employees
- Feedback
- Rewards and recognition
- Remove obstacles
- Discipline at Workplace

UNIT 7.10: Grievances Solution

Unit Objectives

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

1. Illustration of the grievance's solution

7.10.1 The Grievance's Solution

Grievance's Solutions

A grievance can prove to be quite harmful if not dealt with in time. It may lead to frustration among the employees, and they can start losing their trust from the employers.

Work-related grievances and complaints from staff need to be tackledwith proper care and are also known to be a time taking procedure.

It is the liability of the HR department that employee grievances are addressed quickly and in an effective manner.

There are five ways in order to address the grievances effectively:

- **Prompt and timely Action:** The staff or department expert in handling the grievances must be highly trained in managing the employee grievances effectively and in a time-bound manner.
- **Grievance acceptance:** The supervisor or expert must accept the employee grievance and also should respect their genuine feelings.
- **Collect information:** Management should not wait for the grievances to be reported. Instead, it should take preventive steps in order to avoid it. In order to curb it, the management must discuss, collect information, communicate regarding various issues at the workplace.
- **Cross verify the grievance cause:** Once the information and cause of grievance are collected about the reported incident, the information must be cross-checked from various other sources.
- **Decision making:** On successful identification of the causes, the management must develop a series of steps in order to resolve it along with the next course of action.
- **Review and implement:** The management should not wait for a longer time once they have a rational and effective resolution. It is necessary to involve the concerning employee(s) in confidence before implementing the decision.

UNIT 7.11: Interpersonal Conflicts

Unit Objectives

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

1. Recognize the interpersonal conflicts

7.11.1 The Interpersonal Conflicts

Interpersonal Conflicts

Interpersonal conflicts refer to any type of conflict among two or more people. The idea mainly refers to the situation when a person or group of employees try to interfere in some other employee's work.

Ways to Resolve Conflict at the Workplace

- Communicate
- Listen carefully
- Show empathy
- Never hold back any grudges
- Effective communication skill

UNIT 7.12: Disabilities and Challenges

Unit Objectives

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

1. Identify the disabilities and challenges

7.12.1 The Disabilities and Challenges

People with disabilities are far more impacted by personal and environmental barriers than normal people. By the end of this module, you will be able to get clarity on the rights of disabled people in the workplace.

These challenges to employment can range from a variety of physical and social ones. These can include:

- Physical barriers
- Nature of co-workers and stereotyping
- Communication barriers
- Policy barriers

Physical Barriers

They can take the form of structural issues in an environment that retrogrades the basic functioning of disabled people. As an instance, the lack of a wheelchair ramp or an elevator can hamper basic tasks for disabled people or not allow them access to modern equipment that would authorizethem to perform tasks.

Nature of Co-Workers and Stereotyping

Judgements and assumptions against people with disabilities are pretty much the norms of our present-day society. They tend to prevent disabled people from getting hired or having a positive experience in the workplace. For example, a person might be denied useful resources because their employer believes that they don't tend to possess a learning ability. This is common for people suffering from autism, ADHD or several other 'invisible' disabilities.

Communication Barriers

Communication barriers can create an inefficacy to effectively write, speak, read or understand the necessary requirements for a job. Some examples would involve the inability to use a phone due to hearing disability, lack of braille prints for blind people, and usage of languages that are too technical for people with cognitive impairments.

Policy Barriers

Policy barriers can also be a defining factor for the challenged people to get a job in a cooperative workplace. These include giving people not enough time to complete their tasks.

UNIT 7.13: Gender Sensitivity and Discrimination

Unit Objectives

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

1. Identify the disabilities and challenges

7.13.1 The Disabilities and Challenges

Gender sensitivity has also been an ongoing dialogue inside the workplace. The workplace has frequantly been referred to as an “inhospitable place” for women due to the multiple decisions taken by the HRs (i.e., policies, decisions and their enactment, training, wage).

Ways to Build Gender Sensitivity and Eliminate Discrimination

- Recognizing the workplace’s “Gender Equality Maker (GEM)."
- By being open and informative about it
- Altering existing policies to make room for gender diversity and equality
- Strict implementation of the policies

Recognize the Workplace’s Gender Equality Maker

Being gender-sensitive is just one of the many necessary steps to be taken in order to have a gender-fluid workplace. Recognizing your company's current status in its diversity can be helpful and would point you in the right direction.

By Being Open and Informative About It

An open atmosphere in a workplace would help a company and its employees to excel in all directions. Understanding their needs and fulfilling them accordingly would help the employers and workers in a similar manner to achieve a gender-balanced environment.

For example, having group discussions with men, women, and LGBTQ+ would help people to understand their needs and concerns.

Altering Existing Policies to Make Room for Gender Diversity and Equality

The “Equal Remuneration Act of 1976” of India has prohibited differential pay to men and women employees for conducting the same work or work of the same nature.

Strict Implementation

Rules and regulations are only followed up with when implemented strictly. There are lots of rules and policies that can be put in place in order to check inequality and help a workplace to go from being gender-sensitive to gender transformative. One example which can be taken under consideration is the ensuring of nearly everyone to be confident and open to a leadership role if offered, while the otherscould portray equal pay amongst colleagues in the same position. Lastly, for sexual harassment, implementing strict rules against this kind of behaviour is paramount and shows that a corporation is heading in the right direction. Companies must realise that employees are working in a safe environment and do not need to be anxious about a harassment encounter.

UNIT 7.14: Applicable Legislation, Grievance Redressal Mechanisms

Unit Objectives

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

1. Discuss the applicable legislations, grievance redressal mechanisms

7.14.1 The Applicable Legislations, Grievance Redressal Mechanisms

The Indian Constitution guarantees equality and prohibits discrimination on the grounds of religion, race, caste, sex, birthplace, and residence.

Discrimination against or profiling individuals can occur at two stages – pre-recruitment and post-recruitment. The former entails rejecting potential candidates on the basis of their gender, religion, caste, marital status, pregnancy etc. Post-recruitment discrimination manifests in lesser pay, fewer benefits and/or leave or even termination, based on the same grounds.

The Constitution guarantees equality of opportunity for every citizen in matters relating to employment or appointment to any office under the state.

“Equal Remuneration Act, 1976” needs the employers to pay equal remuneration to the employees for the same task or work of a similar nature without having any discrimination on the basis of sex.

Grievance Redressal Mechanism

A transparent, quick, robust and confidential grievance redressal system can effectively help in order to handle conflicts in the workplace and potentially go a long way in bringing harmony to the workplace. Some of the better places to work are identified to have an efficient worker-based grievance redressal mechanism.

In India, certain central and state-specific labour laws require the employer to adopt certain grievance redressal mechanisms at the workplace.

- **Internal Commite for Complaints:** According to the sexual harassment of women at workplace "(Prevention, Prohibition and Redressal) Act, 2013" of India (POSH Act), each workplace possessing at least ten employees is required to constitute an Internal Complaints Committee (IC). The IC is required to investigate complaints of sexual harassment of women at the workplace and also provide recommendations to the employers.
- **Grievance Redressal Committee:** According to section 9C of the Industrial Disputes Act, 1947 of India (IDA), each employer recruiting at least twenty workmen, is needed to structure a Grievance Redressal Committee (GRC) for resolution of the conflicts arising out of grievances of the people.
- **Works Committee:** The labour authorities might, under section 3 of the IDA, order an initiation possessing at least one hundred workmen to set up a Works Committee (WC).
- **Committee for Employee's Health and Safety:** Certain states in Indian like Maharashtra need employers to employ at least one hundred workers to structure a Health, Safety and Welfare Committee (HSW Committee). The responsibility of the HSW Committee includes surveying and identifying any accident-prone, hazardous objects or spots in the boundaries, rectifying such spots, conducting healthcare camps once a year.

UNIT 7.15: Transacting With Others without Personal Bias

Unit Objectives

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

1. To administer with others without personal bias

7.15.1 Personal Bias

When it arrives at making choices at work, it's important to know they are not based on bias. It is essential for organizations to have concrete processes and procedures in place to curb unconscious bias. Nevertheless, there are many stages that can be adopted to check the biases and to create an inclusive environment for the team.

Recognizing an Individual's Own Biases

Recruitment is known to be an area where unconscious bias may come into play as it has been seen that people may unwittingly tend to favour applicants from their own familiar backgrounds.

Focusing on People

Many organizations are so focused on their processes that they lose sight of their own people. Of course, there is a requirement to find time, for example, to write reports, define job descriptions, and set up performance appraisals, but it's important that there is also the establishment of expectations communicate plans, and givingas well asreceiving feedback from everyone involved in the team.

Increasing Exposure to Biases

Many organizations assume that their policies on avoiding discrimination are robust and work well, so perhaps they fail to weed out some subtle biases. Declaration of the intentions about valuing a diverse workforce is extensively required. Saying words out loud, or writing them down, sends a clear message to everyone with whom an individual is working, as well as is involved inone's own subconsciousness.

Summary

- Organizational policy or work place policy is a type of statement which provides the outlining of any organization that practices out the procedures. This eventually leads to its business which covers and everything, starting from the operations to concerns and compliances along with the employee's legislation.
- It is the legal requirement of an organisation to comply with the local laws as well as regulations and keep them updated time-to-time. The HR department is mainly responsible for continuously updating the regulations and making sure that it is communicated across the organisation.
- Policies communicate the connection between the organization's vision and values.
- The reporting structure acts as a command it is hierarchal within every employee report to another employee who resides to be one level higher in their authority or position within the organisation including communication and decision channels.
- Teams of employees working together in hierarchy of organizational structure tend to demonstrate high chances of success rather than working individually.
- Prioritizing a task or work is a process of having an understanding of which task requires to be achieved first by determining the level of importance and urgency of task, thing or event.
- Effective and clear communication at the workplace ensures that the healthy work environment supports the overall team development, engagement of employees, innovative idea, which in turn help the overall company's growth, enhancing the goodwill and trust of its customers.
- Discipline at the workplace lays a strong foundation of trust between the employer and its employees. It includes reporting on time, maintaining decorum during working hours and at the workplace, appropriate dressing, proper communication, etc.
- A grievance can prove to be quite harmful if not dealt with in time. It may lead to frustration among the employees, and they can start losing their trust from the employers. In order to handle grievances properly, one should have an adequate set of procedures that lays out a clear step by step process in order to deal with the grievances.
- Women have been witnessed to have fought for their rights and for their place in this world for hundreds of years. However, it's not just women now, and the LGBTQ+ communities are also fighting for their rights and their voices in order to be heard.
- The Indian Constitution guarantees equality and prohibits discrimination on the grounds of religion, race, caste, sex, birthplace, and residence.
- A transparent, quick, robust and confidential grievance redressal system can effectively help in order to handle conflicts in the workplace and potentially go a long way in bringing harmony to the workplace.
- Recruitment is known to be an area where unconscious bias may come into play as it has been seen that people may unwittingly tend to favour applicants from their own familiar backgrounds. But a person can take practical steps in order to reduce this bias.

Exercise

A. Answer the following questions briefly.

1. Which policy stands to be the workplace or organizational policy?
   A. Social Media Policy B. Environment Protection Policy
2. _____ at workplace lays a strong foundation of trust between the employer and its employees/
   A. Communication B. Discipline
3. _____ can prove to be quite harmful if not dealt in time.
   A. Actions B. Grievance
4. The employment barriers might include:
   A. Communication barriers B. Disciplinary barriers
5. _____ requires employers to pay equal remuneration to the workers.
   A. Equal Remuneration Act, 1976 B. Republic Act No. 9710

B. Answer the following questions by choosing the correct option:

1. List down the importance of having the company policies in force.
2. State the differences between policies and procedures.
3. What do you understand by communication skills?
4. What are policy barriers?
5. What are some of the central and state-specific labour laws in India for focusing on the grievance redressal mechanism?

Notes

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Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

FICSI
Food Industry Capacity and Skill Initiative

8. Material Conservation

Unit 8.1 - Material Handling

Unit 8.2 - Workstation Layout, Electrical and Thermal Equipment

Unit 8.3 - Organisational Procedures for Minimising Waste

Unit 8.4 - Practices of Efficient and Inefficient Management

Unit 8.5 - Material and Water Usage

SGJ/N1702

Key Learning Outcomes

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

1. Identify the ways to handle materials.
2. Categorize the workstation layouts, electrical and thermal equipment.
3. List the organizational procedures for minimising waste.
4. Analyse the practices of efficient and inefficient management.
5. Discuss the material and water usage.

UNIT 8.1: Material Handling

Unit Objectives

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

1. Identify the ways to handle materials

8.1.1 The ways to Handle Materials

Material handling

Material handling is also known as the integrated system, which involves such activities of the movement, storage, protection and control of types of materials and products throughout the manufacturing, distribution, consumption and disposal. The major function involves the focus on methods, mechanical equipment, and related control systems to achieve the mentioned functions.

The fundamental objective of using material handling is to ensure that the material is in the right amount and is safely delivered to the desired place at the right time, along with minimum production cost. The cost of material handling has an estimated 20-25% of total manufacturing labour cost.

Principles of Material Handling

- **Planning:** The planning requires to be done in order to achieve the approach of the team with the input of consultants, suppliers and the end-users, from the management, engineering, operations, finance, sales and operations.
- **Standardization:** All the material handling equipment, methods, controls, and software requires to be standardized in such a way that it would be able to perform a wide range of tasks in a broad range of operations.
- **Work:** In material handling, the process requires to be clarified by reducing, shortening and eliminating in order to remove the unnecessary movement that would impact productivity.
- **Ergonomics:** Work and work-related conditions are being adapted to support the ability of a worker, which reduces the repetitive and difficult manual labour as well as safety.
- **Unit Load:** Due to the less use of effort and work required to move several individual items together as a single load (e.g., moving of many items one at a time), a unit load such as containers or pallets is required to be used.
- **Space Utilization:** In order to maximize the effective use of space within a facility, it is extensively crucial to keep the working stations organized and clutter-free to increase the density and availability of the storage area. 5S principle can be implemented for space utilization 5S stands for the 5 steps of this methodology: Sort, Set in Order, Shine, Standardize, Sustain.
- **System:** In material handling, the movement and the storage are required to be coordinated throughout the process in order to form or receive the inspection, storage, packaging, order selection, production, and shipping, return handling, as well as transportation.
- **Environment:** Energy, which is used in potential environmental impact, have been considered in designing the system with recycling and reusability processes implemented whenever possible, as well as for the establishment of practices for safe handling of hazardous materials.
- **Automation:** To develop operational efficiency and consistency, the automated material handling technologies need to be positioned whenever possible.

- **Life Cycle Cost:** For all the equipment used in material handling for a specified system, the analysis of a life cycle cost is required to be conducted. The areas of considerations require possessing the installations, programming, training, operation, maintenance and also repairing.

Material Handling Equipment

The simplest shelf to the most complex light out facilities, warehouse mechanization, is capable of being operated in the dark as it uses a lot of material handling equipment.

There are different kinds of material handling equipment, and they fall under four broad types. Material handling is the unloading and loading or movement of goods within a warehouse, especially with the help of mechanical devices. Thus, material handling equipment refers to the devices that are used in a warehouse's operation by storing and moving the goods.

Type 1: Storage and Handling Equipment

This stands to be usually the simplest type of material handling equipment which includes shelves and racks where an individual is capable of storing their material in the middle of shipping and receiving it. Drawers, bins, flow racks, cantilever racks and stacking frames are additionally included in this category.

Type 2: Bulk Material Handling Equipment

It is the process of storing, transportation and control of materials in loose bulk form. For instance, a silo, a large cylinder that is capable of holding stuff like grain. Other examples include:

- Reclaimers and Stackers:
- Hoppers
- Conveyor Belt
- Grain Elevators
- Dump Trucks
- Rotary Car Dumper
- Screw Conveyor
- Bucket Elevators
- Vacuum lifter

Type 3: Industrial Truck

These are the type of equipment or vehicles that is used to move materials. Sometimes it is run by workers, and sometimes they are automated. "Automated Guided Vehicles (AGVs)" fall under both industrial trucks and engineered systems. Other examples include:

- Forklifts
- Order Pickers
- Hand Trucks
- Pallet Trucks

Type 4: Engineered System

It is the type of material handling equipment that stands to be a more complicated system with multiple components, which are usually automatic. They include AGVs, conveyor belt or robotic delivery system that comes in different sizes and shapes or automated storage systems.

8.1.2 Hazards, Risks and Threats Associated with Handling Different Materials

There are multiple hazards, risks and threats can be identified during receiving, loading & unloading, storage, and transportation for handling different types of materials.

Receiving

Hazards, risks and threats can be identified during receiving of the material. Inspect incoming materials as soon as they are received to ensure established specifications such as product temperature, packaging conditions, etc. are met. A designated employee should verify and document:

- Incoming raw materials – Quality and other kinds of defects can occur during receiving of incoming materials. So, all kind of material should be from an approved supplier. Approved supplier can be verified through supplier visit, document verification and certification from legal bodies.
- Cleanliness of the truck – Foreign body, pest can be identified as a hazard. So, we must ensure that no foreign material, dirt, odours, rodents, insects or other pests are there in the vehicle.
- Temperature of the truck – Every different material requires different type of temperature requirements such as ambient (Normal temperature- 20-25°C), chilled (0-5°C), frozen (-16°C to -23°C) and dry items. Any deviation of temperature requirements can be considered as a hazard. Proper temperature needs to maintain for products according to specifications.
- Condition of door seals – Improper door closing, or door gaps of the vehicle can be one of the risk factors of material. So, it needs to ensure that close-fitting doors with no spaces at sides or bottom.
- General truck conditions or Material handling equipment's – Truck or material handling equipment's can be cause damage of product, infrastructure damage and injury of the person or even fatality.

Loading and Unloading

Loading and unloading process can be considered as hazard due to the potential risk involved to the product, property and person.

- Product damage and spillage can happen during loading and unloading process and it can be considered as a risk.
- Human error during loading or unloading process can cause damage to product, property or the employees. Employees responsible for loading and unloading materials should follow company standards for hygiene and sanitation practices.
- Proper product temperature must be maintained during loading and unloading as well. Movers should be aware of the product temperature requirements. Any kind of deviation regarding temperature can cause product damage. Document verification plays an important part for tracing shipments in case of a recall and should include: Time of receipt, type of product, ingredient and product packaging, labelling, lot number, pallet tag, quantity, size and weight.

Storage

Products should be stored adequately to maintain package/pallet integrity:

- Allow maximum air circulation and stock rotation. Air circulation is important to maintain the temperature, humidity inside the warehouse. Also, HEPA (High efficiency particulate air) filter can be installed to avoid biological hazard.
- Assign different storage areas for different products (ingredients, raw materials, finished products) to avoid cross contamination.

- Material should be used within the manufacturer's specified time period to maintain shelf-life requirements. Appropriate rotation of food and packing materials -- first in, first out (FIFO) -- helps minimize product contamination, damage and spoilage. Allergen control precautions need to establish for food industry regarding raw materials purchasing, transportation and storage Ensure suppliers have documented and implemented an allergen control plan. Check labels on incoming ingredients to ensure supplier has not sent the wrong product, a substitute product or used the wrong label. Ensure vehicles and shipping containers are cleaned before shipping. Clearly label raw materials to indicate they contain food allergens (ex: color-coded containers, tags).
- Pallet used to store materials can cause different hazards. For example- Damage pallets can result into product damage or fall down of the product; Protruded nails can product damage or injury.
- Loading strength and design should be based on Health and safety risk assessment. Major accidents can happen due to excessive product storage on each rack or improper design of racking system.

Transportation

Vehicles and containers that transport materials should be used only for the intended purpose and should have both sanitary design and pest control procedures in place. (Ex: truck's doors should be sealed to prevent entry of pests.) Refrigeration equipment in vehicles and temperature measuring devices should be calibrated and in good working order. Mechanical refrigeration should be provided for perishable food products such as meat, fish, poultry, milk and eggs.

Inspection of vehicles

Designated employees should evaluate and document the condition of trucks, containers and carriers of finished products before loading. The following should be verified before loading:

- Cleanliness of the truck should be maintained to avoid any physical, chemical or biological hazards.
- No odours or obvious dirt or debris.
- No evidence of chemical contamination such as fluids, powders, chemical residues
- Correct temperature in the truck.
- Temperature measuring devices will work properly during transportation. Documentation and maintain a log to verify inspection and cleaning tasks. Indicate type of loads, cleaning and sanitation procedures, inspections, etc.

UNIT 8.2: Workstation Layout, Electrical and Thermal Equipment

Unit Objectives

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

1. Categorize the workstation layouts, electrical and thermal equipment

8.2.1 The Workstation Layouts, Electrical and Thermal Equipment

Workstation Layout

Workstation or workplace is also known as the floor space occupied by the workers, as well as by the machines or a group of machines. An ergonomic workplace is a scientific discipline that is concerned with improving the productivity, health, comfort and safety of people in order to promote effective interactions among people, the environment and technology.

During the design of the workstation layout, the following space requirements are taken into considerations:

- Requires having spaces for racks, bins and conveyor stations that either contain the under processed work or receive the work after it has been completed by the machine.
- There should be a rectangular space occupied by the length and width of the machine or group of machines. They need to include the space for the travel of moving parts as well as the projected parts of machines which include shafts, levers, pulleys, handles and wheels.
- There requires being a proper workspace for the workers in order to efficiently complete their tasks.
- Requires having clearance space for feeding the work on and off the machine.
- There needs to be a space for tool racks, workbenches, etc., required by the individual machine, if any.
- There needs to be proper floor space for the power source, or if in case of any electric motor, it has to be placed on the floor or within the working area.

Storage Space Requirement

In any plant layout, the space for workstations allocation requires to be made for the storage of material and space essentially required inside the plants. Every department and area need to be designed in such a way so that they are capable of providing waiting, processing and moving facilities.

The storage space requirement depends on various factors such as:

- Quantitative use of raw material per hour
- Movement of semi-built parts between two machines depending upon the weight and volume.
- Movement of parts between the departments, depending upon the weight and volume.
- The dependence upon the scrap weight and volume
- Vertical heights of the building plants.
- Production capacity of the assembly.

- Floor load-bearing capacity.
- Storage practices.

Once the space requirement for all machines has been estimated, the employer needs to have the provision for the basic amenities like canteen, drinking water, first aid, restrooms, sales department, changing room (for factory worker like machine operators), refreshment place, etc.

Workplace Layout Design:

Employee productivity stands to be directly in proportion to workplace conditions. A good and comfortable workplace always results in high productivity per employee.

Some important aspects which need to be considered while designing the workplace are:

- Cleanliness
- Proper lighting
- Noise
- Too ls and Material positioning
- Chairs and Workbench
- Machine design

Electrical and Thermal Equipment

In order to build an efficient workplace layout, one needs to consider the electrical and thermal requirements of the workers. Workstations that are well equipped with electrical supply takes care of the power source needs of employees in order to operate the required equipment and tools.

The following points require to be considered while designing an electrical workstation.

- Placement of electricity outlet or strips
- Power/voltage requirement of different equipment
- The number of power outlets required
- Alternative or emergency power source outlets

UNIT 8.3: Organisational Procedures for Minimising Waste

Unit Objectives

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

1. List the organizational procedures for minimising waste.

8.3.1 The Organizational Procedures for Minimising Waste

Types of organisational waste and ways to minimise them:

- **Transportation:** Transportation waste refers to the movement of tools, equipment, inventory, raw material, people etc., more than the actual requirement or consumption. Unnecessary or excessive movement of resources leads to unnecessary work, increased wear and tear, increased damaged and defects.

  In order to curb this type of waste, the department which works closely needs to be designated next to each other. The materials required for production has to be placed in easy to reach locations as well as the multiple handling of material needs to be avoided.

- **Inventory:** Inventory is often considered as an asset to any organisation; however, storing inventory stands to be more than the required leads to unnecessary damage, defects and increased lead time during the production process. The main cause of this is over-purchasing of raw material, increased WIP (work in progress) and over-production in comparison to the actual customer needs.

  Measure to be taken in order to reduce such kind of waste involves the purchase of raw material as per the demand, avoid overproduction and reduce the work in progress.

- **Motion:** This includes unnecessary movement of tools or equipment, machinery or people. It also includes repetitive movement that doesn't add value to the work or customer, reaching for raw material, unnecessary walking to fetch tools or equipment and readjusting of installed machinery.

  Measures to be taken in order to reduce such kind of waste include a well-designed workplace, easy to reach location for tools or equipment, and efficient one-time installation of machinery.

- **Waiting:** It includes equipment or machinery which are kept idle and also the workers waiting for material or equipment. It is majorly caused by unevenness among the various production lines.

  This type of waste is capable of being curbed by streamlining the process for continuous workflow as well as training the workers on multiple skills set who are capable of easily adapting to the changing work demands and standardized workflow.

- **Overproduction:** Overproduction means manufacturing a product or material in excessive quantity than the actual demand.

  Measures to be taken in order to reduce such kind of waste include, even manufacturing rate between the station or production units and also manufacturing small batch size.

Fig. 8.3.1: Overproduction

- **Defects:** A defect usually refers to a specific product that is of no use. This results in either discarding the product or reworking on them and is capable of incurring the additional operational cost.

Tips

- For having an effective system of food processing implementation of automated statistical process control systems are extensively required
- Maintaining a high level of supply chain visibility is also considered to be important for efficient food processing

UNIT 8.4: Practices of Efficient and Inefficient Management

Unit Objectives

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

1. Analyse the practices of efficient and inefficient management

8.4.1 The Practices of Efficient and Inefficient Management

Inefficient Management Practices

Inefficiency at the workplace often refers to low productive and poor confidence. Inefficiency directly impacts the cost incurred by any organisation.

Following are the key indicators of inefficient management:

- Uneven prioritization of work
- Non-essential work
- Lack of resource planning
- Improper justification of resources
- Inefficient productivity management
- Lack of fruitful collaboration

An efficient manager must answer the below questions in order to identify the inefficient management practices.

1. Who is working on what?
2. Are they working on the highest priority projects?
3. Do they have the resources they need?
4. Do they have the information they need?
5. How is work coming along?
6. Will work be done on time?

Efficient Management Practices

An efficient management practice refers to those practices which can perform the task with minimal wastage of resources. It also refers to the appropriate utilisation of resources leading to profit maximisation. The basic rules of effective management are:

- Consistency
- Goal setting
- Delegation
- Task prioritization
- Effective communication
- Rewards and Recognition
- Training and development
- Management Commitment

UNIT 8.5: Material and Water Usage

Unit Objectives

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

1. Discuss the material and water usage.

8.5.1 The Material and Water Usage

Material Usage

Material refers to those components or raw goods which are used in producing hard goods like machines and equipment for another industry or end consumer as well as soft goods like food items, chemicals, medicines, apparel, etc.

Water Usage

In manufacturing units, water is used for various purposes like fabrication and processing of various materials, cleaning, diluting or as a coolant.

The need and demand for industrial water vary upon the product which is being manufactured. The other factors which need to be taken into consideration are water quality in the region, type of treatment required in order to make water usable.

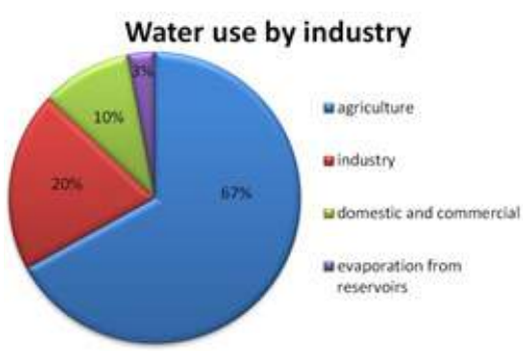

Fig. 8.5.1: Industry-wise water consumption

Industrial usage of water:

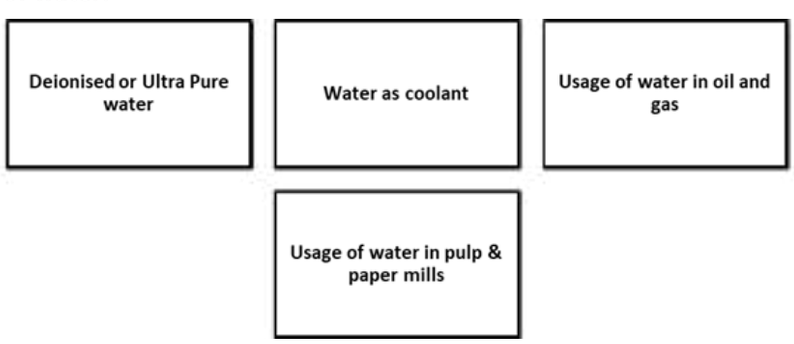

Fig. 8.5.2: Industrial wastage of water

Summary

- Material handling is also known as the integrated system, which involves such activities of the movement, storage, protection and control of types of materials and products throughout the manufacturing, distribution, consumption and disposal.
- Workstation or workplace is also known as the floor space occupied by the workers, as well as by the machines or a group of machines.
- Employee productivity stands to be directly in proportion to workplace conditions.
- An efficient management practice refers to those practices which can perform the task with minimal wastage of resources.

Exercise

A. Answer the following questions briefly.

1. What is the manufacturing labour cost for material handling?

A. 20- 23% B. 20- 25% C. 20- 30% D. 20- 35%

2. What stands to be the full form of AGV?

A. Automated Guided Vehicle

B. Activated Guided Vehicle

C. Accurately Guided Vehicle

D. Action Guided Vehicle

3. _____ is the major component for manufacturing semiconductors and chips, which are widely used in mobile phones, computers and various other electronic goods.

A. Nitrogen B. Silicon C. Hydrogen D. Lithium

4. _____ directly affects the efficiency of the workers.

A. Proper lighting B. Noise C. Cleanliness D. Machine design

5. The appropriate temperature at the workplace usually requires being at _____ degrees Celsius.

A. 22

B. 30

C. 18

D. 16

B. Answer the following questions by choosing the correct option:

1. What are the key indicators of inefficient management?
2. What are the four ways to control the defects types of waste?
3. What are the points required to consider while designing an electrical workstation?
4. What are the important aspects which need to be considered while designing the workplace?
5. What are the requirements for a storage space?

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9. Energy and Electricity Conservation

Unit 9.1 - Define Electricity

Unit 9.2 - Basics of electricity

Unit 9.3 - Energy efficient devices

Unit 9.4 - Standard Practices for Conserving Electricity

SGJ/N1702

Key Learning Outcomes

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

1. Define electricity
2. State the basics of electricity
3. Identify the energy-efficient devices
4. Explain the standard practices to be followed for conserving electricity
5. Illustrate electrical equipment and appliances

UNIT 9.1: Define Electricity

Unit Objectives

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

1. Define electricity

9.1.1 Definition of Electricity

Electricity stands to be a general form of energy observable in a positive and negative form that takes place naturally (as in lightning) or is generated (as in a generator), as well as that is expressed in terms of movement and interaction of electrons.

The existence of an electric charge, which is capable of being either positive or negative, creates an electric field. The movement of electric charges leads to an electric current which further generates a magnetic field.

It is at the heart of many of our present era technologies, being utilized for:

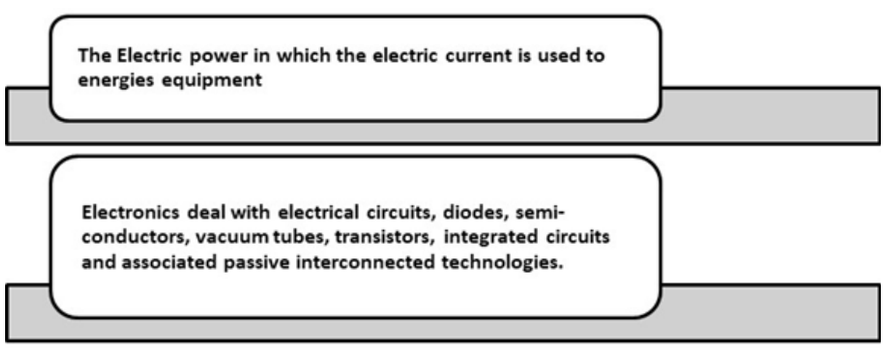

Fig. 9.1.1: Electricity utilization

UNIT 9.2: Basics of electricity

Unit Objectives

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

1. State the basics of electricity

9.2.1 The Basics of Electricity

Electricity is easily put in the flow of electrons in a conductor. Electric current flows in the form of free electrons; thus, the greater the number of free electrons in a material, the better would stand to be its conductivity. On the basis of conductivity, these 'materials' can be classified into three categories:

- **Conductors –** Materials whose conductivity lies between 104 to 107-ohm m. For example, Iron, Copper, etc.
- **Semi-conductors –** Materials whose conductivity lies between 10-6 to 104-ohm m. For example, Graphite, Silicon, etc.
- **Insulators –** Materials whose conductivity lies between 10-20-to-10-10-ohm m. For example, Paper, Glass, etc.

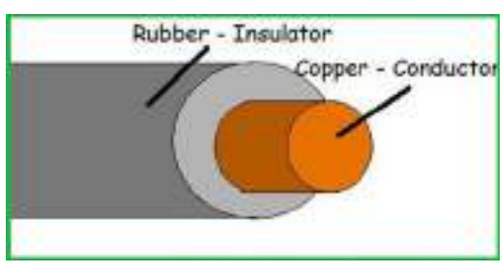

Fig. 9.2.1: Conductor of Electricity

There are three primary electrical parameters:

- Volt
- Ampere
- Ohm

Volt: The amount of external force exerted on free electrons is known as "Electromotive Force (EMF)". Volt is the amount of EMF needed to push a current of one ampere through a conductor with the resistance of one ohm.

Ampere: Ampere defines the rate of flow of electric current. For example, when one coulomb of charge flows through a given point on a conductor in a second, it is defined as a current of one ampere.

Ohm: Ohm is the unit of resistivity of a conductor. Three factors determine the resistivity of a conductor:

- Size of conductor
- Composition of conductor
- Temperature of conductor

UNIT 9.3: Energy efficient devices

Unit Objectives

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

1. Identify the energy-efficient devices

9.3.1 Energy-Efficient Devices

The use of energy– efficient devices has proved to be an effective strategy for the economics and planet as a whole, as it cuts down on unnecessary power consumption while also being cost-effective.

From the viewpoint of an energy consumer, the main motivation for saving energy is frequently and simply saving money by decreasing the cost of purchasing energy. From an energy policy viewpoint, there has been a long trend in wider recognition of efficient energy as "first fuel" (meaning the ability to avoid consumption of fossil fuels for energy production).

Fig. 9.3.1: Energy-efficient devices

Energy-Efficient Devices

Devices like LED bulbs, fluorescent lighting or natural skylights reduce the amount of energy required to attain the same amount of illumination compared to using traditional incandescent light bulbs. Modern appliances such as freezers, dishwashers, ovens, stoves, dryers use significantly less energy than their previous generation models and line-ups. For example, modern energy-efficient refrigerators use 40% less energy than their conventional models did in 2001.

Energy Conservation

Energy conservation is broader in comparison to energy efficiency in including active efforts to decrease energy consumption. For example, through behavioural change it has an addition to using energy effectively. Energy conservation is a challenge requiring stringent policy programmers, technological development and behaviour change to go hand in hand. Many energies intermediary organizations, government, non-government, regional, local or at the national level, are working in order to meet this challenge.

9.3.2 Common Ways to Identify Electrical Problems

Electricity appears to be something most of us understand it for granted. When the individuals need it, you turn to the nearest switch or outlet, and there it is, ready to serve you 24/7.

Yet that electric energy faithfully facilitating us is additionally a potential destruction's source.

Several electrical fire dangers are hidden within the walls of your house or offices or other workplaces. Nevertheless, if the indivdiuals have the knowledge the ways to point the warning signs, the individuals are capable of making proactive — and less expensive — repairs that will also help protect your home in the long run. Here are certain manners to spot common issues and what to do about them.

- **Unknown odour:** When you detect an odd smell arriving from an electrical store, unplug anything linked to it, as well as don't utilise it again until a qualified electrician has tended to check it. In addition to this, if the individual's breaker panel or fuse box is emitting an odd odour, call an electrician immediately.
- **ARC faults:** Arc faults tend to take place when an electrical circuit veers off its intended path, frequently via a breach in the wiring. Arc faults stand to be preventable via the installation of a tool referred as an arc-fault circuit interrupter (AFCI).
- **Sparking or warm switches and outlets:** If the individual's light switches stand to be warm to the touch or an store is sparking, call a expertised the electrician immediately to see if your wiring needs repairs or the fixture should be replaced.
- **Buzzing sounds:** If you hear any buzzing, cracking or sizzling sounds when you flip a switch or plug into an outlet, turn off the power to that fixture immediately and consult a professional electrician.
- **Flickering lights:** Flickering lights usually indicate a power surge. These power surges don't necessarily have to come from a catastrophic event — more than likely, your appliances are making demands on the electrical system that it cannot handle.
- **Broken light switches and loose outlets:** If switches or outlets stop working or work only intermittently, it could be a sign of loose wiring — and another potential fire hazard. Loose outlets also create a potential for electrical shock.
- **Hot ceiling fixtures:** Occasionally check the area around your ceiling fixtures for warmth that could indicate a lack of sufficient insulation. Also, exceeding recommended bulb wattages can cause overheating. Either issue poses a potential fire hazard. Consider switching to compact fluorescent light (CFL) or light-emitting diode (LED) bulbs as these don’t produce as much heat as incandescent bulbs.
- **Circuit breaker problems:** Circuit breakers are designed to trip when a circuit is overloaded. Tripping prevents overheating and eliminates fire hazards. Occasional tripping probably indicates a simple overload, but if it occurs repeatedly, you need to call in an electrician and have them evaluate your entire electrical system.

UNIT 9.4: Standard Practices for Conserving Electricity

Unit Objectives

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

1. Explain the standard practices for conserving electricity

9.4.1 Standard Practices for Conserving Electricity

Renewable energy sources have received plenty of attention in recent years, but the conservation of electricity is also important for sustainability. Nevertheless, the best results are acquired when clean power is combined with energy conservation, reducing the pressure to invest in newer infrastructure.

Environmental Reasons to Conserve Electricity

All systems of power generation have an environmental influence that must be taken into consideration before an investment decision. This is evident while dealing with fossil fuels since their combustion emits a constant stream of greenhouse gases in the atmosphere. The process of construction also has an environmental impact. Some waste materials are unavoidable, heavy machinery releases emissions and the ecosystem is seen to be disrupted.

Practices for Saving Electricity

For an average consumer, saving electricity can be good for the pocket and in turn, it reduces the increasing stress on the environment. Those savings can be diverted to alternative sources of energy like solar panel arrays, especially in a tropical country like India, where seasons are relatively moderate and 'timed'. Some practices and habits changes which would help in saving electricity are:

- Turning down the refrigerator
- Usage of energy-efficient LED bulbs
- Air drying the dishes and clothes
- Cooking under the right-sized burner
- Washing clothes with cold water
- Using window shades to alter sun rays entering the house
- Turning off electrical appliances, fans, lights when not in use
- Using low flow faucets and showerheads

Summary

- Electricity is a basic form of energy observable in a positive and negative form
- The main motivation for saving energy is frequently and simply saving money by decreasing the cost of purchasing energy.
- Energy conservation is broader in comparison to energy efficiency in including active efforts to decrease energy consumption.
- Renewable energy sources have received plenty of attention in recent years, but the conservation of electricity is also important for sustainability.
- All systems of power generation have an environmental influence that must be taken into consideration before an investment decision.
- Electrical equipment involves any machine powered by electricity.

Exercise

A. Answer the following questions briefly.

1. On the basis of conductivity, conductors possess:

   A. Materials whose conductivity lies between 10-6 to 104-ohm m

   B. Materials whose conductivity lies between 104 to 107-ohm m

   C. Materials whose conductivity lies between 10-20-to-10-10-ohm m

   D. None of the above

2. What is the full form of EMF?

   A. Electromotive Force

   B. Electromagnetic Force

   C. Electro mobile Force

   D. Electro massive Force

3. _____ energy sources have received plenty of attention in recent years, but the conservation of electricity is also important for sustainability.

   A. Renewable

   B. Non- renewable

   C. Sustainable

   D. Non-sustainable

4. Energy _____ is broader in comparison to energy efficiency in including active efforts to decrease energy consumption.

   A. Release

   B. Emission

   C. Conservation

   D. Deletion

5. Modern energy efficiency refrigerators use _____ less energy than their conventional models did in 2001.

   a. 50%

   b. 40%

   c. 60%

   d. 90%

B. Answer the following questions by choosing the correct option:

1. What are the classifications for the materials of electricity?
2. What are the three primary electrical parameters?
3. What are the components of electrical equipment?
4. What are the categories of appliances?

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10. Waste Management and Recycling

Unit 10.1 - Types of waste

Unit 10.2 - Waste Management and Disposal Solutions

Unit 10.3 - Pollution and Remedies

SGJ/N1702

Key Learning Outcomes

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

1. List the types of wastes
2. Describe waste management and disposal solutions
3. Explain pollution and its remedies

UNIT 10.1: Types of waste

Unit Objectives

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

1. List the different types of waste

10.1.1 The Different Types of Wastes

Unwanted, trash, rubbish, excess, superfluous, scrap, extra, rework, unused- there are so many synonyms for waste.

There are different types of waste which are recyclable or non-recyclable. Recycling of waste depends on the scientific progression as well knowledge about different kind of waste handling. Below are lists of different type of waste.

Recyclable waste	Non-recyclable waste
1. Concrete 2. Steel 3. Aluminium 4. Plastic (PET) 5. Newspapers 6. Corrugated Cardboard 7. Plastics (HDPE) 8. Glass 9. Mixed Papers 10. Used Motor Oil 11. Used oil from food industry	1. Garbage. Mixture of different of garbage makes it hard to recycle. 2. Food-tainted items (such as: used paper plates or boxes, paper towels, or paper napkins) 3. Ceramics and kitchenware. 4. Windows and mirrors. 5. Plastic wrap. 6. Packing peanuts and bubble wrap. 7. Wax boxes. 8. Photographs 9. Medical waste 10. Polystyrene or Styrofoam 11. Hazardous chemicals and chemical containers 12. Plastic toys or sporting goods equipment 13. Foam egg cartons 14. Wood 15. Light bulbs 16. Yard waste or garden tools

Table 10.1.1: Lists of different types of waste

'Waste' is any unwanted material. These are objects that have been discarded, either because they do not function as intended or are simply not required anymore. Waste can come in many forms: solid, liquid or even gaseous (although it's mostly solid). There are many types of waste, but the two general ones are:

- Municipal Waste
- Hazardous Waste

Municipal Waste

It consists of everyday items discarded by the population. It includes clothes, wires, glass, unwanted food and a multitude of other things. It is further sub-divided into household, commercial and demolition waste.

- Household Waste – Materials like unused food, unwanted paper, empty batteries come under this category.
- Commercial Waste – Waste collected from establishments like businesses, trading factories, schools, etc., comes under this category.
- Demolition Waste – Evident from its name, this type of waste comes from the destruction of buildings or any structure made of concrete, bricks, wood, etc.

Hazardous Waste

It refers to solid, liquid or gaseous waste that has the properties of corrosiveness, ignitability, reactivity and toxicity. Proper disposal and treatment of this waste are necessary as it is unsafe for the well-being and the environment at large. It is further sub-divided into industrial and biomedical waste.

Fig. 10.1.1: Hazardous wastes

- Industrial Waste – Waste produced by industries such as chemicals, pigments, ashes, metals, etc., come under this category.
- Also cafeteria garbage, dirt and gravel, masonry and concrete, scrap metals, trash, oil, solvents.
- Biomedical Waste – Waste coming from medical facilities such as hospitals, medical colleges, research centres etc., come under this category.

  PPE kits also consider as biochemical waste (specially now a days)

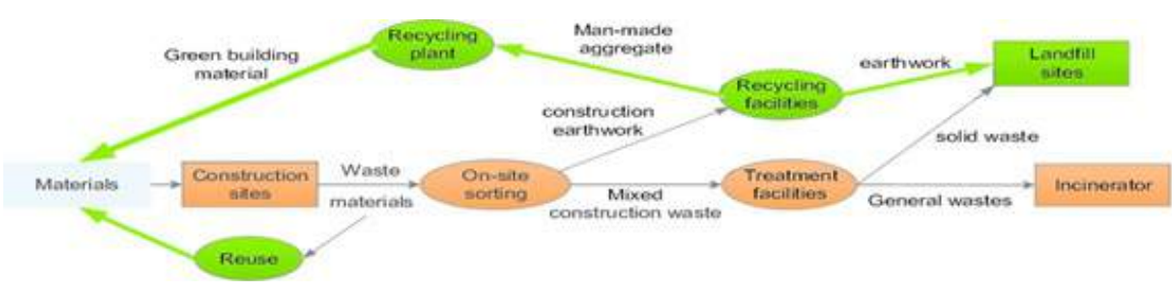

Fig. 10.1.2: Ways to process industrial and biomedical wastes

Significance of Different Coloured Dustbins

Colour coding of waste bin help us to understand which waste can be reuse or recycle and which waste need to dump. It also eliminates the amount waste through segregation process. Disposition process of waste can be defined based on different type of waste. Some waste can be dumped to land fill as it will not impact the soil quality such as food waste (onion, potato skin) as it act as fertilizer whereas industrial waste such as oil, batteries, chemical can't be dumped in land fill as it is hazardous to the soil property. It means if the wastes were separated in the 1st place then it will prevent or reduce any kind of negative impact to the environment due to waste disposition process.

Ideally every place where we discard waste should have three bins.

GREEN – for wet waste, which comes from the kitchen/cooking/food, goes to one bin.

BLUE – Dry recyclable waste such as newspapers, cardboard, packing plastics, bottles, cans, etc., should go to a different bin.

RED – Reject waste, which does not belong to the above two categories, including biowaste like diapers and bandages should go into a third bin.

All over the world, three-way segregation of waste is followed, and it is primarily instituted with some form of colour coding. It works just like the way traffic lights are coded in people's minds.

Govt authorised vendor details for different waste disposal solution-

There are many industries those are known for waste collection and disposal process approved by Indian govt. through registration process.

S No.	Registered PRO	Issued PRO Certificate
1	M/s. Attero Recycling Private Limited, H-59, Sector 63, Noida, UP-201301	11.10.2018
2	M/s. Auctus E Recycling Solutions Pvt. Ltd. A-58, Udyog Kendra-1, Ecotech-III, Village Habibpur, Noida-Dadri Road, Surajpur, Greater Noida (UP) 201306	12.11.2018
3	M/s Earth Sense Recycle Pvt. Ltd., Plot No:37, TSIIC Industrial Park, Mankhal, Maheshwaram Mandal, Rangareddy Dist., Telangana-501359	11.10.2018
4	M/s EPR Compliance Pvt. Ltd., 422, The Summit Business Bay, Andheri Kurla Road, Near WEH Metro Station, Andheri (East), Mumbai-93	12.11.2018
5	M/s Hulladek Recycling Pvt. Ltd., 4 D.L. Khan Road, Block B, Flat-401, 4th Floor, Kolkata-700025	12.11.2018
6	M/s Karo Sambhav Private Limited, 408-409, Fourth Floor, Suncity Business Tower, Sector-54, Golf Course Road, Gurugram-122002, Haryana	29.08.2018
7	M/s Mahalaxmi Metalloys India Private Limited, Plot No. 87, 91/92, Sikhera Road Industrial Area, Modinagar, Dist. Ghaziabad (U.P.)201204	23.10.2018
8	M/s Pegasus Support System Pvt. Ltd, F- 6, 1st Floor, 4648/1, 21, Ansari Road, Daryaganj, New Delhi 110002	14.09.2018
9	M/s Pro Connect, G-7, New Market, Near Khasa Kothi Circle, Jaipur-302016 Rajasthan	12.11.2018
10	M/s R2 PRO Pvt. Ltd., B03-Jain Height-Altura, Kalkondrahalli, Sarjapur Road, Banglore-560102	23.10.2018

Fig. 10.1.3 : Examples of waste collecting vendors

UNIT 10.2: Waste Management and Disposal Solutions

Unit Objectives

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

1. Describe waste management and disposal solutions

10.2.1 Waste Management and Disposal Solutions

Waste management includes the activities as well as actions required to manage waste from its inception to its end disposal. This involves the disposal, collection, transport, and treatment of waste, together with regulation and monitoring of the waste management procedure and waste-related laws, technologies, as well as economic mechanisms.

Proper management of waste is significant for building sustainable and liveable cities, yet it remains a challenge for many developing countries and cities. A large portion of the practices of waste management deal with municipal solid waste, which stands to be the bulk of the waste that is produced by household, industrial, and commercial activity.

Fig. 10.2.1: Waste management and disposal solutions

Turn Away from Single-Use Plastics

A few instances of these include plastic straws, sanitary napkins, take-out containers etc. There are plenty of reusable alternatives to them, like glass and metal straws.

One good manner of doing this is by shopping at bulk stores and zero-waste stores that provide products without packaging. A good practice is to carry around a reusable bag, metal straw and a stainless steel bottle to cut the dependencies on polluting stuff.

Fig. 10.2.2: Waste Management Hierarchy

Conventional Technologies

It is apparent that certain technologies are no longer applicable to modern waste reduction as well as recycling, but some organizations continue to rely on them because they appear to be cheap. However, more technologies are evolving or being created to solve waste management problems. These technologies can be used to recycle or up cycle waste, creates alternatives from products that normally produce more waste, or find a way to address the ever-growing problem of waste management.

There is seen to be plenty of this technology, including plastic-free shampoo pods and toothpaste pills, machines that sustainably remove waste from bodies of water.

UNIT 10.3: Pollution and Remedies

Unit Objectives

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

1. Explain pollution and its remedies

10.3.1 Pollution and Its Remedies

Today, the air is becoming foul, water is no longer clean, and forests are being cut down unscrupulously. Pollution in and of itself is difficult to define. The term is derived from the Latin word "polluere", which means 'to contaminate any feature of the environment. It may be broadly said to be 'adding to the environment a capably hazardous source or substance of energy faster than the environment can accommodate in it.

Methods to Counteract Pollution

Pollution prevention is considered as any action that reduces the number of contaminants released into the environment. Implementation of such processes reduces the severity and/or a number of hazards posed to both public health and the environment. If companies produce less waste, they do not have to worry about proper disposal. Some common methods for controlling pollution are:

- Reducing, Reusing, Recycling and Mitigating.
- Water pollution is capable of being controlled by using non-toxic soaps, detergents and cleaning products.
- Limiting the use of artificial fertilizers and pesticides helps in controlling soil and water pollution.
- Promoting and enforcing the use of biological methods for pest control.
- Chimneys should be longer in length so that polluting air is released high up in the atmosphere where it would not harm the surrounding environment.
- Automobiles should be installed with emission and pollution control systems.
- The timely servicing of automobiles also checks for air pollution.
- Carpooling and public transportation should be encouraged.
- Alternative sources of energy like wind, sun, water, geothermal should be harnessed and put to use.

Summary

- 'Waste' is any unwanted or un-useful material.
- Municipal wastes consist of everyday items discarded by the population.
- Hazardous waste refers to solid, liquid or gaseous waste that has the properties of corrosiveness, ignitability, reactivity and toxicity.
- Waste management includes the activities as well as actions required to manage waste from its in-ception to its end disposal.
- Proper management of waste is significant for building sustainable and liveable cities, yet it re-mains a challenge for many developing countries and cities.
- The biosphere and ecosystem are self-sustaining, and nature maintains a balance between the land, water, air and living organisms.
- The term "pollution" is derived from the Latin word "polluere", which means 'to contaminate any feature of the environment.
- Pollution prevention is considered as any action that reduces the number of contaminants re-leased into the environment.

Exercise

A. Answer the following questions briefly.

1. Which one stands to be a general type of waste?
   A. Commercial waste
   B. Hazardous waste
   C. Household waste
   D. Demolition waste

2. Which one is the type of hydrocarbon-eating bacteria that feed on oil?
   A. Alcanivorax borkumensis
   B. Bacillus
   C. Spirillum
   D. Vibrio

3. _____, reusing, recycling and mitigating helps in pollution reduction.
   A. Reducing
   B. Reinstalling
   C. Redeeming
   D. Reinvolving

4. The Latin term for pollution is _____
   A. pollueme
   B. polluese
   C. polluere
   D. polluete

5. _____ waste comes from medical facilities.
   A. Municipal
   B. Biomedical
   C. Industrial
   D. Commercial

B. Answer the following questions by choosing the correct option:

1. What are the differences between recyclable waste and non- recyclable waste?
2. What are two general types of wastes?
3. What stand to be the significance of the different colored dustbins?
4. Outline the responsible waste management hierarchy.
5. What are the methods for controlling pollution?

Notes

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11. Employability Skills

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Employability and Entrepreneurship Module

12. Annexure

Chapter No.	Unit No.	Topic Name	Page No.	Link	QR Code
Chapter 1: Introduction to Food Processing Sector and the Job of Craft Baker	Unit 1.1	Overview of Food Processing Industry	3	https://www.youtube.com/watch?v=J-2EiMVNtpM&t=15s	
Chapter 1: Introduction to Food Processing Sector and the Job of Craft Baker	Unit 1.2	Introduction to Bread and Bakery Industry	8	https://www.youtube.com/watch?v=mcpVs3CVNIw	
Chapter 1: Introduction to Food Processing Sector and the Job of Craft Baker	Unit 1.2	Orientation Video-	8	https://www.youtube.com/watch?v=OljRVDAM0N0&t=6s	
Chapter 1: Introduction to Food Processing Sector and the Job of Craft Baker	Unit 1.2	Roles and responsibilities	8	https://www.youtube.com/watch?v=1lgTQfNOGsM	
Chapter 3 : Prepare for the Production of Baked Products in Artisan Bakeries and Patisseries	Unit 3.5	Tools and Equipment's used in baking industry	116	https://www.youtube.com/watch?v=zNArOSLoTiY	
Chapter 3 : Prepare for the Production of Baked Products in Artisan Bakeries and Patisseries	Unit 3.4	Overview of the baking process	101	https://www.youtube.com/watch?v=Js8uiPAQ5k0	

Chapter 3 : Prepare for the Production of Baked Products in Artisan Bakeries and Patisseries	Unit 3.3	Storage of Finished product	93	https://www.youtube.com/watch?v=HcI3v1d22CM	
Chapter 5 : Basic Food Safety Standards	Unit 5.1	Food hazard	211	https://www.youtube.com/watch?v=_scyr4DlENA&t=97s	
Chapter 5 : Basic Food Safety Standards	Unit 5.1	Allergen contamination	211	https://www.youtube.com/watch?v=sbNDnODWTbA	
Chapter 5 : Basic Food Safety Standards	Unit 5.2	Food intolerance and allergies	221	https://www.youtube.com/watch?v=_JrsKqORzDo	
Chapter 5 : Basic Food Safety Standards	Unit 5.3	Audit and Documentation	229	https://www.youtube.com/watch?v=3QuKCYfHHow	
Chapter 5 : Basic Food Safety Standards	Unit 5.4	Food alert, Food traceability and food recall	239	https://www.youtube.com/watch?v=w0oA7lRBUf4	
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