







# Partcipant Handbook

Sector Food Processing

Sub-Sector **Generic** 

Occupation

Research and Development

Reference ID: FIC/Q9301, Version - 1.0

**NSQF Level: 5** 



**Food Product Developer** 

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If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi Prime Minister of India







### Certificate

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### FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE SECTOR SKILL COUNCIL

for Food Processing

### SKILLING CONTENT - PARTICIPANT HANDBOOK

Complying to National Occupational Standards of Job Role/Qualification Pack: <u>Food Product Developer</u> QP Nos <u>FIC/Q9301 Level 5</u>

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The preparation of this participant Handbook would not have been possible without the support of the Food Processing Industries. The Industry feedback has been extremely encouraging from inception to conclusion & it is with their inputs that we have tried to bridge the skill gaps existing today in the Industry.

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

### **About this Book** -

This Participant handbook is designed to enable training for the Qualification Pack (QP) for Fruit Pulp Processing Technician with Reference ID: FIC/Q0106 published by Food Industry Capacity Industry and Skill Initiative (FICSI).

This course encompasses all National Occupational Standards (NOS) of the Qualification Pack, Fruit Pulp Processing, Reference ID: FIC/Q9301. Each NOS is covered across one unit/s. This book is designed for upgrading the knowledge and skills for working as a 'Food Product Developer' in the Food Processing Industry. This book will provide the necessary knowledge and skill inputs for a Fruit Pulp Processing Technician to work in an organized and the disciplined manner and following safe working practices, effective communication, documentation, and work ethics as well as production work, ensuring preparation and maintenance of work area along with the required machinery. Upon successful completion of this course the participant will be able to:

- 1. FIC/N9301: Prepare recipe formulation and guidelines for product development
- 2. FIC/N9302: Perform tasks for product development
- 3. FIC/N9904 Ensure Food Safety at the Workplace
- 4. FIC/N9903 Ensure Workplace Health and Safety
- 5. FIC/N9902 Work effectively in an organization
- 6. SGJ/N1702 Optimize Resource Utilization at the Workplace
- 7. DGT/VSQ/N0101: Employability Skills

# **Symbols Used**



Key Learning Outcomes



Unit Objectives



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# Introduction to the program and Overview of the Food Processing Industry

Unit 1.1 - Introduction to the Training Programme

Unit 1.2 - Introduction to the Food Processing Industry



# **Key Learning Objectives**



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

- 1. State the importance of an Food Product Developers in a food processing industry
- 2. Discuss the roles and responsibilities of a Food Product Developer in a food processing industry

# **UNIT 1.1: Introduction to the Training Programme**

# **Unit Objective**



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

- 1. Explain the roles and responsibilities of a Food Product Developer in a food processing industry.
- 2. Discuss the future trends and career growth opportunities available to a Food Product Developer.
- 3. Discuss the significance of a Food Product Developers to ensure smooth operations in the food processing industry.
- 4. List various food product development activities that are performed in the job.
- 5. List the various terminologies used in carrying out food product development activities in food processing industry.
- 6. Discuss the organisational policies to be followed pertaining to the delivery standards, health, safety and hazard handling procedures, integrity, dress code, etc.

# 1.1.1 Purpose and Benefits of the Training Programme

This training programme is developed to impart specific skills to individuals who wish to be an Ice

Cream Processing Technician. The training programme is based upon the National Occupational

Standards for the food processing sector. The National Occupational Standards have been described in the following subsection of this chapter.

the following subsection of this chapter.

The training programme will enable an individual to:

- Prepare recipe formulation and guidelines for product development
- Perform tasks for product development
- Ensure Food Safety at the Workplace
- Ensure Workplace Health and Safety
- Work effectively in an organization
- Optimize Resource Utilization at the Workplace

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



Fig. 1.1.1. Skill cards

# 1.1.2 Introduction to QP and NOS

This training programme is intended for imparting basic skill and knowledge relevant to the job role, required to perform at a food processing industry. This programme is based on qualification pack called Food Product Handler. The Qualification Pack Code for an Food Product Handler. is

FIC/Q9301. This is also called a QP.

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

Under Food Product Handler QP, there are five NOSs which detail the functions to be performed at work site as an Food Product Handler.

NOS Code	Major Function/Tasks
FIC/N9301	Prepare recipe formulation and guidelines for product development
FIC/N9302	Perform tasks for product development
FIC/N9904	Ensure Food Safety at the Workplace
FIC/N9903	Ensure Workplace Health and Safety
FIC/N9902	Work effectively in an organization
SGJ/N1702	Optimize Resource Utilization at the Workplace

# **UNIT 1.2: Introduction to the Food Processing Industry**

# - Unit Objective



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

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

## **1.2.1 Food Processing**

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

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

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



Fig. 1.2.1. Sub-sectors of food processing industry

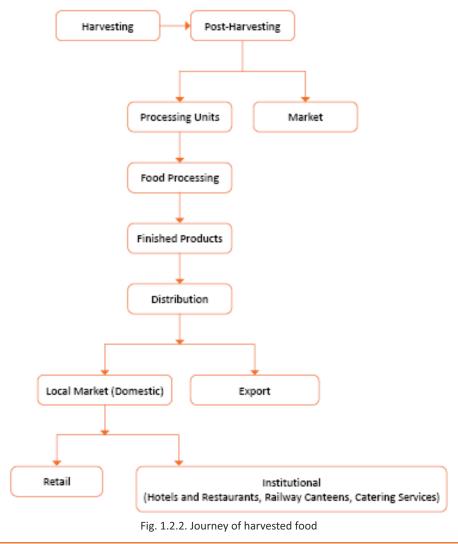
The Indian food industry is a star sector in India with a bright prospect for growth and development. Indian food and grocery market is the sixth-largest in the world. Food industry, particularly the food processing sector in India, has shown immense potential due to its quick-paced growth. Food processing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

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

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

# 1.2.2 Journey of Food from Harvest to Consumer

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



# 1.2.3 Roles and Responsibilities

The following table provides detailed information about the roles and responsibilities of an Food Product Developer:

Roles	Responsibilities
Handle raw material from the timeof	Check the raw material for quality
receipt tillit reaches the process line	Ensure minimum loss of raw material
Record-keeping and documentation	Document and maintain records of raw materials, productionschedule, and process
	Document and maintain records of finished products
Hygiene and sanitationmaintenance	Adopt safety and sanitation-elated measures
	Follow food safety norms and practices
Operate equipment and machineries	Optimisethe use of machinery
	Ensure smooth operation of machinery to complete productionline
Inspect machines and troubleshoot issues	Atend to minor repairs of tools and machinery when required
	Ensure that safety rules and regulations are observed
	Prevent accidents
Plan and execute the producton	Examine products at different stages of prroduction
process	Adhere to Good Manufacturing Practices(GMP)
	Inspect intermediate as well as finished products
	Achieve good quality products of the correct quantity
	Ensure the products meet the quality standards set by the organisation
Follow storage and packaging norms	Ensure safe and proper storage of raw material, packing material, and finished goods

Table 1.1.1: Roles and responsibilities

# **Exercise**

### Fill in the blanks with the correct option.

1.	Food	is an import	ant method	to store f	ood prod	ucts for	longer period:	s of time.

I. preparation

ii. preservation

iii.consumption

iv. allocation

2. Journey of food from harvest ultimately reaches the .

I. consumers

ii. bankers

iii. builders

iv. packers

3. Food Product Developer is responsible for handling raw material from to process line.

I. post production

ii. pre production

iii. receipt

iv. delivery

4. Is the backbone of the Indian economy.

I. Agriculture

ii. Fishing

iii. Mining

iv. Meat and Poultry

5. Sub-Sector Produces Juices, Jellies, Pulps, Pickles, Jams etc.

I. Dairy

ii. Grains and cereals

iii. Fisheries

iv. Fruit and Vegetable processing

6. Workplace ethics are set of that are followed to ensure smooth and effective functioning of a workplace.

I. guidelines

ii. rules

iii. principles

iv. standards

7. Food Product Developer must follow at all times.

I. food spoilage norms

ii. food safety norms

iii. food breakage norms

iv. food control norms

8. Sub-Sector produces whole milk powder, skimmed milk powder, condensed milk, ice-cream, butter and ghee, cheese, etc.

I. Consumer foods

ii. Grains and cereals

iii. Fisheries

iv. Dairy

9. Ice cream technician does not compromise with the of the product at any given cost.

I. quantity

ii. quality

iii. quantity and quality

iv. characteristics

### Scan the QR Code to watch the related video



https://www.youtube.com/watch?v=J-2EiMVNtpM

https://www.youtube.com/watch?v=5VIYw38hCxU

Scope of food processing in India with National and International perspective

Overview of Food Processing Industry









# 2. Recipe formulation and scale up process guidelines for product development

Unit 2.1 Recipe Formulation

Unit 2.2 Scale up Process

Unit 2.3 Develop new guidelines



# **Key Learning Objectives**



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

- 1. List the pre-requisites for new product development process
- 2. Perform tasks related to scale up process

# **Unit 2.1 Recipe Formulation**

# - Unit Objective 🏻 🏻



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

- 1. Discuss the information to be obtained from the consumer and market research data received from the marketing team
- 2. Describe food processing methods i.e. cooking, baking, roasting, drying, freezing, etc
- 3. Describe various sensory parameters i.e. taste, texture, smell, appearance, etc. and their impact on the food product
- 4. Describe standardized weights and measures, weight range of package and recommended maximum scale of interval for a food product

# 2.1.1 Market Trends, Consumer Preferences and **Expectations**

Food product development entails more than just perfecting a recipe. Food manufacturers should plan extensively, labor hard, and conduct considerable research to generate innovative food products. Before embarking on a new development effort, it is critical to establish defined objectives and schedules that incorporate the business's future orientation.

Companies develop new products hoping to gain more new customers, expand into new geographic markets, maximize profits, build brand excitement, and increase market share. Every day, a rush of new food products enters the market, vying for the attention of consumers. Some of the motivations for the development of new food products are as follows:

- a. Innovative inventions
- b. A customer's demand due to change of lifestyle, healthy living
- c. Loss in the current market
- d. Market Instability

The role of food scientists in the conceptual process of new product development differs across the sector. Regardless of direct engagement, it is vital to be conscious of market trends, consumer preferences, and expectations to generate a new and successful food product.

Market research serves a purpose at each stage of a product's lifespan. It is the most significant component in defining an approach to product creation, from discovering and developing needs to testing products and enhancing their performance to identifying their role in the immediate and distant future.

Marketing research and current trends play a significant role in enabling food product development. Before actually drafting out any prototypes, it is vital to assess and investigate the market to determine a target audience, a purpose for the product, and what challenges it would address. There are two common types of market research techniques:

- 1. Primary Market Research
- 2. Secondary Market Research

### 1. Primary Market Research

Primary market research is a method that collects information by using direct and primary sources because it involves an in-depth analysis of some particular problem or issue. A Marketer often looks for primary data that is tailored to their goals. The approach taken to gather primary data depends on the volume and kind of information the business is interested in. While some businesses opt to do their own research, others might spend money on third-party studies. Two types of information are commonly gathered when conducting primary research:

- I. Exploratory: In-depth interviews with a single person or a small group are frequently conducted as part of this wide and open-ended research project.
- II. Specific: This research is more accurate, and is used to solve a problem identified in exploratory research. It comprises more structured, formal interviews.

Some of the most common primary market research methods are as follows:



Fig 2.1 Primary Market Research Methods

### a. Interviews

Interviewing relevant industry leaders about their successful initiatives, rivals, and business methods is a good way to gather primary data.

### b. Surveys

A survey consists of a set of both open-ended and closed-ended questions that are given to respondents digitally, either via email or using survey software that gathers responses automatically. For more information, see this article on survey questions. Survey questions might vary, therefore it's crucial to use the proper one for your objectives.

### c. Focus Groups

When time is limited, this method works well for gathering many people's opinions at once, but it has management problems of its own. The interviewer must plan a strategy for gathering responses and recording them while conversing with a large number of people. The main objective of a focus group is to gather information regarding what participants like or dislike about the product or service.

### d. Monitor Social Medias

Marketers can acquire information about pertinent talks in online channels by using social media monitoring. A business can better understand trends and consumer behavior by tracking how frequently certain words or phrases are used in social media posts. Websites including social networking platforms, review sites, news sources, blogs, and forums are helpful for this kind of research.

### 2. Secondary Market Research

Secondary market research also called desktop research is the utilization of data that has already been gathered, examined, and published. This data is gathered from public sources such as websites, periodicals, or other literature. When acquiring secondary data, it's crucial to confirm a source's reliability before using its data. If a marketer decides to conduct both primary and secondary research, starting with secondary research makes the shift to primary research simple.

Throughout the food product development process, food product researchers establish customerproduct interaction. The marketing team analyses the market and designs marketing and distribution techniques.



Fig. 2.2 Benefits of Market Research for Food Product Development

### **4Ps of Marketing**

The four fundamental pillars of any marketing plan are summarized by the phrase "the four Ps of marketing."

The four Ps of marketing are:

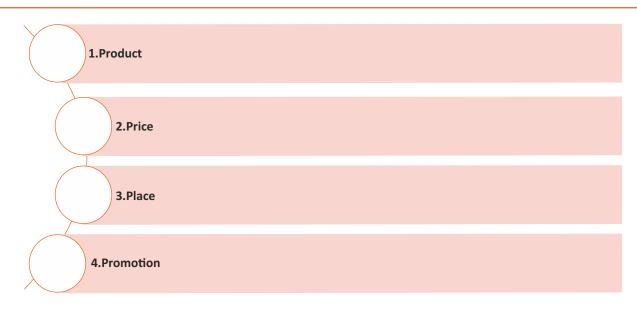


Fig 2.3 Four Ps of Marketing

### 1. Product

The object produced to meet the wants of the consumer can be tangible or intangible. A tangible good could be anything, including a smartphone, clothing, art, etc. A service, a legal consultation, a medical consultation, etc. are examples of intangible goods. Marketers need to be aware of what the product involves for the customer as well as the business. They must be well-versed in the product's Unique Selling Proposition (USP), which will serve as a significant differentiator from the rest of the rivals, as well as its most coveted attributes, among other things. The better a marketer understands a product, the better able they will be to satisfy the needs of the target market. The following are the few questions that marketers need to find answers for:

- I. How is your product going to help your customers?
- II. Will your product fulfill their needs fully?
- III. What are the most important features of your product?
- IV. Are there any features that your product has missed out on that should also be included?
- V. How do you see your customers using your product?
- VI. What will your customers experience while using your product?
- VII. How can they take full advantage of your product?

The market's demands should be satisfied because that is the most crucial thing a product should perform. The product should be so alluring that consumers are led to believe that it is exactly what they were seeking, even if there is no market in the first place.

### 2. Price

Price is the second P in the 4Ps of marketing. What does a product's price indicate? It establishes the product's worth to the intended market. You will be able to draw customers to your product if the pricing is determined by the value it offers, whether that value is actual or perceived. The value of the product must be understood by your target market. Only then will they be purchasing it. Below are some questions that marketers need to ask to set product pricing:

I. How much will the customers be willing to pay for the product?

- II. What is the maximum that customers would be willing to pay for this?
- III. How much do the competitors who make similar products charge?
- IV. Which way do customers perceive the brand?
- V. How price-sensitive are the customers?

### 3. Place

In marketing, the market is what is meant when we talk about a place. The location of the product's sale is just as crucial as the other 4Ps of marketing. The location determines the type of customers that will use the product and how it will be delivered. A marketer's main objective is to bring the product in front of their target market. You must sell your goods where your target market is present. The greater the distance or difficulty in connecting with you, the greater the friction. Your clients will eventually look for a product that is simpler to purchase.

Here are some questions that a marketer needs to ask to get to the right place:

- I. Who is my ideal customer?
- II. Where can I find my ideal customers?
- III. What are the channels that they mostly use?
- IV. What are the strategies used by my competitors to seek out customers?
- V. Which is the most used channel by my customer, and how best can I leverage it?

### 4. Promotion

The promotion also has a special role in the 4Ps of marketing. It explains to the final customer why they require the product and why they should allocate money to purchase it. The following phase is to maximize your marketing efforts, also known as promotion after you have the other 3 Ps of the 4Ps of marketing prepared. Earlier businesses used mass marketing tools like TV ads, billboards, radios, pamphlets, and so on to capture the attract the attention of their target market. Nowadays internet and digital tools are widely used for product promotion. Here are some questions that a marketer needs to ask to get their product promotion:

- I. What are the channels used by our prospective customers to consume information?
- II. How will you send your marketing messages to your target market?
- III. What are the methods that attract the attention of our end consumers?
- IV. Which kind of brand voice should I use when getting in touch with my prospective customers?
- V. What are the tactics used by our competitors to get the attention of the consumers?
- VI. Which is the best way to promote your product?
- VII. What are some low-effort but high-value promotional tactics that we can use in our niche?
- VIII. When is the best time to promote?

### **New Product Development Research**

New product development is crucial for every organization to stay competitive within the market. While the process can be difficult and protracted, new products and services help businesses develop and broaden their market reach. This kind of market research is crucial because 40% of new items never reach shelves. Organizations must decide wisely based on the actual market potential and customer

insights in order to ensure that the time and money invested in new product development don't go to waste. Project teams receive these insights via market research, which also directs all product development and design activities.

### Importance of New Product Development Research

The "wants" and "needs" of a target audience are prioritized by research, which also records client preferences and enables your business to comprehend the end-user experience. In the end, market research is essential for determining market demand and ensuring that the finished product satisfies user requirements throughout the product development process. Although the end-user is often the focus of most market research, other stakeholders must also be considered. The below audience should be included in the market research through any of the research methodologies:

- I. Sales representatives
- II. Leadership teams
- III. Customer support teams
- IV. Distributors
- V. Engineers
- VI. Marketing teams

Different Phases of New Product Development

Different phases involved in new product development are as follows:

Phase 1: New Product Idea Generation (Exploratory Research)

**Phase 2:** New Product Concept or Prototype Testing Research

Fig 2.4 Different Phases of New Product Development

### Phase 1: New Product Idea Generation (Exploratory Research)

Exploratory research is one of the most crucial elements in new product development, it adds value even when a company is in the initial phases of concept testing. This kind of study helps to determine the level of client satisfaction today and offers guidance for enhancing and selling already-available goods and services. The major objective of this study is to understand the market's general demands and find new chances for your company's products or services.

The following queries are addressed by exploratory research?

- I. What is the awareness of products available on the market?
- II. Are customers satisfied with the products available?
- III. How could products on the market be improved?
- IV. What new products/features is there interest in?
- V. What are the customer needs? What needs are not being met?

- VI. What type of customer would be most interested in a new product?
- VII. What does the decision-making process for buying the product look like?

### Research options available for new product idea generation are as follows:

- I. Voice of the Customer (VoC)
- II. Ethnography/Observational Research
- III. In-Depth Interviews
- IV. Focus Groups
- V. Online Surveys
- VI. Competitive Assessments

### Phase 2: New Product Concept or Prototype Testing Research

An organization has determined a market need after performing exploratory research (officially or informally), and is preparing to create a new product that customers will find appealing. Having your target audiences review the new product and make sure it satisfies their needs is the primary objective of new product testing research. After all, 70 to 80 percent of items will fail even before they are released. Yikes! You don't have to be that. Before a product is finished and released to the market, there may be alterations that need to be made, according to this research. Through marketing insights, it can also assist in directing the product launch.

What questions do new concept research answer?

- I. What do customers like about the concept/product?
- II. How could the product be improved?
- III. What would the customer use our product for?
- IV. What features/specifications are the most important?
- V. How likely would customers be to purchase the product?
- VI. How much would customers pay for this product?

Research options available for prototype testing are as follows:

- I. Voice of the Customer (VoC)
- II. IHUTs (In-Home Usage Testing)
- III. In-Depth Interviews
- IV. Focus Groups
- V. Online Surveys

**Product Development Research Steps** 

Steps to get started with product development research are explained below:

### Step 1: Set the Objectives

This first action is crucial. Before you begin your IHUTs, you should thoroughly discuss and comprehend a number of things.

Consider what you hope to learn from the study. What do you anticipate? What steps are you going to take?

Also, take into account the audience you want to test your product on. What are the demographics and features of this group?

How long should the testers test the product? These are all important factors that influence your hiring process and screener.

### Step 2: Determine the Scope

The scope is determined by numerous factors and many of these overlaps with objectives.

Answer questions like:

- I. Whom do you want to target?
- II. How long will the test run?
- III. What are the steps and instructions involved in the test?

If you are sending your product to participants to test things at home, you should be as specific as you can when it comes to product testing. For example, suppose your business sends a client some dish soap and asks them to download an app to keep a diary of their use and feedback over the course of a month.

The scope may need to include instructions during shipping such as:

- I. Instructions to download the app
- II. Instructions to register a free account
- III. Instructions to open and record feedback in the diary
- IV. How often to test the product
- V. Whom to email or call with questions

### Step 3: Find a Market Research Partner

Recruitment is the most time-consuming and difficult aspect of new product development research (both qualitative and quantitative). In terms of identifying test subjects or survey participants for a bigger study, this is recruiting.

### **Research Methodology**

Each phase of the nal research strategy is determined by a number of variables, including:

- I. The accessibility of the potential market
- II. The type of product
- III. The overall budget

New product research typically includes:

- I. Quantitative research provides statistically reliable findings.
- II. Qualitative research which provides detailed feedback.

### **Types of Product Development Studies**

There are a number of studies you can run during the product development journey, each of which focuses on a different aspect of the brand and product. Focus groups, interviews, and surveys are a few

of the various methods that can be used to conduct these studies. Surveys are the best method to collect both quantitative and qualitative data from a larger audience. Different types of product development studies are explained below:

### a. Customer Experience

Customer experience research is one of the finest ways to obtain comprehensive customer input about the product, marketing plan, and brand. The best time to conduct this study would be around the conclusion of the product development cycle or after the product has been released; you'll want to make sure that customers have had a chance to use the product before offering feedback. An essential component of customer experience that shouldn't be overlooked is understanding customer loyalty and the value they place on your product and brand. It is considerably simpler to retain current customers than to find new ones.

### b. Concept Testing

Concept testing is the process of finding out what your target market thinks of your idea before it is completely developed or made public. Prior to the creation of the product, you can modify your vision and features.

### c. Competitor Research

Become more competitive by utilizing the competitors' weaknesses to your strengths. Consider why should customers choose your products over your competitors. Set a fair price for your products. Remember that the market is constantly shifting as well. After the launch of a new product, keep conducting research. To stay ahead of the game, be up-to-date with market trends and the competition.

### d. Pricing Research

Pricing research is an important step in product development. It might be difficult to choose the ideal price; you need to find a price that is both high enough to generate a profit and cheap enough to maintain demand. To do this correctly, you must look at the prices of your rivals, determine your price premium, and learn what consumers are prepared to spend.

**Customer preferences** captured through research allow a better understanding of the end-user experience and prioritize the target audience's "wants" and "needs." A diversity of influencers play a significant role in customers' decisions to buy or reject a food product. **Religion, race, age, non-religious beliefs, and personal experiences** all affect consumers. Food product producers must understand their target markets to match consumer expectations for creating food products. Before development, it is critical to understand the constraints of some diets.

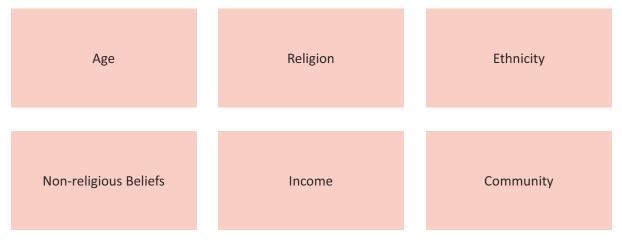


Fig. 2.2 Factors Affecting Consumer Preferences for Food Product Development

### **Religion and Dietary Preferences**

In religion, food is one of the most significant parts of religious ceremonies. There are many religions with dietary restrictions and food traditions. Since many of these religions uphold religious rules, food is cooked differently and plays a significant part in religious culture as a means of demonstrating respect among their communities. Dietary preferences for different religions are explained below:

### a. Islam

Muslims consume only halal (permissible) foods, such as fruits, vegetables, and eggs. They must only consume meat from halal-slaughtered animals, as well as any meat products. Depending on the ingredients, cheese may be halal. Milk and dairy products are halal. Careful sourcing is necessary since there are worries that not all beef marketed as halal is genuinely halal.

Pork, crustaceans, blood, non-halal animal-derived additives like gelatin or suet, alcohol, and any foods containing alcohol are examples of haram (forbidden) foods.

Ramadan, the ninth month of the Islamic calendar, is a time when Muslims are supposed to fast and abstain from eating, drinking, and using any medication between sunrise and sunset. Pregnant ladies, breastfeeding or menstruating women, children under 12 years, older people, and chronically or acutely ill people are exempt from fasting.

### b. Hinduism

Hinduism is a multifaceted religion with multiple scriptures and holy text. Although some Hindus may eat lamb, poultry, or fish, the majority of Hindus are Lacto-vegetarians (avoid eating meat or eggs). Since cows are revered as holy animals, beef is never consumed, but dairy products are. Lard and dripping are examples of animal-derived fats that are prohibited. Hindus who belong to the Brahmin class are subject to additional rules regarding who can prepare and store their food. Although some Hindus may eat lamb, poultry, or fish, the majority of Hindus are Lacto-vegetarians (avoid eating meat or eggs). Since cows are revered as holy animals, beef is never consumed, but dairy products are. Lard and dripping are examples of animal-derived fats that are prohibited.

### c. Christianity

There are many different varieties of Christianity, but certain of them, in particular, include dietary restrictions.

- I. Catholicism: Devout Catholics observe many holy days and times when they fast. For instance, during Lent, meat is not permitted on Fridays. Additionally, Good Friday and Ash Wednesday also call for fasting.
- II. Eastern Orthodox Christians: There will be weekly fasts that call for avoiding alcohol, olive oil, eggs, dairy, seafood, and meat. Other fasts are longer and more restrictive in what they allow as meals.
- III. Seventh-Day Adventists: They are called lacto-ovo-vegetarians. They will consume some animal products, such as dairy and eggs, but they avoid consuming wine, fish, poultry, and other types of meat.

### d. Buddhism

Buddhism does not specifically restrict any particular food or food preparation, but it does have tenets that are interpreted and adhered to in many areas of daily life, including food preparation and consumption. Buddhists adhere to the do no harm principle. This has been construed as supporting a vegetarian lifestyle. Buddhists are most likely to practice Lacto-vegetarianism, which permits dairy and other animal products but forbids meat. If the animal was not slain for consumption, Theravada, a

branch of Buddhism, does permit the ingestion of pig, poultry, and fish; nonetheless, consumption ultimately proves to be the most respectful method to utilize the entire animal after death.

### e. Sikhism

Some Sikhs are vegetarian. Faith gives each person the freedom to choose whether to consume meat. Sikhs do not eat halal or kosher meat since it is against the law to consume meat from animals killed in accordance with religious laws. Alcohol is not consumed by Sikhs.

### f. Jainism

Jainism adheres to strong guidelines for the preservation of all life and the practice of nonviolence. They avoid eating eggs, fish, meat, and poultry as a result. They also stay away from most root vegetables because they frequently kill the entire plant in order to collect the root. Additionally, honey is not allowed because it exploits honeybee labor and frequently causes harm to bees during collecting. On certain holy days, people observe fasting. The longest and most well-known, Paryushan, lasts for eight days. Since green and raw vegetables are thought to be more alive than simple grains, they are frequently prohibited during these fasts, and people only consume the food before sundown.

### g. Judaism

Kosher is the term for the religious dietary laws that specify what can be consumed by practicing Jews. Kosher foods are made in accordance with stringent regulations that apply to every step of the supply chain, from harvest and slaughter to preparation, packing, and food combinations. The prohibition of pork and shellfish is well known. Food traditions and additional restrictions apply during religious holidays.

The three Jewish holy days of Yom Kippur, Passover, and Rosh Hashanah are among the most well-known. On these holy days, as well as other holy days throughout the year, food traditions and limitations are particularly important.

The research led by the marketing team gathers as much information as possible on target market members through different methods, including interviews, social media research, email surveys, and more. Then divide them into demographic groups and construct a complete persona for each. By collecting demographic data, food product developers can develop a better understanding of the opportunities and constraints for obtaining customers. It could include demographic information like age, money, and family.

What is the awareness of products available on the market?

Are customers satisfied with the products available?

How could products on the market be improved?

What new products/features is there interest in?

What are the customer needs? What needs are not being met?

What type of customer would be most interested in a new product?

What does the decisionmaking process for buying the product look like?

Fig. 2.4 Research Questions Food Product Development

### Role of Marketing Agency

A marketing agency is a group of skilled people, or marketers, who cooperate to help a client increase user experience and attract customers through a variety of media. They start customer-focused marketing efforts to spread awareness of their company or brand, create differentiation in the marketplace, and draw in new customers. Of course, the purpose of marketing initiatives is to boost sales. These businesses can also serve as consulting firms and provide marketing strategy advice. The different roles of a marketing agency are as follows:

### a. Consulting

The success of every business depends on thorough study and analysis of the target market, including its demands, competitors, and other factors. In order to assist an organization prepare for the market, a marketing agency will do a thorough investigation and provide new strategies that will increase the business profit.

### b. Branding

Marketing agencies can also assist a business to create the right image for its brand or product so that it attracts potential buyers and converts them into loyal customers.

### c. Attracting Clients

One of the first steps in effective marketing is finding techniques to attract the target audience and finding ways to direct them to your business. In order to create tactics to draw clients, a marketing agency will start by determining corporate objectives and target audiences.

### d. Managing Accounts

Once a business has begun advertising, a marketing agency may assist with managing its current accounts and developing marketing calendars to distribute the appropriate materials at the appropriate times.

### e. Planning Media

Marketing agencies can make sure that their products are distributed to the appropriate channels at the appropriate time by developing new media and establishing plans to improve their existing media.

### f. Overseeing public relations

The way the public notices a brand is crucial. Events and communications in public relations can be organized and managed by a marketing agency.

### g. Performing Competitive Research

A marketing agency can conduct in-depth research on competitors to determine the strength and weaknesses of an organization over its competitors. Once they've analyzed the data, they can assist with implementing new strategies.

### Importance of Marketing Case Study

A marketing case study is a story you tell that reveals how you assisted previous customers and how your business was successful. This is done to attract potential customers who are already thinking about using your services. Your potential consumers can learn more in-depth, more intimate information about your customers by employing case studies. Additionally, by demonstrating how you have benefited former clients, you assist new customers in making wise purchasing selections. The below points should be considered while making a case study.

- I. Who was the customer?
- II. What was their need and what goal did they have?
- III. Are they typical customers?
- IV. What did you do to meet their need and help them achieve their goal?

New Coke Marketing Case Study

Coca-Cola is a forward-thinking company that controls one of the most iconic brands in history. Management made the decision to use a new formula to reestablish its leading position in the 1980s. The company introduced reformulated coke often referred to as "new coke" marking the first formula change in 99 years. This was undoubtedly a huge decision, and as a market research powerhouse, it was risk-free. In order to determine how consumers would rate the new flavour in comparison to Pepsi's competition, it invested \$4 million in development and conducted over 200,000 taste tests across the US. These experiments also indicated that New Coke would be a success.

However, management committed a number of errors. In a classic instance of confirmation bias, they tended to give greater weight to opinions that were positive in focus groups and ignore those who voiced concern that a change would make them less interested in the brand. They disregarded brand criticism that was emotionally charged. Additionally, they put too much emphasis on Pepsi's uniqueness as it had long positioned itself as the sweeter product.

One major mistake was performing sip testing rather than investigating how consumers would feel after consuming the entire can of the sweeter recipe. However, by focusing more narrowly on their research and ignoring the context for consumption, they launched a product that completely alienated people from the brand.

Therefore, failing to perform market research was not a mistake. It was a failure to use acceptable procedures and conduct research objectively. Management wanted evidence to support their choice, not assurance that it was the right one.

# **2.1.2 Various Food Processing Methods**

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 levels of food processing.

### **Primary Food Processing**

- Conversion of raw agricultural produce, milk, meat, and fish into a commodity that is fit for human consumption
- Example Cleaning, grading, sorting, packing, etc.

### **Secondary Processing**

- Conversion of ingredients into edible products -
- E.g. Preparing of orange juices from oranges

### **Tertiary Food Processing**

- Commercial production of what is commonly called processed food
- E.g. Ready-to-eat (RTE) or heat-and-serve foods

Fig 2.5 Level of Food Processing

There are various techniques for food processing. Some of the most common methods are as follows:

### **Common Food Processing Methods**



**Drying** 

 Drying refers to the removal of a small amount of moisture from a solid or nearly solid material by evaporation to a predetermined level. Drying involves heat and mass transfer operations—and complete removal of moisture content to bone dry condition.



Sorting

 Sorting, and grading ensure the removal of an inferior or damaged commodity. The sorting of products based on weight, shape, line capacity, and more is easily achieved and can significantly increase the output.



Concentration

 The concentration method is typically used as a pre-treatment to lower the initial moisture content of various commodities such as milk, tea, or coffee before final dehydration in a spray or freeze dryer.



**Pickling** 

 Pickling is the process of preserving fruit and vegetables in salt and vinegar. Pickles may be prepared in two ways; without fermentation or with partial or complete fermentation. Spices, edible oil, sugar/jaggery, etc. are also added to improve the taste and palatability of the product.

Continued...

### **Common Food Processing Methods**



**Asceptic Sterilization** 

 Aseptic Sterilization is the processing and packaging of sterile liquid into sterilized containers followed by airtight sealing with a sterilized closure. This process prevents viable microbiological recontamination in the food product.



**Pasteurization** 

 Pasteurization is a process in which the products are treated with mild heat, usually to less than 100 °C (212 °F), to eliminate pathogens and extend shelf life. The process is intended to destroy or deactivate organisms and enzymes that contribute to spoilage or risk of disease, including vegetative bacteria, but not bacterial spores.



**Aeration** 

 The process of adding very small pockets of air to something is known as aeration. In the case of fats and oils, this is typically accomplished using mechanical or physical techniques, such as creaming a combination with a wooden spoon or an electric whisk.

Continued...

# **Common Food Processing Methods**

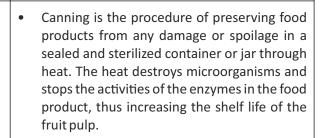


Blanching

 Blanching is a food preparation method in which food is briefly immersed in hot liquid, for e.g. boiling water, often but not always as a prelude to cooking it further. Fruits, vegetables, are frequently blanched for pickle and paste making. Sometimes it is used for softening, or to loosening of the skin to make peeling it easier, or simply to brighten its color of it.



Canning





**Mixing** 

 Mixing is the process of combining two or more different components to produce a homogenous product. It is often associated with combining solids with a large quantity of liquids or liquids with liquids.

Continued...

# **Common Food Processing Methods**



 Baking is the process of preparing food using dry heat, typically in an oven, which can also be done on hot stones or in hot ashes. The most common baked food item is bread although many other dishes can also be baked.

**Baking** 



• Extrusion is the technique of forcing soft, combined ingredients through a hole in a perforated plate or die that has been created to generate the desired form.

**Extrusion** 



 Fermentation is the process of converting carbohydrates to alcohol or organic acids using microorganisms such as yeasts or bacteria—under anaerobic (oxygen-free) conditions. It is an ancient method of preserving food. This process is used to produce wine, cheese, sauerkraut, yogurt, and kombucha.

Fermentation



Dehydration

 Dehydration is the process of preserving food items for unspecified periods by extracting moisture, thereby preventing the growth of microorganisms. Foods can be dried in a number of ways, including the sun, an electric dehydrator, a regular oven, a microwave (just for herbs), air drying, and solar drying.

Table 2.1 Various Food Processing Methods

# 2.1.3 Recipe formulation

A recipe is a set of instructions for preparing and making a certain meal, dish, or beverage. A recipe's goal is to keep a detailed record of the materials used, the amounts required, and how they are combined.

The activity of producing, designing, or developing food products to offer some utility is known as **recipe formulation.** The functionality might range from giving additional nutritional benefits to dietary supplements in addition to the food's primary purpose.

Certain food products contain ingredients that increase the intake of sugar, sodium, fat, and additives. Food product formulation can generate public health concerns, and consumers should be made aware of this on product labels. Due to the variety of available ingredients, procedures, and the emphasis placed on nutritional content, processed foods are becoming increasingly sophisticated. Numerous nutritious additives are currently being added to products and processes to improve their quality and stability.

Finding **existing formulations and recipes** and then changing and modifying them as needed is typically the simplest method to start when developing a new recipe formulation for a food product. Food product developers should research ingredient consumption levels, especially if specialized or industrial components are required (gums, modified starches, etc.). They must seek parallels and variances in existing recipes, formulations, and processing instructions. It is also essential to consider the ingredient's functioning and the objective of the processing methods to select the optimal starting points.

## Challenges in recipe formulation

Formulation is an important step in any product development, however, it is a challenging process, and formulators encounter numerous obstacles while creating a recipe. They must take into account a variety of demands from diverse teams, including marketing, quality, and regulatory affairs. It's also essential to keep up with the fast-changing trends and the need for new items. A further issue for formulators is the ongoing demand for innovation and environmentally friendly manufacturing. Not to mention the difficult regulatory environment and fierce competition that present extra difficulties. Different challenges in the formulation of the recipe and its solutions are explained below:

#### a. Cost Control

Cost is an important factor in product development, from the price of raw materials to the cost of manufacturing. It's crucial to create a product that complies with specific standards, notably with regard to cost. The marketing division will frequently set a maximum production cost for a product based on the price that consumers are ready to pay for it. If a sufficient process is not in place to ensure that all information is easily available, it may be difficult to determine direct material costs. The implementation of too many different processes and pieces of software, on the other hand, can also be problematic, especially when these systems are frequently from different providers and housed on various platforms. So it becomes time-consuming and slow to get the required data.

#### Solution

Whether a manufacturer has deployed too many processes and software or not enough processes, it should:

- I. Revise how to centralize intellectual data (costs of raw materials, packaging, etc.)
- II. Version each recipe and product
- III. Define a clear process to facilitate the sharing of information from raw materials received from suppliers through formulation to product launch
- IV. Enforce this process across the whole company

To guarantee that the research and development teams are using accurate and up-to-date data, such procedures are crucial. The costs of the finished product's ingredients and packaging should be used to automatically compute its expenses.

IT solutions, such as Product Lifecycle Management (PLM) software, integrate all corporate departments and minimize human error while facilitating information sharing from a marketing brief through supplier inputs to formulation.

# b. Allergens Management

Formulators must be very careful when creating new recipes or products. Allergens management is divided into two primary sections. First, they must adhere to strict guidelines that outline the allergies that are prohibited, such as if the product must be devoid of dairy or nuts. The allergens contained in the finished product should be precisely identified and disclosed even if there is no explicit need.

Manufacturers of food and beverages must put procedures in place to manage and control all kinds of allergies in their goods. In order to choose which ingredients to employ in a recipe in order to avoid specific allergens, formulators also need access to a reliable database that contains all available information about raw materials.

#### Solution

One of the major solutions is having the right information at the right time via a single source of information. It is essential for ensuring that a product adheres to the standards established by other divisions and that all food allergies are correctly listed. All departments should have access to this source of information, which should be updated regularly and organized according to predetermined standards. Manufacturers can take extra measures to manage allergies more effectively, like enforcing connections with suppliers. For instance, to ensure that all necessary information has been completed, information received and sent from/to suppliers should adhere to the same structure (e.g.: certifications, declaration of the presence of allergens in ingredients, etc.). Using a supplier portal will make these procedures easier.

#### c. Requirements from other departments

Formulators must take into account a number of standards, which makes the process even more difficult for food and beverage products. These specifications can range from the marketing team's desired claims for the packaging to a list of allergies that are particularly forbidden for a product to all the national standards a product must adhere to. It is obvious that the R&D team might very easily become overwhelmed by all of these standards and struggle to adhere to them precisely and effectively.

## Solution

Streamlining communication is crucial because numerous departments are involved in product development. The R&D will be able to swiftly determine the requirements by using templates to build a marketing brief. Additionally, a uniform short structure will guarantee that all necessary data has been collected and disseminated.

It is crucial for the R&D team to have access to the laws that will govern the product during formulation. Making sure a product is compliant should begin as soon as formulators are developing a recipe. In fact, they ought to have access to all relevant regulations from the very beginning of product development. In order to accomplish this, it is crucial to increase communication between the teams in charge of quality, compliance, and R&D.

# 2.1.4 Prototype Development

A **food prototype** is a functional but not finished version of a product that manufacturers can use for testing, soliciting feedback, and introducing to investors before launching to a larger consumer market.

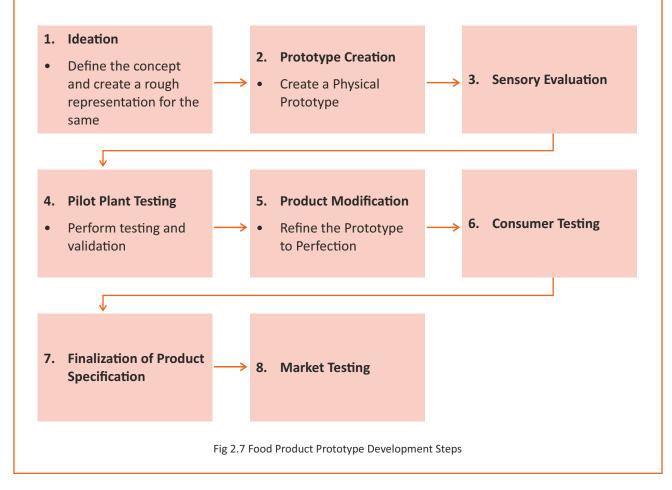
Before developing a final food product, a prototype or a replica of the product is used as an early model to test it and get customer feedback. It is a crucial first step in the development of new food products. Whether a prototype is built based on existing food products or inventing a new product, it should evolve into making it authentic.

Following are the importance of creating prototypes for food product development

- 1. Highlight the unexpected physical, technical, or financial limits
- 2. Change the colour, texture, and so forth
- 3. Improve the food product's quality
- 4. Present a concrete future product to potential clients
- 5. Reduce risks and danger
- 6. Assist in determining the realistic cost of a product

## **Steps in Food Product Prototype Development**

The following steps are involved in the food product prototype development:



#### 1. Ideation

In this stage, the team members engage in creative brainstorming to generate new product concepts. These are frequently determined by market trends, popular flavour profiles, popular ingredients, and other factors. Typically, the marketing team provides the initial data at this stage. The marketing department sorts through and evaluates client data, providing important information based on:

- I. Market research
- II. Changing consumer trends
- III. Understanding current customer needs
- IV. Identifying market gaps

This information is later shared with the product development team. At this stage, it is also essential to screen the product and check the regulatory and financial feasibility.

#### a. Screening

Checking if the prototype food product matches with company goals is crucial at this stage. To comprehend market trends, continuous screening is required. The following are some of the questions to be asked:

- I. Who is the target demographic?
- II. How will this prototype food product be used?
- III. How best can this prototype food product be prepared to meet consumer needs?
- IV. How will the consumer benefit from it?
- V. Does this prototype food product have other uses?
- VI. Who are the current competitors? How are their products different?
- VII. Where will the product be sold?
- VIII. What is the go-to-market strategy?
- IX. What will be the price point?

#### b. Feasibility

Financial, technological, and regulatory compliance are all aspects of brand feasibility. To ensure the development of the food prototype goes smoothly, this necessitates the creation of an internal, devoted team.

# c. Regulatory

The brand must be informed from the start of the numerous state and/or federal agencies that oversee products and the various regulations they are subject to. For instance, local sales of goods that don't cross state lines are subject to different rules than interstate sales. It is imperative to identify the relevant regulatory organizations in each situation and choose the best ways to uphold compliance at each level.

#### d. Technological

Developing a prototype food product needs specific equipment, facilities, and methods. To guarantee a seamless development process for food prototypes at every level, certain requirements must be met.

#### e. Financial

It is crucial to fully comprehend all production and marketing costs prior to launch.

I. **Fixed Costs:** Items that do not vary due to changes in production.

**Example:** Equipment, Building, Property taxes, etc.

II. Variable Costs: Costs that vary with the volume of production.

**Example:** Hired labor, Raw ingredients, Packaging materials, Fuel, Electricity, Utilities, and other items used during production.

# 2. Prototype Creation

The product development team begins working on the prototype food product once they have a firm understanding of the shortlisted possibilities and the flavour profiles they want to build. This serves as the benchmark for the final product's appearance and flavour. Usually, these studies are carried out in a company's internal test kitchen or a third-party test kitchen.

Experts from the culinary arts and food science are needed for the multi-disciplinary process of creating prototype food products. The prototype food product is initially developed on a smaller scale to iron out the wrinkles, make necessary recipe adjustments, and reduce waste. Developing food prototypes frequently entails a process of trial and error to produce the desired result.

#### 3. Sensory Evaluation

It is necessary to evaluate the product at this stage in relation to the areas of taste, texture, aroma, and appearance. Using sensory analysis to assess food prototypes yields insightful data that may be used to:

- I. Meet and exceed customer expectations
- II. Answer critical product questions that lead to higher revenue and market share
- III. Troubleshoot problems
- IV. Gain an edge by comparisons to competitors

This phase of food prototype development is carried out either by an internal team or a third-party contractor. It is crucial to make sure the testing is done consistently when using sensory evaluation. To produce the greatest outcomes, the data must be gathered quickly and reliably. Maintaining quality and giving the data the proper presentation is essential.

The opinions and suggestions received at this point are taken into account to modify the product as necessary and complete the gold standard.

# 4. Pilot Plant Testing

The pilot stage, which follows the completion of the prototype food product, is where the product is tested on a bigger scale. This is done to replicate commercial production and confirm the requirements for food products.

When manufacturing is scaled up, the pilot stage leaves plenty of opportunities for process modifications. For example, preparing pasta for four people at home is considerably different than doing the same thing on New Year's Eve for forty people. Before increasing production, brands can make critical adjustments thanks to pilot-scale testing.

#### 5. Product Modification

The scaled-up product prototype is again subjected to sensory evaluation and product modification after pilot-scale testing in order to standardize the scaled-up product.

To attain the ideal appearance, flavour, texture, and quality the cooking time, temperature, and the balance of spice would have changed while scaling up. Up until the desired parameters are met, the pilot-scale procedure is carried out with the appropriate alterations.

Before the next stage, the following aspects are also evaluated:

## a. Packaging

This is an important aspect of the product's appeal. The team needs to consider the following factors:

- I. Customer perspective
- II. Target Demographic
- III. Placement
- IV. Packaging Material
- V. Product's quality goals (Premium/Generic)

#### b. Distribution

Brands need to consider the following:

- I. Special distribution needs (frozen/refrigerated)
- II. Cost of special distribution
- III. Product availability radius
- IV. National or regional distribution

#### c. Shelf life

Accelerated or real-time testing is frequently used to determine shelf life. Testing for shelf life must be accurate, especially in light of the numerous distribution methods. Food product prototypes can either be internally tested for shelf life or externally tested by contractors.

#### d. Safety

The following aspects need to be considered for safety when developing a prototype food product:

- I. History of outbreaks
- II. Published safety risks of certain product categories
- III. Products susceptible to the growth of spoilage and pathogenic microbes
- IV. Allergens and physical contaminants

#### 6. Consumer Testing

It's a good idea to modify the recipe by using an internal team for sensory evaluation or even an outside contractor. Nevertheless, bias is a possibility. It's crucial to involve the target audience in the process after determining who they are. Therefore, it is essential to give the product's target market the chance to try it and give feedback. This can be done by the following methods:

- I. Inviting a small focus group to taste and confer on the product's features. Specific focus groups could include vegans, pregnant women, athletes, etc.
- II. Testing flavours in public locations, such as supermarkets, malls, beaches, etc.
- III. Sending the products to homes to be evaluated.

## 7. Finalization of Product Specification

The final product specifications can be greatly improved by getting input from the particular target population. To ensure that the product meets and surpasses client expectations, the product can be modified in accordance with their recommendations. Based on the feedback received, the team may have to:

- I. Restart the brainstorming process to identify alternative components and create a new prototype.
- II. At the pilot production stage, make more changes.

## 8. Market Testing

The food product prototype is launched following client feedback. The production will need to be increased to a commercial scale to accomplish this. It is advised to roll out in stages (particular areas or mini-markets) and work out any glitches along the way. This will make it possible to tweak the recipe and receive feedback based on sales performance. At this point, marketing will also be working diligently to develop advertising campaigns. The following metrics are used to measure the success of the new product.

- III. Social media responses
- IV. Sales Growth
- V. Market share expansion
- VI. Sales revenue

# 2.1.5 Various Sensory Parameters and their Impact on the Food Product

Food products' five key sensory parameters are **appearance**, **texture**, **smell**, **taste**, **and irritation**. They get sensed through our five major human senses: vision (sight), touch (touch), smell (smell), taste (taste), hearing (hearing), and chemesthesis (common chemical sense). These sensory factors aid us in the sensory evaluation of a food product. It should get performed by a trained and experienced person.











Fig. 2.7 Various Sensory Parameters

#### **Types of Sensory Tests**

Sensory testing is used to evaluate food products to make sure that the customer obtains a good quality product that appeals to the senses and has been examined using scientific methods. The sensory organs (eyes, nose, mouth, skin, and ears) pick up on the qualities of the product and analyze them using diverse systems. Different types of sensory tests are explained below:

#### 1. Triangle Test

The triangle test is used when comparing two items to see if there are any visible sensory differences. It is particularly helpful when there is a chance that production adjustments have affected the final product. The three samples are tasted by the panel, which then notes which sample is unique. In terms of statistics, the triangle test is more effective than duo-trio and paired comparison tests based on the likelihood of selecting the right answer by guessing. When there is significant flavour carryover between samples, however, and panelists are perplexed by three samples rather than two to evaluate, this test might not be the best option.

## 2. Duo-Trio Test

The duo-trio test is also used to find product variations that could be brought on by modifications in ingredient suppliers, storage, packaging, etc. The sample that is identical to a specific reference sample is identified by the panel. It is clear and straightforward to comprehend.

#### 3. Paired Comparison Test

Paired comparison tests are employed to determine which of the two samples possesses a greater amount of the attribute under test or which of the two samples is favoured. It is regarded as an acceptance test in the latter case. One of the most popular characteristic difference tests, it is simple to comprehend by panelists.

# **Scoring Method**

This method awards a specific score to each sensory feature listed on a score sheet in a logical order. The relevance of the attribute determines how much weight is given to it. For instance, the attribute of flavour receives the highest score because it is deemed to be the most significant. The dairy business makes the most use of the scoring system. For dairy and food products, scorecards with a total of 10 to 100 points assigned to various quality parameters are in use. The most popular scoring technique is chosen because it is versatile, straightforward, and simple to conduct statistical analysis on. The best thing about this system is that panelists don't need to undergo extensive training because information about flaws and a scoring guide is also supplied on the scorecard.

## **Ranking**

In the ranking approach, the panelists are given two or more samples and asked to arrange them in ascending or descending order of the strength of a particular feature, such as sweetness. In the creation of new products, ranking is frequently employed to separate inferior from better samples. This approach is suitable for comparing market samples of various brands. Samples may be graded according to their level of acceptability, general quality, or a particular trait.

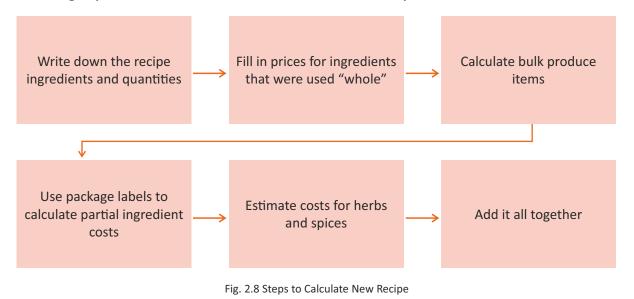
#### **Hedonic Rating**

Hedonic psychology deals with pleasant and unpleasant states of awareness. The hedonic technique uses a rating scale to quantify the psychological states of liking and dislike. The five common types of rating scales are numerical, visual, standard, cumulated points, and forced choice forms.

# 2.1.6 Recipe Costing and Sizing

The cost breakdowns for recipes are a crucial aspect of the cost computation. It's essential to determine how each item affects a recipe's overall cost according to the standard procedure. Understanding the exact price of a food item allows for creating the ideal profit margin for the product. When knowing how much everything costs, use food pricing guidelines to ensure that every dish remains profitable.

# Following steps are shown the calculation of the cost of a new recipe-



A sample recipe costing is shown below:

Menu Item: Seafood Newburg

Ingredient	Unit	Cost/Unit	Quantity	Total
Lobster Meat	kg	Rs 1500	500g	Rs 750
Scallops	kg	Rs 800	250g	Rs 200
Shrimps	kg	Rs 400	250g	Rs 100
Sole	kg	Rs 700	250g	Rs 175
Cream	L	Rs 300	500ml	Rs 150
Butter	kg	Rs 450	500g	Rs 225
Fish Sauce	L	Rs 400	500ml	Rs 200
Paprika	kg	Rs 700	250g	Rs 175
Sherry	L	Rs 800	250ml	Rs 200
Egg	-	Rs 5	6	Rs 30
Tart Shells	-	Rs 20	10	Rs 200
Total			Rs 2405	

Table 2.1 Sample recipe costing

# 2.1.7 Standardized Weights, Measures, Weight Range, and Sensory Scales for Food Products

Standard units are regularly used measurement units that aid in the measurement of length, height, weight, temperature, mass, and other variables. These units are standardized, which means that everyone understands the size, weight, and other characteristics of objects and things in the same way. Metric measurements (S.I. Systems) are used to represent the weight and measure. All weights and measurements should express in standard units.

Measurement	Unit	
Mass	Kilogram (kg), gram (g), milligram (mg)	
Length	Metre (m), centimetre (cm), milli metere (mm)	
Area	Square metre (m2)	
Capacity	Kilo litre (kl), litre (l or L), milli litre (ml)	
Temperature	Degree Celsius (°C) of Degree Kelvin (°K)	
Volume	Cubic metre (m3), Cubic Centi-metre (cm3) cubic milli metre (mm3)	

Table 2.2 Standard Measurement Units

On average, the actual contents of the packaged food cannot be less than the nominal quantity (the weight or volume that is marked on the package).

The Standards of Weights and Measures Act of 1976 and the Standards of Weights and Measures (Enforcement) Act of 1985 was replaced by the Legal Metrology Act of 2009. This Act went into force on April 1, 2011.

# Maximum permissible errors on net quantity declared by weight or volume

The maximum permissible error, in excess or in deficiency, in the net quantity by weight or volume of any commodity shall be as specified in the table below:

Sl.No	Declared Quantity g or ml	Maximum permissible error in excess or deficiency	
		As a percentage of declared quantity	g or ml
1.	Up to 50	9	-
2.	50 to 100	-	4.5
3.	100 to 200	4.5	-
4.	200 to 300	-	9
5.	300 to 500	3	-
6.	500 to 1000	-	15
7.	1000 to 10000	1.5	-
8.	10000 to 15000	-	150
9.	More than 15000	1.0	-

Table 2.3 Maximum permissible errors on net quantity declared by weight or volume

The maximum permissible error specified as percentage shall be rounded off to the nearest one-tenth of a g or ml, for a declared quantities less than or equal to 1000 g or ml and to the next whole g or ml for declared quantities above 1000 g or ml.

# Maximum permissible errors on net quantities declared by length, area, or number

The maximum permissible errors on net quantity are declared by length, area, or number. - The maximum permissible error, in excess or in deficiency, in the net quantity declared in terms of length, area, or number of any commodity not specified in the First Schedule shall be as specified in the table below:

SI.No	Quantity Declared	Maximum permissible error in excess or in deficiency
1.	In units of length	2% of the declared quantity up to 10 metres and thereafter 1% of the declared quantity.
2.	In units of area	4% of the declared quantity up to 10 sq. meter and thereafter 1% of the declared quantity.
3.	By number	2% of the declared quantity.

Table 2.4 Maximum permissible errors on net quantities declared by length, area, or number

# 2.1.8 Vendor Selection for Procurement

A vendor, also known as a supplier, is a person or company that sells goods or services to another person or company in the economic production chain. The chosen vendor completes a sale or service, takes immediate money, or invoices its clients with credit conditions for later payment, and then delivers products to the buyer. The vendor selection process consists of a series of procurement procedures that are used to assess product or service requirements and match them with vendor capabilities and pricing. It includes locating possible suppliers, collecting competitive bid quotations or proposals, evaluating vendors by contacting references and using a company's vendor selection criteria checklist, and contracting.

## **Steps for Vendor Selection**

Below are 7 steps to successful vendor selection:

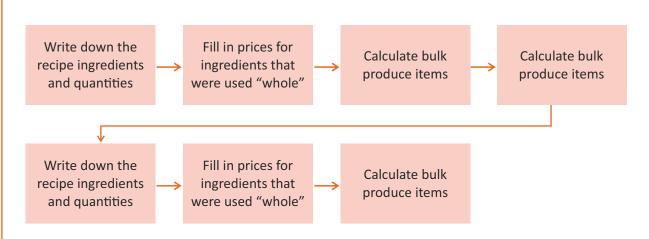


Fig 2.9 Steps for Vendor Selection

#### Step 1: Define and Analyze Business Requirements

Putting together an evaluation committee with experience in the vendor selection procedure and a thorough grasp of the company's operations would be a good start. The evaluation team should be able to:

- I. Define the product, material or service that is needed;
- II. Define the Technical and Business Requirements;
- III. Define the Vendor Requirements (i.e. the features the organization is looking for in a vendor), and
- IV. Publish a Requirements Document.

The evaluation team should also make every effort to gather as much data as they can, including identifying and speaking with stakeholders and users, reviewing reports and statistics that are already available internally, and gathering technical data such as descriptions of the current technical environment and standards.

#### **Step 2: Identify Third Party Vendor Candidates**

The evaluation team must now prepare a list of potential providers after publishing a requirements paper. The team should execute a team evaluation procedure and send each individual a Request for Information (RFI). Then, a short list of vendors is made.

# Step 3: Develop Evaluation Criteria (with weighting)

In the third step, the team would create a model for evaluating requirements based on their importance and value. For instance, if a vendor responds to a need with a score of 7 (on a scale of 1 to 10) and the requirement's priority is 5, the response can be given a score of 35. This contributes to highlighting the variations among vendors.

# **Step 4: Conduct Vendor Briefings**

It is time to schedule a first meeting with each prospective vendor to go over the stated needs and make sure everyone is on the same page once the team has defined evaluation criteria with weighting and further whittled down potential vendor candidates.

#### Step 5: Evaluate Vendors and Schedule Demos

After the vendor briefings are over, the team ought to be better prepared to assess potential vendors. The chosen suppliers should offer a solution overview that addresses the organization's existing

business and technological needs, costs, advantages of working with a specific vendor, etc. Vendors are also required to offer a "demo" that demonstrates the features of their system. Demos are an excellent way to learn more and assess a vendor's intangible qualities. The evaluation method must include checking the references of the vendor (site visits are also strongly recommended).

## **Step 6: Complete Vendor Selection**

Primary and Secondary Options: The team will choose a primary option (the winner) and a secondary alternative following the review process.

### Step 7: Complete Contracting with Vendor

Together with the vendor, this process entails defining a precise set of project goals, deliverables, timelines, and budgets. These should be spelled forth in the contract's terms in explicit language. Making a plan for contract negotiations is one of the most crucial steps in the vendor selection process. Successful contract negotiations simply entail the parties looking for advantages that will benefit them both overall while negotiating a fair and equitable agreement.

It's crucial to be explicit about all the key contract requirements, terms, and conditions, and to give the vendor detailed information on the items and/or services they must deliver. Vendor compensation, including the overall cost, the payment schedule, and the financing terms, should be made explicit. Additionally, the dates for implementation, renewal, completion, and termination should be acknowledged.

# Business risk with single vendor

A single supplier strategy makes the commitment to buy a specific resource only from that one supplier. Business owners may benefit if the provider is dependable and well-suited. However, working with one vendor has some potential disadvantages:

- Difficulties in finding just the right contractor: Finding a company that possesses the ideal
  competence in your field while also being able to meet all of your needs can be pretty difficult. The
  likelihood that you may require numerous vendors to complete all of the project's objectives
  increases with the project's complexity.
- II. Dependence risk: If the business only works with one vendor, any issues with the contractor could quickly affect you, the client. The vendor's lack of personnel or knowledge may prove to be a more significant barrier than if you were working with multiple contractors. If a vendor is unexpectedly unable to perform their duties, another vendor may be able to take over some extra project components.

#### **Vendor Audit**

Vendor audits are very important for every organization. This audit ensures that the product's quality and the suitability of the raw material for long-term use will not get damaged within a short period of time. Typically, manufacturing, factories, and industries use suppliers to get their raw materials. These products need to be of high quality and grade. Since the finished product is delivered to the customer, the business cannot use anything bad. If the consumer receives bad or damaged goods, the company's reputation will suffer and they risk losing business. Giant firms carry out supplier audits as a result of these factors. Various vendors and suppliers provide commodities to businesses. Before approaching any vendor to obtain raw materials, the organization must conduct a thorough investigation. It is crucial that the raw materials are of high quality and level. It is impossible to modify a product once it has been developed into a finished good and distributed on the market. Therefore, if the raw material is of poor quality, the finished product will undoubtedly encounter several difficulties and challenges. The products could be returned by the customer with complaints.

Vendor audits or supplier audits are to be performed once a year. The location of the vendor, his products, and his manufacturing facility should all be thoroughly scrutinized and checked in this type of audit. The type of audit that should be performed and how frequently depends on the products and services that the organization uses or purchases from the vendor. It also relies on how crucial the vendor and his goods are to the success of the firm. On the basis of that, one can choose the kind and frequency of an audit.

## **Product Costing and BOM**

Product costing is the process of estimating a product's price. The following details are required in order to estimate the cost of any product.

- What resources, and in what quantity, are used to create the finished product? The term "Bill of Materials (BOM)" refers to a list of all the materials that will be used.
- How much does it cost to produce a finished good? Making costs are derived from operations on raw materials to create finished goods. Each and every activity that is carried out has a cost attached to it. Therefore, if we compute the cost of each operation and add them together, we will get the cost of the final product.

Ex	Exercise			
An	Answer the following questions-			
1.	What is market research?			
2.	List steps for vendor selection for food procurement.			
3.	List the two benefits of market research for food product development.			
4	Fundain any thurs a feed any accessing months add			
4.	Explain any three food processing methods.			

5.	What is recipe formation?
6.	Explain the importance of prototype development.
7.	Explicate the steps to calculate the cost and size of a new recipe for food product development.
8.	Which act replaced the Weights and Measures Act 1976?

#### **Practice questions**

- 1. Do the secondary market research for breakfast foods list of popular breakfast foods and its growth trend in india and its future.
- 2. Formulate the prototype for Energy bars with FSSAI limits, unit of measure
- 3. Conduct the qualitiative research for any two similar product (Example- same flavour juice of two different brands), frame the questions, target group, number of attendantees and justify.
- 4. Estimate the cost for any one flavoured ice cream include process/operational loss
- 5. Frame vendor audit questionarie
- 6. Formulate one fortified product and propose the marketing approach for taking the product to launch—like claims over the product.
- 7. Formulate one propoeritery food and justify the FSSAI limits on it. (refer the near to category)
- 8. You have to develop a product with cheese powder as one of your ingredient, From ideation to GM calculation do one mock case study (Imagine you selected one product, made prototype of 4 different receipes with slight alteration in taste profile by varying the ingredient quantity, selected one from sensory research, modified the initial receipe, final sensory research, costing, and final GM all the process as a mock up explain your detailed approach towards the product.
- 9. Do the sensory mapping of your favourite product and use any graph to showcase your results. Use all the sensorial parameters in your profiling
- 10. Market research on global trends in confectionary industries growth, potential areas, recent launch or developments.
- 11. Make the processing steps involved for make any RTE foods with process parameters

# **Unit 2.2 Scale up Process**

# - Unit Objective



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

- 1. List the steps to be performed for developing the product on a larger scale after the finalization of prototype
- 2. Elucidate halal and haram ingredients and process
- 3. Describe food production process i.e. batch processed or continuous processed
- 4. Discuss the need of nutritional analysis data of food product

# 2.2.1 Steps for Large Scale Production -

Food product development encompasses the entire process of bringing a food product to market. It also includes the renewal of an existing product and the introduction of an old product into a new market. Identifying market needs, envisioning the product, developing the product roadmap, launching the product, and collecting feedback are all part of this process. The procedure does not conclude until the product life cycle is completed. It can continue to collect user feedback and improve or add new features to new versions.

After the finalization of the prototype, it's time to scale up the process for production at a larger scale.

Scale-up is an exhilarating moment, full of optimism and potential, but it is also a vulnerable time for new enterprises. When it comes to scaling up food production, developers who do not prepare ahead can make terrible blunders and suffer losses that are too enormous to recover from. The difficulties of scaling up are not insurmountable. The following figure explains the steps for developing the product on a larger scale after the finalization of prototype:

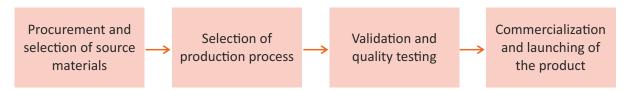


Fig. 2.10 Steps for Large Scale Production of Food Product

Scaling up a recipe formula is not as simple as multiplying. In prototype development, a recipe can be doubled or tripled while using the same ingredients, measuring tools, and process time. However, as the quantity of an ingredient increases from 10 to 2,000 pounds while increasing food output, things change:

- 1. Because different ingredients may perform differently, they may need to be altered or changed to produce the intended result.
- 2. An ingredient can be too expensive to match your budget.
- 3. The stability of an ingredient may not meet the requirements of the new procedure.
- 4. The resulting product may differ in flavor or texture.

- 5. Measurements can range from teaspoons and cups to pounds and gallons.
- 6. The cooking or preparation time may get adjusted.

#### Scale up

Scaling up food production means enlarging the size of the food production. Scaling up might be small, such as producing 50 muffins rather than 10, or large, such as producing 10,000 muffins rather than 10. You can experience many challenges since you're producing your products in larger quantities. You might need to modify your machinery, switch up your ingredients, relocate your manufacturing facility, alter the procedure steps, etc.

#### Importance of Scaling up

You can produce more goods by expanding your food production. Numerous factors could be at play in your decision to act in this way. You might just wish to increase customer satisfaction, revenue, employment opportunities, or the sustainability of your company. There are numerous causes, however, bear in mind that not all food businesses need to expand. A small scale can be fantastic if you're content where you are and earning a solid profit; small-scale production has its benefits.

#### Pros and Cons of Scaling up

By scaling up, you can produce more goods. But it will probably also have an impact on a lot of other aspects of your company. Below are a few factors to consider while scaling up:

- I. When you scale up, you'll probably need to use more (automated) machinery to produce your goods.
- II. You might need to supervise (many) other people who manufacture your product rather than manufacturing it yourself.
- III. Your product can have a slightly different flavour and appearance. Though it really depends on your goods whether this is the case.
- IV. The manufacturing facility will require more space.

# When should scale up

Before you start scaling up the production of your food product, it's important that you know what you're prepared to do. There are other variables come into play, such as:

- I. Are you making a profit with your present product line?
- II. Do you have the right personnel or enough staff to implement the change?
- III. Are you refusing customers because you don't have enough inventory?
- IV. Even so, do you want to scale up? Or do you actually like working in a smaller space?

# Steps to scale up

The below figure explains the steps for scaling up a food product:

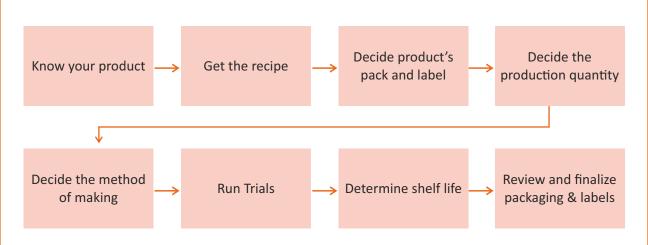


Fig. 2.10 Steps for scaling up a food product

#### 1. Know your product

when you need to produce a large quantity of your product. You'd better be an expert on that product. Understand what will happen if typical issues develop and how they will impact the product. For example if you're scaling up your homemade muffin recipe:

- I. Do you know what happens when you bake your muffin too long or too short?
- II. What happens if the temperature is incorrect?
- III. Or if a crucial ingredient is missing?
- IV. What should the batter look and feel like?
- V. What should the final color be?

Knowing all of this information will be incredibly beneficial when scaling up. In such case, you'll be prepared to deal with problems when they arise. This is important even if other people will be producing your product. If things don't work out, they'll look to you for advice on how to adjust and change the process.

# 2. Get the recipe

List each ingredient you're using in detail. Include whether you're utilizing a specific brand or variety of something. If you're writing "vanilla," for instance. Are you referring to vanilla paste or vanilla extract? Is it a natural or man-made type?

When you are writing this down, think about which details are important and which are not. The specific brand of vanilla, for instance, can be crucial, although any brand of pecan nuts will do.

#### 2a. Covert that recipe

The recipe must then be documented in a form that allows it to be scaled up to bigger numbers.

You don't want a recipe to specify the use of 34 cups or 23 teaspoons. Larger scale facilities, however, will always measure their quantities using scales. It's quicker, simpler, and more accurate to do. Any volumetric recipes must therefore be changed to weight-based recipes. Ensuring that the recipe can be easily scaled to different quantities is the next step. It is simplest to accomplish this by converting a recipe to a percentage-based recipe. You will specify which ingredient makes up which fraction, and the total amount will equal 100%. This makes scaling a recipe to any size relatively simple.

#### 2b. Make a flow diagram

Next, drawing a flow diagram of your production process might be quite beneficial. This is especially useful if you're expanding your output to quite large, factory-scale levels. By doing this, you can better picture each process step and determine what tools you'll need for each one.

# 3. Decide product's pack and label

A food product's packaging has several uses. First and foremost, it safeguards your goods, enabling it to remain sufficiently secure and fresh. Additionally, it is a crucial marketing and communication tool.

It is essential to consider any potential environmental effects when selecting packaging materials. While certain types of packaging are simple to reuse and recycle, others cannot be recycled at all and will have a greater negative environmental impact. There are already a growing number of environmentally friendly packaging solutions.

#### 3a. Make a label & determine nutritional value

You must include specific details on your packaging depending on where you manufacture and sell your product. You'll probably need to have a list of the ingredients, details on the product's nutritional value, etc. To make sure your product complies with these criteria, be sure to check with the relevant regulations.

### 4. Decide the production quantity

You are aware of your product and have a clear description of how to manufacture it in writing. It's time to really decide how you want to increase the recipe's scale now. Make inquiries to define the following:

- I. How much will you be making per day?
- II. Will the volume between days vary significantly? If so, what is the most and lowest sum you anticipate having to earn?
- III. Knowing this is crucial while choosing equipment. A 100kg mixer will be ideal if you frequently produce 100kg. However, you might want a different sort of mixer, or perhaps even two types of mixers, if you need to be able to produce 20 kg one day and 200 kg the next.
- IV. How long is the freshness of your product? You have more production flexibility the longer the shelf life of the product.

# 5. Decide the method of making

The first common decision at this step is: who is going to make your product? Will you create it yourself? You will then need to look for a site and the necessary tools. Or are you going to let another, more established business produce your goods? Rather a few food goods actually offer this option quite frequently. There are numerous enterprises that produce food items with a focus on different industries. They'll have the resources—people, machinery, etc.—to produce the goods in accordance with your requests.

The majority of your effort should go toward locating a local business that fits you and can produce your goods if you decide for the second choice. They will have their own production facilities and be able to give you production-related advice.

## 6. Run Trials

Running trials and conducting small experiments are essential when scaling up. Does the recipe turn out as it ought to? What's changed and what's going wrong?

When things go wrong during scale-up, things can get expensive very quickly due to the large scale of things. So make sure you test.

#### 7. Determine shelf life

How long may your product be stored? Since it will affect how you decide to scale, it is ideal that you already have a clear understanding of that before beginning to scale up. Utilize the products you've created for testing to establish the shelf life of your goods. The tests you must run to establish the shelf life will vary depending on your product, its packing material, how hygienically you manufacture and package it, regional laws, and more.

#### 8. Review and finalize packaging & labels

You could have needed to alter the kind or number of ingredients in your product during scale-up. As a result, your package's label may need to be modified. Before approving them, make sure to review them again.

# 2.2.2 Sensory Analysis for Scaleup Products

Sensory analysis is a very important parameter during new product development and in day to day routine of a food manufacturer. To produce consistent and same food products each and every time sensory analysis becomes a day-to-day activity in an industry. Hence, it is very important for a food technologist to be aware of these parameters and practice them in accordance with the need of the situation. Different sensory testing methods for scaleup products are:

- I. Difference sensory analysis: This is one of the most helpful sensory tests used to select and train members of sensory panels. The purpose of this test is to identify differences between two or more samples.
- II. Descriptive sensory analysis: Performing a descriptive analysis is crucial to evaluating sensory information. It is frequently used to get a full description of the aroma, flavour, and general texture of the food product. It gives information on the qualitative as well as quantitative evaluation of food.
- III. Affective sensory analysis: Affective or acceptance testing is a sensory technique typically carried out at the level of the consumer. It is used to quantify consumer preference or liking a product. Direct preference measurements can be made by contrasting two or more products. Finding the product that had a significantly higher rating than another product in a multi-product test allows for the indirect evaluation of preference. The paired comparison test and a 9-point hedonic scale are the two techniques that are most frequently used to gauge preference and acceptance directly.

# 2.2.3 Food Preservation

Food preservation is one method of protecting food from microbial growth. Following production, the food product is stored and preserved in compliance with standard procedures to prevent spoilage or contamination. It is done to extend the shelf life of food products. It is the process of treating and handling food products to prevent spoilage and foodborne illness while retaining nutritional content, texture, and flavor.

The following are the primary goals of food preservation:

- 1. To keep microbiological contamination at bay
- 2. To eradicate pathogens
- 3. To reduce food decay and poisoning

A few age-old food preservation procedures include cooling, freezing, fermenting, sun-drying, etc. Modern food preservation methods were established with the introduction of technology and accomplished through chemical applications and other natural substances referred to as preservatives. The food processing business employs the following preservation technologies:

#### **Chemical Method**

- Natural preservatives includes salt and edible oils
- Synthetic preservatives include vinegar, sodium benzoate, sodium metabisulphite, etc.

# **Smoking**

prevents dehydration in fish and meat and thus prevents spoilage

# **Canning**

#### Sterilization

- Remove microbes by sterlilizing the product
- For eg., milk sterilization at 100°C kills the microbes

Heat process kills the microorganisms that

Prevent around 70 percent of microbial

**Heat and Cold Methods** 

growth

- cannot tolerate extreme temperatures
- Pasteurization methods used for preserving milk or food liquids

Contents are sealed in an airtight container at high temperatures

#### Dehydration

Prevents food spoilage by removing water

Fig. 2.11 Food Preservation Methods

# 2.2.4 Halal and Haram Ingredients and Process

Halal foods are defined under Islamic dietary regulations. Halal foods are legal and permissible for individuals who follow Islamic principles. Haram, or forbidden foods and beverages, are not allowed to be consumed by Muslims. Foods with the halal mark on their packaging have been approved by an organisation and are guaranteed to be free of any prohibited ingredients or components.

The following chart explains the Halal and Haram ingredients according to the Islamic dietary regulations-



#### **Cereal Products Halal**

- Rice
- Pasta



## **Cereal Products Haram**

- Alcohol
- Animal fats
- Vanilla extract



# **Fruits and Vegetables Halal**

- All (frozen, canned, raw, boiled, butter, vegetable, oil)
- Juice



#### **Fruits and Vegetables Haram**

• Fruits and vegetables containing Haram ingredients (alcohol, animal fats, gelatine, bacon)



#### Milk and Dairy Halal

- Milk
- Yogurt, cheese, and ice creame made with bacterial culture without animal rennet



# Milk and Dairy Haram

• Cheese, yogurt and ice cream made with animal rennet, vanilla extract, gelatine, pepsin, or lipase



#### **Meats and Alternatives Halal**

- Certified meat and poultry, seafood, nuts, eggs, peanut butter, Tofu
- Halal deli meats and Legumes



#### **Meats and Alternatives Haram**

Pork and port products (ham, sausage, bacon)

Any product prepared with alcohol or animal fats

Fig. 2.12 Examples of Halal and Haram

Because of the ingredients in processed foods, it might be difficult to determine whether they are strictly halal or haram. As a result, it's critical to examine the product's label or packaging for halal certification. Check the ingredient list for haram or banned items if no certification is mentioned.

# - 2.2.5 Various Food Production Process

All productive processes can be categorised based on how the raw material input stage is completed and how the final output is obtained. Continuous processes and batch processes are the two types of processes.

## **Batch Process**

- A batch process consists of a series of one or more steps that must be completed in a specific order
- At the end of the sequence, a finite quantity of the product is generated, which is then repeated to make another product batch

## **Continuous Process**

- A continuous process is one in which a single work unit is moved from one step to the next without any interruptions in time, substance, sequence, or length
- The flow of product or material is continuous, as the term implies. Every machine is in a constant state of operation and performs a certain processing function

Fig. 2.13 Food Production Process

#### **Batch Process Pros and Cons**

The main benefit of batch processing over continuous processing is that it has a tendency to be more adaptable. There may be some variations between batches. A different flavour, slightly different consistency, a different hue, etc. might all be made. To start producing something else, you merely need to remove the old batch from your machinery.

#### I. Natural variability, easier to adjust

The majority of food ingredients vary from batch to batch. As a result, depending on the ingredients you receive, your technique may need to be somewhat modified. In a batch production process rather than a continuous one, this is simpler to accomplish.

#### II. Cheaper process control

Controlling the process typically has lower costs. The price of accurate continuous feeding and weighing equipment may surprise you. You can employ more "standard" equipment for a batch procedure.

#### III. More labor

More manual labor is typically required for a batch operation than a continuous one.

#### **Continuous Process Pros and Cons**

The consistent continuous quality of the end product is a major benefit of continuous processing. Regardless of when it is produced on the line, it will be essentially the same. Nevertheless, it is less adaptable than a batch procedure, and switching between those several muffin flavours is frequently more difficult.

Another significant benefit is that once the process is running, not much more needs to be done. There is no need to wipe the bowls in between; the procedure will continue. Less labor is needed to produce this. Investment costs, however, are frequently much higher than for a batch operation. The volumes you require will determine whether or not this makes sense.

# **Example: French Fry Production**

**Continuous Process:** In this method, the potatoes are dropped continuously on a large belt. The potatoes are then continuously sliced by a cutter that is fed by this belt. After being chopped, the potato falls into hot oil and is moved by another conveyor belt. It exits the oil at the end of the oil bath and moves into a freezer once more on a belt. You'll have potatoes at every stage of the process the entire time. Others have just started frying, are nearly through frying, have just entered the cooling tunnel, or are halfway through the freezing process.

**Batch Process:** On the other hand, in a batch procedure, you would load a bag of potatoes into a cutting device. Before putting the potatoes in a bin, you cut every single one. After that, the hot oil is added to the potatoes. They will all be removed from the fryer at the same time. After that, they are spread out on a pan and put in the freezer to freeze.

# 2.2.6 Significance of Nutritional Analysis Data of Food Product

The method of determining the nutritional content of food products is known as nutritional analysis. It's an important aspect of information regarding food's chemical composition, processing, quality control, and contamination. The nutritional analysis is usually presented on the backside of the packaging in tabulation form. It aids in distinguishing between different foods based on calories per gram and items' contents. A nutrition label considers three other important nutrients: lipids, carbs, and protein, in addition to calories.

Following are the importance of **Nutritional Analysis-**

Provides a better quality check of the product

Helps in maintaining product consistency

Assist in streamlining the process and formula for the product

Easier to market

Helps in increasing the availability of the product

Helps in reducing foodborne diseases

Enables better food fortification

Helps people to act accordingly for allergies and diabetes

Helps consumer to have a better idea about the product

Fig. 2.14 Importance of Nutritional Analysis

#### **Food Fortification**

Food fortification is the process of adding vitamins or minerals to food or beverage products. Food producers may implement this method, or governments may implement it as a public health measure. The goal of food fortification is to reduce the number of persons who have nutritional deficiencies.

Fortified foods play a significant role in nutrient shortages. Foods are fortified for the following reasons:

- I. To restore the lost nutrients
- II. Substitution of nutrients for similar products
- III. To enrich staple foods with nutrients
- IV. To make the product a more valuable source of nutrients
- V. To add nutrients to foods and make them more appealing to customers

FSSAI under the regulation of the fortified food category FFRC (Food Fortification Resource centre) covers the below products to be fortified with listed micronutrients.

Food commodity	Fortified with
Wheat flour	Iron, Folic acid, Vitamin B12
Rice	Iron, Folic acid, Vitamin B12
Double fortified Salt	Iron, Iodine
Edible Oil	Vitamin A and Vitamin D
Milk	Vitamin A and Vitamin D

Fig Products to be fortified with micronutrients

# 2.2.7 Allergen Management

A food allergy is an immunological response to a food that the body sees as foreign and potentially dangerous. People may be allergic to an item as a whole or to one of its constituents, which are mostly proteins. Responses can range from high fevers, rashes, and influenza-like symptoms to more severe disorders such as anaphylactic shock, which can result in death. In manufacturing, retail, and food administration, allergen control techniques are critical for good hygiene practices (GHPs) and HACCP systems. Allergens should monitor throughout the supply chain and manufacturing process.







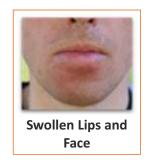


Fig. 2.15 Allergen Management

Following are some symptoms that can be caused by an allergy-









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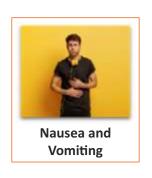




Fig. 2.16 Symptoms of Food Allergy

# Common food allergens are-











Eggs

Fish









Milk

Nuts (tree nuts)

Peanuts and Soybean

Sulphite in concentrations of 10 mg/kg or more

Fig. 2.17 Food Allergen

The following figure explains the steps for Allergen management are-

# Cross contact prevention during processing

- Allergenic and non-allergenic production areas to be segregated
- Traffic of raw material supplies, employees, and packaging materials to be limited during manufacturing of allergenic products.
- Dedicated equipment and tools to be used for allergenic products
- Reuse of products like oil, water to be avoided
- Allergenic products should be easily identifiable using tags or colour codes, etc while on the processing line

Continued...

# Validated and verified allergen cleaning

- Appropriate cleaning and sanitizing of equipment
- Written protocols to be maintained
- No dead spots should be present in the production
- Cleaning validation and verification procedures should be present with their records.
- Identification of the effectiveness of the allergen control plan to be done through internal and external audits

# Review of product label /packaging usage and control

- The product should be labeled appropriately as per standards and adhere to the Food Allergen Labeling and Consumer Protection Act of 2004
- The companies cannot add may contain as precautionary labeling according to FSSAI
- Labels should be reviewed prior to their receipt for their accuracy

# Personnel training

- Training to be provided to personnel at all levels for allergen awareness and control
- Specific documented training for jobs of greater responsibilities
- Consequences to be highlighted if the plan is not followed during trainings and the reasons for the protocols followed

Fig. 2.18 Steps for Allergen Management

# **Exercise**

## Answer the following questions-

- 1. What is food preservation?

3.	Explain halal and haram ingredients.
4.	What is the batch production process?
5.	Write a short note on scale-up process of a food product.

# Match the following-

Column A	Column B
Halal	Peanuts and Soybean
Haram	Food Preservation
Allergen	Alcohol
Sterilization	Peanut Butter

# **Practical questions**

- 1. Scale up peanut burfi receipe, compare the difference between lab scale Vs pilot scale
- 2. Conduct focus group research on any of your favourate product, analysis the outcome of the research
- 3. Benchmark the nutritional details of fortified foods, baby products, meal replacing products, Biscuits and compare the difference.
- 4. Take any 5 confectinary products and list the allergens mentioned in their products.
- 5. List the halal certification requirement for exporting to UAE of any 3 food products of different category
- 6. Draft the SOP/WI for making cup cakes
- 7. If you want to produce mango pickles in bulk quanity analysis the proc and cons of doing it in batch process Vs continuous process also calculate the cost invlovment in both the process.
- 8. Take any culinary dish, convert the receipe to scale up receipe.

# **Unit 2.3 Develop new guidelines**

# - Unit Objective



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

- 1. Describe various testing parameters i.e. appearance, color, taste, odor, adulterants, contaminants, nutritional value, etc. and their impact on the food product
- 2. Describe basic seven quality management tools process flow chart, check sheets, histograms, fishbone diagrams, Scatter diagrams, Pareto analysis, Control chart

# 2.3.1 Quality Testing Parameters for Desired Product

Food quality management is critical to ensuring that customers consume and handle safe food. It can safeguard customers from hazards such as tainted goods while also ensuring that they receive the weight and quality of food for which they have paid.

Product testing presents a variety of possibilities to a target audience and asks them to provide feedback on each one. Testers evaluate characteristics such as texture, taste, adulterants, nutritional value etc. to determine product quality, acceptability and identify areas for improvement.



**Taste** 



**Texture** 



Colour





**Contaminants** 



**Nutritional value** 

Fig. 2.14 Testing Parameters

- 1. Participants in a taste test evaluate the taste of a product on its own or in comparison to other items. A taste test is frequently conducted "blind," with brand names, packaging, and other identifiable items eliminated.
- 2. Texture refers to the properties of a product that can be felt with the fingers, tongue, palate, or teeth. Crisp crackers or potato chips, crunchy celery, hard sweets, soft steaks, chewy chocolate chip cookies, and sticky toffee are just a few examples.
- 3. Colour analysis is a crucial aspect of food product safety and quality. Several studies have revealed that visual acceptance is the first thing customers consider when making food decisions. Food color is so powerful that it can alter how humans perceive the taste and quality of foods. Spectrophotometers compare the light reflected or transmitted by a food product to that emitted by a specified reference standard.
- 4. Adulterants can make a product unsafe, less expensive to manufacture or fail to function properly. It is a substance introduced to a product but not mentioned as an ingredient or a substance that accidentally ends up during the production process. Adulterants are tested via chemical testing of food product.
- 5. Chemical contaminants such as pesticides, antibiotics, hormones, dyes, illicit compounds, and chemical adulterants are commonly identified using mass spectrometry (MS) (prohibited chemicals added to foods, as well as bisphenol A, or BPA).
- 6. Nutritional value, also known as nutritive value, is a measure of a well-balanced ratio of the key elements carbs, fat, protein, minerals, and vitamins in food or diet products in relation to the nutrient requirements of its consumer. The nutritional value of food products is checked via lab analysis.

# **Various Testing Methods**

#### a. Physical Testing

In the food sector, physical testing refers to the procedures used to assess a food product's numerous physical attributes. Food products' colour, viscosity, weight, thickness, granulation size, and texture are frequently examined qualities. Physical testing can be used to guarantee product consistency in addition to serving as a quality indicator in the context of food.

# b. Chemical Testing

Chemical testing is used to verify the contents of the food. It enables you to keep up the standard of your goods and ensures their safety. The purpose of chemistry testing is to confirm the food's chemical makeup, including its sugar, protein, and fat content. Additionally, it aids in determining the quantity and presence of heavy metals and minerals in the meal.

You can find a balance between what is safe and what is delicious by using food chemistry testing. You can use it to improve your products, which is another element. Preservatives and additives can enhance the texture, flavour, and aroma of your product without compromising food safety.

#### c. Microbiological Testing

The continuing safety of your food products throughout the supply chain can be ensured by microbiological food testing to identify food borne diseases and spoiling organisms. Monitoring of functional microorganisms in the end product and throughout manufacture is also necessary.

# d. Water Testing

The water has to be tested for toxic substances such as pesticide residues, polychlorinated biphenyls and polyaromatic hydrocarbons. The various testing methods used for water for food processing include standard plate count, proteolytic plate count, lipolytic plate count, test for coliform bacteria etc.

The bacteriological, physical, chemical, and radioactive tolerance levels for the water must be met, according to the Indian Standards: Water for Food Processing Industry (IS: 4251; 1967 Reaffirmed 2004). The water also needs to meet requirements for pH, colour, odour, taste, turbidity, and total dissolved solids. Ammonia nitrogen, anionic surface active agents, total hardness, alkalinity, residual free chlorine and chloramines, different metallic and non-metal ions, total solids, and mineral oil are some examples of general chemical parameters.

## e. Pesticide Residue Testing

Pesticide residue testing is a procedure that determines the amounts of pesticide residue in food items by a thorough chemical and microbiological analysis, giving food producers and manufacturers assurance in the components of their products.

# 2.3.2 Basic Seven Quality Management Tools

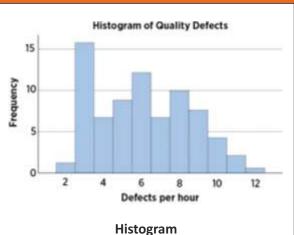
Quality management tools assist organizations in gathering and analyzing data so that employees can readily grasp and interpret information. Quality management approaches necessitate substantial planning and the collection of appropriate end-user information. Customer input and expectations must be constantly monitored and evaluated to offer superior quality products. The following table illustrate the basic quality management tools:

# A process flowor representing a wo step method to co several directions. In the process flowor an an output which is the succeeding step. The method will picture of what it in identification quality. The straig flowchart is given. Process Flowchart

- A process flowchart could be a diagram representing a workflow method, or a step by step method to connect by arrows and lines in several directions.
- In the process flowchart, each step is an associate action and result of which produces an output which is again used as an input to the succeeding step.
- The method will then offer information or picture of what it looks like and will facilitate in identification of the issues related to quality. The straightforward structure of the flowchart is given below.

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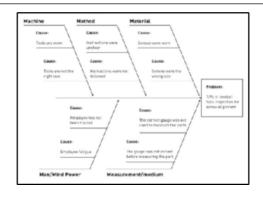


- A histogram is a graphical illustration of a bar chart that shows pattern falls with totally different and typical method conditions.
- The examples to measure data in the histogram can be a number of new students joined, the number of new patients registered, etc. The basic structure of the histogram is given below.



- A check sheet is a structured quality tool that is used to collect data. It is a type of prepared form for analyzing data and it can be adapted for a variety of purposes.
- It is also used during the review process, to ensure that all the required steps and necessary pre-requisites have been completed.

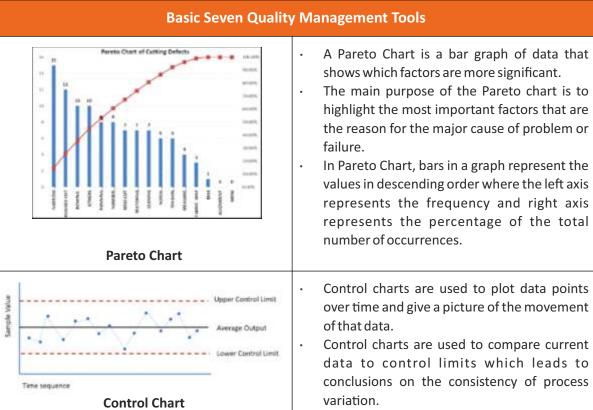
# **Check Sheet**

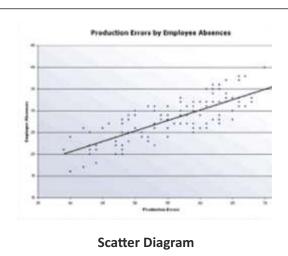


**Cause-Effect Diagram** 

- A Cause- and Effect diagram, also known as the fish-bone diagram shows the many possible causes of a problem.
- Fish-bone captures all causes, ideas, and uses a brainstorming method to identify the strongest root cause. It also records the cause of specific problems to the processor system.
- To use this tool, you first need to identify and state the problem as a question. This will help in brainstorming as each question should have an answer. You can also simply start by writing it in the first headbox of the fish.

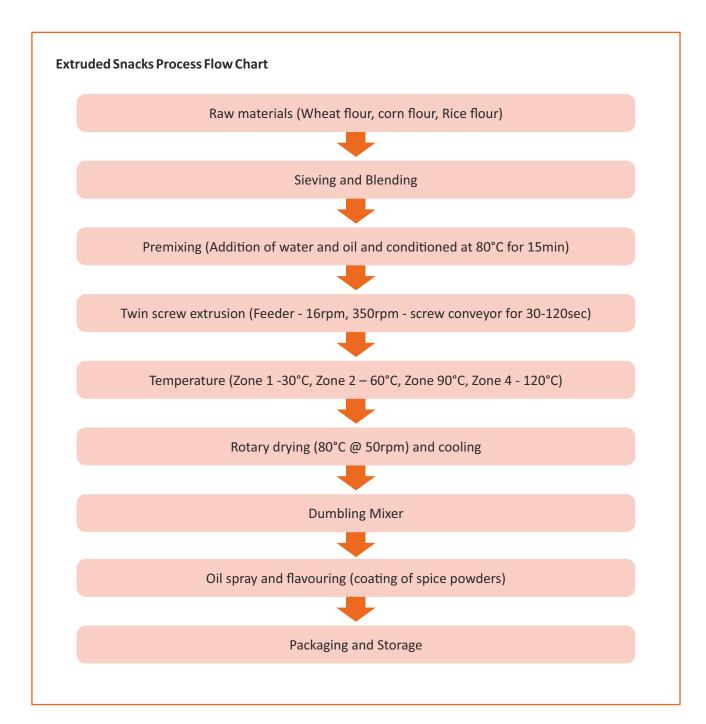
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- Scatter diagrams are the type of graphs that shows the relationship between the variables in which variables represent the causes and effect.
- The main purpose of the scatter diagram is to establish a relationship between the overall effect of the problem and the causes that are affecting it.

Table. 2.4 Types of Quality Management Tools



#### **Summary**

- Companies develop new products hoping to gain more new customers, expand into new geographic markets, maximize profits, build brand excitement, and increase market share. Every day, a rush of new food products enters the market, vying for the attention of consumers.
- The role of food scientists in the conceptual process of new product development differs across the sector. Regardless of direct engagement, it is vital to be conscious of market trends, consumer preferences, and expectations to generate a new and successful food product.
- Customer preferences captured through research allow a better understanding of the end-user experience and prioritize the target audience's "wants" and "needs." A diversity of influencers play a significant role in customers' decisions to buy or reject a food product. Religion, race, age, nonreligious beliefs, and personal experiences all affect consumers.
- The research led by the marketing team gathers as much information as possible on target market
  members through different methods, including interviews, social media research, email surveys,
  and more. Then divide them into demographic groups and construct a complete persona for each.
  By collecting demographic data, food product developers can develop a better understanding of the
  opportunities and constraints for obtaining customers.
- 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 concentration method is typically used as a pre-treatment to lower the initial moisture content of various commodities such as milk, tea, or coffee before final dehydration in a spray or freeze dryer.
- Blanching is a food preparation method in which food is briefly immersed in hot liquid, for e.g. boiling water, often but not always as a prelude to cooking it further.
- A recipe is a set of instructions for preparing and making a certain meal, dish, or beverage. A recipe's goal is to keep a detailed record of the materials used, the amounts required, and how they are combined.
- The activity of producing, designing, or developing food products to offer some utility is known as recipe formulation. The functionality might range from giving additional nutritional benefits to dietary supplements in addition to the food's primary purpose.
- Finding existing formulations and recipes and then changing and modifying them as needed is typically the simplest method to start when developing a new recipe formulation for a food product. Food product developers should research ingredient consumption levels, especially if specialized or industrial components are required (gums, modified starches, etc.).
- A food prototype is a functional but not finished version of a product that manufacturers can use for testing, soliciting feedback, and introducing to investors before launching to a larger consumer market.
- Food products' five key sensory parameters are appearance, texture, smell, taste, and irritation. They get sensed through our five major human senses: vision (sight), touch (touch), smell (smell), taste (taste), hearing (hearing), and chemesthesis (common chemical sense).
- The cost breakdowns for recipes are a crucial aspect of the cost computation. It's essential to determine how each item affects a recipe's overall cost according the standard procedure. Understanding the exact price of a food item allows creating the ideal profit margin for the product.
- Standard units are regularly used measurement units that aid in the measurement of length, height, weight, temperature, mass, and other variables. These units are standardized, which means that

- everyone understands the size, weight, and other characteristics of objects and things in the same way. Metric measurements (S.I. Systems) are used to represent the weight and measure.
- The vendor selection process consists of a series of procurement procedures that are used to assess
  product or service requirements and match them with vendor capabilities and pricing. It includes
  locating possible suppliers, collecting competitive bid quotations or proposals, evaluating vendors
  by contacting references and using a company's vendor selection criteria checklist, and contracting.
- Food product development encompasses the entire process of bringing a food product to market. It also includes the renewal of an existing product and the introduction of an old product into a new market. Identifying market needs, envisioning the product, developing the product roadmap, launching the product, and collecting feedback are all part of this process.
- Scale-up is an exhilarating moment, full of optimism and potential, but it is also a vulnerable time for new enterprises. When it comes to scaling up food production, developers who do not prepare ahead can make terrible blunders and suffer losses that are too enormous to recover from. The difficulties of scaling up are not insurmountable.
- Scaling up a recipe formula is not as simple as multiplying. In prototype development, a recipe can be
  doubled or tripled while using the same ingredients, measuring tools, and process time. However, as
  the quantity of an ingredient increases from 10 to 2,000 pounds while increasing food output, things
  change.
- Food preservation is one method of protecting food from microbial growth. Following production,
  the food product is stored and preserved in compliance with standard procedures to prevent
  spoilage or contamination. It is done to extend the shelf life of food products. It is the process of
  treating and handling food products to prevent spoilage and foodborne illness while retaining
  nutritional content, texture, and flavor.
- Halal foods are defined under Islamic dietary regulations. Halal foods are legal and permissible for
  individuals who follow Islamic principles. Haram, or forbidden foods and beverages, are not allowed
  to be consumed by Muslims. Foods with the halal mark on their packaging have been approved by
  an organisation and are guaranteed to be free of any prohibited ingredients or components.
- Continuous processes and batch processes are the two types of production processes.
- The method of determining the nutritional content of food products is known as nutritional analysis.
   It's an important aspect of information regarding food's chemical composition, processing, quality control, and contamination. The nutritional analysis is usually presented on the backside of the packaging in tabulation form. It aids in distinguishing between different foods based on calories per gram and items' contents.
- A food allergy is an immunological response to a food that the body sees as foreign and potentially
  dangerous. People may be allergic to an item as a whole or to one of its constituents, which are
  mostly proteins. Responses can range from high fevers, rashes, and influenza-like symptoms to more
  severe disorders such as anaphylactic shock, which can result in death. In manufacturing, retail, and
  food administration, allergen control techniques are critical for good hygiene practices (GHPs) and
  HACCP systems.
- Food quality management is critical to ensuring that customers consume and handle safe food. It can safeguard customers from hazards such as tainted goods while also ensuring that they receive the weight and quality of food for which they have paid.
- Quality management tools assist organizations in gathering and analyzing data so that employees

can readily grasp and interpret information. Quality management approaches necessitate substantial planning and the collection of appropriate end-user information. Customer input and expectations must be constantly monitored and evaluated to offer superior quality products.

Ex	ercise 📝 ———————————————————————————————————
	swer the following questions-
1.	What is fish-borne diagram?
2.	Explain the quality testing parameters of food product.
3.	NAME - A in a share to the second sec
3.	What is a check list?
4.	What is Pareto chart?
5.	Explain quality management tools.

#### **Practice questions**

- 1. If health mix is my product, make the process flow chart, raw material specification of any 6 ingredients involved, draft receipe, packaging and labelling template, FSSAi regulation for this product.
- 2. If masala powder is my product draft the online quality checks required while processing
- 3. Take any one beverage and draft the final specification of the product and involved ingredients.
- 4. Set the product releasing criteria for falooda ready made mix.

#### Scan the QR Code to watch the related video



https://www.youtube.com/watch?v=xOXnrKy17s0

Developing A New Food Product









# 3. Guidelines and benchmarking for new product development

Unit 3.1 Follow FSSAI regulations

Unit 3.2 Benchmarking of New and Existing Products



### **Key Learning Objectives**



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

- 1. Perform various tasks to identify new recipes and ideas for new product as per FSSAI guidelines
- 2. Perform tasks to test the quality of food as per FSSAI guidelines

#### **Unit 3.1 Follow FSSAI regulations**

#### - Unit Objective



#### At the end of the unit, the trainee will be able to:

- 1. Discuss food-related discipline such as food science, nutrition, microbiology, chemistry, or food busines
- 2. Recall FSSAI regulations for developing new recipes
- 3. Recall food safety standards that are customary within the food industry and mandated by government regulations
- 4. Discuss the need of guidelines for maintaining the same quality of food product throughout the organization
- 5. Describe FSSAI guidelines for avoiding mixing of permitted and non-permitted ingredients in the food product
- 6. Elucidate Maximum Permitted Limit (MPL) for food additives and Total Phenolic Content (TPC) limit for fresh and reused cooking oil set up by FSSAI
- 7. Describe food adulteration and food contamination

#### 3.1.1 Food-Related Discipline

Below are a few significant scientific food-related disciplines that help to preserve, enhance, and progress the area of food science.

1. **Food science** is a multifaceted field that incorporates chemistry, biochemistry, nutrition, microbiology, and engineering to equip researchers with the scientific understanding required to address real-world difficulties associated with the food system's various aspects.

The study's foundation is to understand the chemistry of food elements such as proteins, carbohydrates, lipids, and water, as well as the processes they undergo during preparation and storage. Drying, freezing, pasteurization, canning, irradiation, and extrusion, to name a few, all necessitate a full understanding of processing and preservation processes. Food ingredient analysis and statistical quality control methods are being developed. Understanding food microbiology and safety is equally crucial.

Among the other topics covered are food additives, food physicochemical properties, flavor chemistry, product development, food engineering, and packaging. Food science combines all of this knowledge and focuses it on food.

2. Nutrition is critical to one's overall health and growth. Improved nutrition is associated with improved newborn, child, and maternal health, stronger immune systems, safer pregnancy and childbirth, a lower risk of noncommunicable diseases (such as diabetes and cardiovascular disease), and a higher life expectancy. Children who are in good health learn better. People who receive adequate nutrition are more productive and, over time, can help to break the cycle of poverty and hunger. Malnutrition, in all its manifestations, is a severe hazard to human health. Today, the world is dealing with a double nutritional burden: undernutrition and obesity, particularly in low- and middle-income countries.

WHO provides scientific advice and decision-making tools to help nations address all types of malnutrition and promote health and well-being for people of all ages. This fact sheet explores the dangers of all forms of malnutrition, beginning with the most vulnerable periods of development. Its solutions can be provided by the health system, both directly, and indirectly through its effect on other sectors, particularly the food system.

3. **Microbiology** is the scientific study of unicellular, multicellular, or acellular microorganisms. It is divided into several subfields: virology, bacteriology, protistology, mycology, immunology, and parasitology. Microorganisms are important to foods for three reasons:

They can cause food spoiling

They are employed to make a wide range of food items

They can transmit microbial diseases

Fig. 3.1 Role of Microorganism in Food

Microbiology is used in food safety, production, processing, preservation, and storage. Microbes such as bacteria, molds, and yeasts are employed in the production of foods and food ingredients such as wine, beer, bread, and dairy products. Food microbiology tests raw materials, in-process products, and finished products to ensure that they are safe for customers to consume. They should contribute to the advancement of scientific or technological knowledge in the journal's specialized field of expertise while also strengthening the journal's strong international reputation.

All food has chemical components. Chemicals in food are generally safe and often desirable; for example, carbohydrates, protein, fat, and fiber are all chemical molecules. Many of these are naturally occurring and contribute to a well-balanced diet as well as our dining experience. Chemistry plays an important role in food preparation and storage. Food additives, for example, may increase meal shelf life; others, such as colors, may make food more appetizing. Flavorings are used to enhance the flavor of foods. Health supplements are employed as an energy source.

- 4. **Food business** applies to any business that is engaged in the preparation, processing, manufacturing, or packaging of food in any manner. It could be a private or public for-profit or non-profit enterprise. The food sector has grown extremely competitive as a result of the large number of people who have entered it.
- 5. Food adulteration is the practice of decreasing food quality by adding low-quality ingredients or extracting important components. It encompasses biological and chemical contamination during food product cultivation, storage, processing, transportation, and distribution, as well as purposeful substance addition or substitution. It is also to blame for the deterioration or reduction in food quality.

The list of several adulterants that have been introduced to food items, along with their adverse consequences, is shown below.

Food Products	Adulterant	Harmful Effects
Milk and Curd	Water and starch powder.	Stomach disorders.
Ghee, Cheese and Butter	Mashed potatoes, Vanaspati and starch powder.	Gastro-intestinal disturbances and other stomach disorders.
Grains	Dust, Pebbles, Stones, Straw, weed seeds, damaged grain, etc.	Liver disorders, Toxicity in the body, etc.
Pulses	Dyes, chemical and Lead Chromate.	Stomach disorders.
Coffee powder	Chicory, tamarind seeds powder.	Diarrhoea.
Tea	Artificial colouring agents.	Liver disorders.
Sugar	Chalk powder, Washing soda, Urea, etc.	Stomach disorders and kidne failure.

Table 3.1 Adulterants in Food Products (Image Source: <a href="https://byjus.com/biology/food-adulteration/">https://byjus.com/biology/food-adulteration/</a>)

6. Food contamination is defined as foods that have decayed or been tainted due to the presence of microbes such as bacteria or parasites, or poisonous substances, rendering them unfit for human consumption. Food contaminants can be biological, chemical, or physical, with the former being the more common. Contamination is any unwanted substance discovered in the product. These contaminants affect the quality of the product or process.

These are the rules and regulations to prevent food contamination followed by the organization are as follows.

To avoid germs, wash hands for at least 20 seconds with soap and warm or cold water before, during, and after food preparation and eating.

To eradicate germs, wash utensils, cutting boards, and counters with hot, soapy water after preparing each food item.

To preserve raw or marinated meat, poultry, shellfish, and eggs, store them apart from all other items in the refrigerator.

Continued...

To keep raw meat, poultry, and shellfish in sealed containers or packaging so that fluids do not contaminate other items.

Fig. 3.2 Rules and Regulations to Prevent Food contamination

The food industry already has safeguards in place to stop germs, viruses, and mold from getting onto food or manufacturing equipment. However, the business is swiftly learning how to deal with a brandnew problem: the transmission of illness from employee to employee. Implementing certain procedures and routinely cleaning the facilities can help avoid various kinds of infection.

#### **Entryway Sanitation**

 For personnel to utilise as soon as they enter the building, set up sanitation stations at the entrances and give soap, water, hand sanitizer, and PPE.

#### **Control Points**

 The FDA defines control points as "any stage at which biological, chemical, or physical elements can be regulated."

#### **Deep Cleaning**

 Deep cleaning, which extends beyond the measures provided during everyday sanitation, should be done occasionally or following a contamination occurrence.

#### **Contact Times for Sanitizers**

 Sanitizers must be administered appropriately in order to be successful, whether during thorough cleaning, everyday sanitation, or between work hours.

#### **Employee Training**

Train each staff on the cleaning and sanitising processes you require, and make sure they
understand how to prepare and apply sanitizer.

Fig. 3.3 Procedures and Routinely cleaning the facilities To Avoid Various Infection

- 7. Food chemistry examines the many chemical reactions and interactions between the biological and non-biological components of food. Simply put, this clarifies the changes that occur to foods throughout preparation and storage. Data on chemical structure and associated reactions are required to solve food science challenges like lifespan and quality decline over time.
- 8. Food technology and engineering Food technology involves the application of food science to the appropriate selection, conservation, preparation, packing, distribution, and consumption of food. The practice of turning raw resources into food comprises a variety of methods and procedures. Making food both appetizing and nourishing requires a great deal of research.
  - To create affordable solutions and address the social and commercial demands in the field of food science, food engineers use scientific concepts and mathematics. This involves product design, food processing optimization, and development. Food engineering is involved in the entire food manufacturing process, from design to testing to food quality maintenance.
- 9. Foodomics has been characterized as a new science that examines the food and nutrition domains using modern omics technology to improve customer welfare, health, and confidence. Foodomics encompasses four major omics disciplines: genomes, transcriptomics, proteomics, and metabolomics.
- 10. Molecular gastronomy is a field of food science that studies the physical and chemical processes that occur during the cooking process. These processes and interactions are examined and modified to produce tasty, utilitarian, and aesthetic outcomes. Restaurants or individuals doing experiments at home are often the ones using molecular gastronomy techniques. The proteins in egg whites cause a souffle to "inflate" as opposed to turning into a pancake.
- 11. Sensory science is a scientific subject that is used to elicit, measure, evaluate, and interpret reactions to the qualities of foods and materials as experienced by the senses of sight, smell, taste, touch, and hearing. Other examples include making sure a packaging closure is hard enough to provide a safety seal but not so rigid that it cannot be opened and making sure potato chips keep the required level of crispness during the reported shelf life. In these kinds of applications, a trained panel that functions like a computer is frequently used to detect deviations from a predetermined objective across a variety of product parameters. These measures can occasionally, but not usually, be made by machines.
- 12. Nutritional genomics emphasizes the use of high-throughput and/or genomic technologies to quicken the pace of conventional nutrition research and its applications miss the new science that has emerged at the intersection of the disciplines of nutrition and genomics, as well as the new opportunities for research, discovery, and application that it offers.

#### 3.1.2 FSSAI Regulations for Development of New Recipes

#### 1. Raw Material

Raw materials are critical because biological, chemical, or physical dangers introduced at the beginning of the process can remain during preparation and processing. Use acceptable-grade raw materials (not low-grade).

#### 2. Food Additives

Any material that is intentionally added to food for a technical (including organoleptic) purpose in the production, processing, preparation, treatment, packing, packaging, shipping, or holding of such food results, or may be reasonably assumed to lead (explicitly or implicitly), in it or its byproducts. This includes substances that are not typically ingested as food by themselves and are not commonly employed as a typical constituent of the food, regardless of whether they have nutritional value. The phrase excludes pollutants or compounds added to food to preserve or enhance its nutritional value.

Food additives are used to preserve or improve the taste, texture, consistency, appearance, and other technological needs. Supplements, minerals, herbs, yeast, hops, starting cultures, malt extract, and other ingredients are not considered food additives.

The product shall conform to the compositional specifications provided in the table below:

Product	Moisture (Not more than)	Milk Fat (Not less than)
Butter, Ghee & Milk fats	16%	80%
Whole milk powder	4%	26%

Table 3.2 Compositional Specifications

#### 3. Food Colors and their Limits

Food coloring and flavoring additives are commonly utilized to draw in customers. The effects of food coloring on food are enormous since they play a critical part in the visual presentation of the meal. In India, the FSSAI (Food Safety and Standards Authority of India) has authorized some food colors and flavors for human consumption. Only FSSAI-approved food colors and flavors may be used in food products. The Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011 (the "Regulations") include a list of the approved food coloring and flavoring chemicals as well as their specifications.

- **1. Erythrosine:** It imparts the food a red color and should fulfill the below-listed FSSAI-prescribed requirements:
- 2. The total dye content of the sample dried at 105±1°C for two hours should be not less than (NLT) 87% by mass.
- 3. Loss on drying (LOD) at 135°C should not be more (NMT) than 13% by mass.
- 4. Water-insoluble content should be NMT 0.2% by mass.
- 5. Ether extractable matter should be NMT 0.2% by mass.
- 6. Inorganic iodide as sodium iodide should be NMT 0.1% by mass.
- 7. Other subsidiary coloring matters except fluorescein should be NMT 4% by mass. Fluorescein should be NMT 20 mg/kg.
- 8. Organic compounds except coloring matter should be NMT 0.2% by mass.
- 9. Lead, arsenic, zinc, and heavy metals should be NMT 10, 3, 50, and 40 mg/kg respectively.
- 10. The food should be completely free from copper, mercury, and chromium. It should also be free from aromatic nitro compounds, cyanides, aromatic hydrocarbons, and aromatic amines.
- **11.**  $\beta$ -carotene: It is commonly called C.I. natural yellow 26 and belongs to the class of carotenoids. It contains all trans- $\beta$ -carotene; no cis  $\beta$ -carotene should be present. The general requirements of this compound can be divided into two different types as follows:
- 12. Spectrophotometric requirement: The absorption maxima in cyclohexane in a 1 cm cell should be in the region of 456 to 484  $\mu$ m. No peaks at 330 to 355  $\mu$ m should be observed as it represents a cis peak.
- 13. Color reaction: β-carotene should have a purity of NLT 96%. The other requirements are:
- · Arsenic should be NMT 3 parts per million (ppm)
- The lead should be NMT 10 ppm
- · Heavy metal content should be NMT 40 ppm
- Subsidiary coloring matter should be NMT 3% by mass
- Sulphated ash and total coloring matter should be NMT 0.1%
- **3. Chlorophyll:** Chlorophyll, also known as C. I. Natural Green 3, is a plant-based green pigment that is used as a coloring material for foods.
  - Limits for metallic impurities in chlorophyll are:
- · Arsenic should be NMT 3 ppm
- The lead should be NMT 10 ppm
- · Copper should be NMT 30 ppm
- Zinc should be NMT 50 ppm

Table 3.3 Food Colors and their Limits - FSSAI Guidelines

 $(Image\ Source: \ \underline{https://www.foodsafetymantra.com/regulatory-insight/spices-condiments-and-additives/fssai-regulations-on-the-use-of-food-colours-and-flavors/)$ 

#### 4. Ingredients (include GMP)

The fundamental procedural and environmental requirements needed to create safe foods are known as Good Manufacturing Practices (GMPs). They provide safe handling of ingredients, goods, and packaging materials as well as appropriate processing conditions for food products.

#### 5. Formulations

Both the food seller and the authorities must pay extra attention to certain types of foods with high levels of salt, sugar, acid, or low moisture. Taste, appearance, textures, aroma, mixing time, pH, water level, and other factors can all be used to monitor critical limits.

#### 6. Preparation and Processing

While it's critical to choose foods carefully to avoid introducing dangers that could spread throughout the chain, it's just as crucial, if not more so, to use the proper preparation and processing processes, which are outlined below.

- The preparation/processing/cooking should be sufficient to eliminate and minimize dangers introduced at the raw food (initial) level to an acceptable level.
- The techniques of preparation, processing, and cooking should ensure that the items are not recontaminated.
- Vegetable and non-vegetable items should be prepared, processed, and cooked separately.

Food-grade equipment and gadgets are essential since commodities are frequently in close touch with the equipment used to manufacture food and beverage items. Chemical elements in the materials may seep into exposed items or, in rare situations, result in tiny particles of the material moving straight into the finished product.

- The food-grade substance must be created following these guiding principles:
- The material is utilized within the advised safe temperature range.
- The material is safe for the sort of food and beverage with which it comes into direct contact.
- The material's integrity will not be jeopardized by ordinary sanitation and cleaning methods.

To describe the substance or apparatus and not imply that the entire apparatus is suitable for use with food and drink. It is necessary to consider additional factors, such as the cleaning ability. The only way to guarantee that the equipment is hygienic and of high quality is to rely on certifications from reputable agencies like the European Hygienic Engineering and Design Group (EHEDG) or 3-A Sanitary Standards, as well as using the right installation and maintenance techniques.

## 3.1.3 Need and Importance of Food Safety Standards in Food Industry and Mandated by Government Regulations

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 food-

 Legal standards - Specifications or requirements about 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. The following parameters are generally taken into consideration while fixing legal standards:

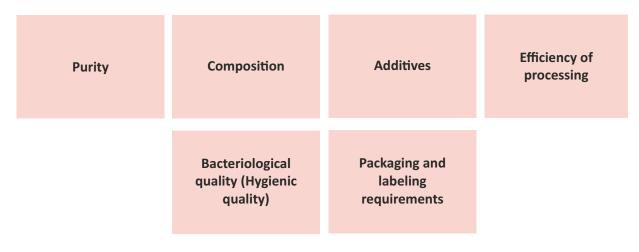


Fig. 3.4 Parameter of Legal Standards

2. 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. They are voluntary. In India, we have two types of quality standards for producing export-quality products: -

#### **Quality Standards Descriptions** a) BIS/ISI Standards India's national standard-setting body is called the Bureau of Indian Standards (BIS). The smooth progression of the operations of standardization, marking, and quality certification of goods, as well as any issues related to or incidental to those activities, is the responsibility of BIS. These standards deal with many types of processed food products, apart from reau of Indian Standar non-food products. For example, all dairy products BIS except ghee and butter. Image Source: (https://snehmanagement.com/service/bis-isi-markcertificate/) b) Agmark Standards The Agmark logo is used to certify the quality of agricultural products. Agmark is a certification mark used on agricultural goods in India to guarantee that they correspond to a set of requirements recognized by the Directorate of Marketing and Inspection. These deal with many types of foods, mainly raw agricultural produce. For example, cereals, oils, oilseeds, spices, eggs, legumes (pulses), ghee, butter, etc. Image Source : (https://en.wikipedia.org/wiki/Agmark#/m edia/File:Agmark.gif

Table 3.4 Quality Standards

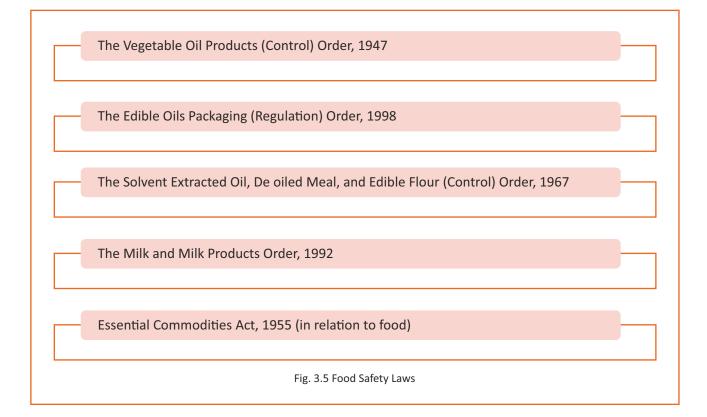
There are 8 laws and its role to be included:

The Prevention of Food Adulteration Act, 1954

The Fruit Products Order, 1955

The Meat Food Products Order, 1973

Continued...



## 3.1.4 Mixing of Permitted and Non-Permitted Ingredients in Food Product

Food preservatives are substances "added to food items to prevent, retard, or block the process of fermentation, acidification, and breakdown of food items." In other words, preservatives in food help keep food safe and fresh for longer. Food preservatives are classified in two categories:

#### Class I preservatives or the natural preservatives

 Example: - salt, sugar, vinegar, syrup, spices, honey and edible oil and

## Class II preservatives or the chemical preservatives

Example:- benzoates, sorbates, nitrites and nitrates of sodium or potassium, sulfites, glutamates, glycerides and the like.

Fig. 3.6 Classification of Food Preservatives

The food standards laws prohibit the use of more than one class II preservative on a single food item. Natural and artificial preservatives are classified into three types:

- 1. **Antimicrobials** kill or inhibit the growth of bacteria, yeast, and mould. Nitrites and nitrates, for example, prevent botulism in meat products. Sulphur dioxide keeps fruits, wine, and beer from deteriorating further. Antifungal benzoates and sorbates are found in jams, salads, cheese, and pickles.
- 2. **Antioxidants** are slow or prevent the breakdown of fats and oils in food in the presence of oxygen (oxidation), resulting in rancidity. BHT, BHA, TBHQ, and propyl gallate are examples of anti-oxidants.

**3. Anti-enzymatic preservatives** inhibit enzymatic reactions such as ripening that occur in foods long after harvest. Erythorbic acid and citric acid, for example, inhibit the action of the enzyme phenolase, which causes a brown hue on the exposed surface of chopped fruits or potatoes.

The table below lists the types of food preservatives used, the food products in which they are used, and the allowable limitations for their use.

Food Preservative	Type of preservative	Type of food products	Maximum Permissible limit
Benzoates and sorbates	Antimicrobial	Pickles, margarine, fruit juices, jams, cheese	200 ppm (200 parts per million)
Propionates	Antimicrobial	Bakery products, cheese, fruits	0.32 percent
Sulfites and sulfur dioxide	Antimicrobial	Dry fruits and fruits, molasses, wine fried or frozen potatoes, prevent discoloration in fresh shrimp and lobster	200-300 ppm
Nitrites and nitrates	Antimicrobial	Meat products	100-120ppm
Propyl gallate	Antioxidant	Baked foods, meats	200 ppm
BHA (butylated hydroxyanisole) and BHT (butylated hydroxytoluene)	Antioxidants	Baked foods and snacks, meats, breakfast cereals, potato products	100 ppm for meat products, 50 ppm for breakfast cereals and potato products
Tert-Butylhydroquinone (TBHQ)	Antioxidant	Baked foods and snacks, meats	100 ppm
Erythorbic acid (iso- ascorbic acid) and citric acid	Antienzymatic	Soft drinks, juices, wine, and cured meats	200-350 ppm

Fig. 3.7 Permissible Limit of Food Preservatives

(Image Source: <a href="https://www.medindia.net/patients/lifestyleandwellness/food-preservatives.htm">https://www.medindia.net/patients/lifestyleandwellness/food-preservatives.htm</a>)

The presence of food additives and preservatives in packaged, processed foods is due to several factors.

The following are the non-permitted food additives:

#### **Trans Fats**

 The issue is that ingesting trans fats has been linked to an elevated risk of heart disease, type 2 diabetes, and stroke.

#### **Sodium Nitrite**

• Consuming excessive amounts of sodium nitrite has been linked to pancreatic cancer and other serious health issues, according to several research.

#### **Monosodium Glutamate (Msg)**

- MSG is a found naturally molecule that resembles sugar or salt.
- Numerous responses, including headaches, flushing, sweating, facial pressure or tightness, numbness, tingling, or burning in the face, neck, and other regions, fast heartbeat, chest discomfort, nausea, and weakness, have been reported in some instances.

#### **Artificial Food Coloring**

- The following are the most dangerous food colorings:
- Yellow#5
- Blue #1 and Blue #2
- Red Dye #3
- Yellow #6
- Natural Green Color

#### **High Fructose Corn Syrup**

- High fructose corn syrup (HFCS) is popular among food makers because it is less expensive than cane sugar while still providing the desired sweet flavour.
- It's thought that HFCS contributes to type 2 diabetes and obesity.

Continued...

#### **Aspartame**

• Aspartame is an artificial sweetener that is widely included in diet or sugar-free beverages, chewing gum, Jell-O, Kool-Aid, and, in rare cases, chewable vitamins. It's over 200 times sweeter than cane sugar, so producers don't need to use as much of it.

#### Bha & Bht

• It's possible to find the preservatives butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) in cereals, chewing gum, potato chips, and vegetable oils. Foods are kept from deteriorating in flavour, colour, or rancidity by this frequent preservative.

Fig. 3.8 Non-permitted food additives (Image Source: https://chefsforseniors.com/blog/7-food-additives-and-preservatives-to-avoid)

The following are the non-permitted food colors:

Rhomdamine

Amaranth

Orange G

Fast red

Metanil yellow

Fig. 3.9 Non-Permitted Food Colours

## 3.1.6 Maximum Permitted Limit (MPL) for food additives and Total Phenolic Content (TPC) by FSSAI

The total plate count is the count of mesophilic, aerobic organisms that can thrive at temperatures between 20 and 45 °C. This comprises every aerobic bacteria, yeast, mold, and fungus that develops on the particular agar. This count covers both pathogens and nonpathogens and is used to assess the sanitary quality of food produced.

Color-coded labels for high fat, salt, and sugar in the product are:

#### 1. High Sugar

Sugar is a simple carbohydrate that the human bodies use for energy. Excessively added sugar can be hazardous to health, especially in diabetics. The American Heart Association recommends that healthy individuals consume fewer than 36g of sugar per day for males and less than 25g for women.

When it comes to added sugar, the amount of energy from added sugar must be greater than 10% of the total energy (kcal) offered by a product's  $100\,\mathrm{g}/100\,\mathrm{ml}$ . Let's use Bournvita biscuits as an example to demonstrate this. These biscuits contain  $30\,\mathrm{g}$  of sugar per  $100\,\mathrm{g}$  and give  $457\,\mathrm{kCal}$  of energy - much above the 10% threshold for added sugar.

#### The total amount of sugar found in solid or semi-solid foods

Total sugar content (per 100g)	The logo's primary colors
More than 22g	Red
5g to 22g	Amber
Less than 5g	Green

#### Reference Source:

Table.3.5. Sugar Content in Solid and Semi- solid Food

#### 2. High Sodium

At least half of all hypertensive persons have blood pressure that is impacted by sodium ingestion, indicating that they are salt sensitive. Table salt, also known chemically as sodium chloride, contains 40% sodium. The risk of salt sensitivity increases with age and can be caused by eating a diet high in sodium.

Britannia's ready-to-eat breakfast cereals contain 0.35 mg of salt per 100 gm of product, but the sodium content of the Saffola Masala oats box is not even shown in the nutrition information table. With this

level, Maggi noodles will be colour-coded RED - far more than the 0.25 gm criterion.

#### The total amount of salt found in solid or semi-solid foods

Total salt content (per 100g)	The logo's primary colors
More than 1.25g	Red
0.25g to 1.25g	Amber
Less than 0.25g	Green

#### Reference Source:

 $\frac{(https://extranet.who.int/nutrition/gina/sites/default/filesstore/LNK\%202019\%20Food\%20\%28Colour\%20Coding\%20for\%20Sugar%2C\%20Salt\%20and\%20Fat\%29\%20Regulations\%202019\%20-\%20No\%2026\%201980.pdf)}{(https://extranet.who.int/nutrition/gina/sites/default/filesstore/LNK%202019%20Food%20%28Colour%20Coding%20for%20Sugar%2C\%20Salt%20and%20Fat%29\%20Regulations%202019%20-%20No%2026%201980.pdf)}$ 

Table.3.6. Salt Content in Solid and Semi- Solid Food

#### 3. Saturated Fat

Saturated fats are named after fat molecules that have been saturated with hydrogen. For example, butter, shortening, or coconut oil are solid at room temperature. They can boost the blood cholesterol level and increase the risk of stroke and heart disease if taken. Saturated fat is linked to elevated LDL cholesterol levels, which can lead to clogs in the heart.

#### The total amount of fat found in solid or semi-solid foods

Total fat content (per 100g)	The logo's primary colors
More than 17.5g	Red
3g to 1.75g	Amber
Less than 3g	Green

#### Reference Source:

(https://extranet.who.int/nutrition/gina/sites/default/filesstore/LNK%202019%20Food%20%28Colour%20Coding%20for%2 0Sugar%2C%20Salt%20and%20Fat%29%20Regulations%202019%20-%20No%2026%201980.pdf)

Table 3.7. Fat Content in Solid and Semi-Solid Food

For some additives, the Food Standards Code establishes maximum allowed levels (MPLs). The MPL is the legal maximum amount of an additive in a food product or when cooked according to the package guidelines. The MPL guarantees that additive levels are not exceeded. The actual amount employed must be the smallest amount required to achieve the desired result.

The Total Phenolic Compounds (TPCs) for unused vegetable oils/fats have been set at not more than 15% by the FSSAI, according to a draught notification released lately. Furthermore, the authority states that used vegetable oil/fat with TPCs of more than 25% should not be utilized for frying. According to the announcement, Total Phenolic Compounds in unused/fresh vegetable oil/fat shall not exceed 15% under the Food Safety and Standards (Prohibition and Restrictions on Sales) Regulations, 2011. Vegetable oil/fat that has generated more than 25% of Total Phenolic Compounds should not be used.

#### - Exercise 🔀

#### Answer the following questions-

- 1. What is food science?
- 2. Explain the significance of microbiological studies in food development.
- 3. List FSSAI regulations for the development of new recipes.
- 4. Write a short note on:
  - a. Legal standards
  - b. Classification of Food Preservatives
  - c. Maximum Permitted Limit (MPL)

#### **Practical questions**

- 1. Formulate the red velevet cheese muffins, with it limits of indregents.
- 2. IF the the product is having high sugar find out the brainstorming ways to reduce the added sugar content provided the taste of the sugar remaining same.
- 3. If you are formulating fried product what are all the limits need to be set for the ingredeints.

#### **Unit 3.2 Benchmarking of New and Existing Products**

#### - Unit Objective



#### At the end of the unit, the trainee will be able to:

- 1. Explain five views of assessing the quality transcendental view, product-based view, user-based view, manufacturing-based view and value-based view
- 2. Elaborate ways to analyze the data and identify opportunities for developing new products.
- 3. Describe functioning of excel or software like SAP for preparing records and documents as per organizational requirements

#### 3.2.1 Five Views of Assessing the Quality

Quality is a difficult concept to define since it signifies different things to different people and is extremely contextual.

The **five different perspectives** on quality are as follows:

#### **Transcendental View**

- Quality is seen as something that can be recognised but is difficult to define in the transcendental view. In this case, quality is something that can be identified via experience but is not easily described
- Quality is considered as an ideal that is too complex to be fully defined

#### **User View**

- It considers quality to be suited for the purpose. According to this viewpoint, when
  evaluating a product's quality, the main question to ask is "Does the product satisfy
  consumer wants and expectations?"
- A user in this perspective is worried about whether or not a product is suitable for usage.
   Quality is determined not only by the capabilities of a product but also by the service provisions in the sales contract

#### **Manufacturing View**

- Conformance to specifications is the definition of quality in this context. The amount to which a product complies with its requirements determines its quality level
- Any variation from the set specifications is regarded as lowering the product's quality.
   Manufacturing industries, such as the automobile and electronics industries, are the originators of the manufacturing viewpoint

#### **Product View**

- In this scenario, quality is considered to be linked to the product's inherent qualities. The intrinsic features of a product influence its appearance
- The product view is appealing because it allows you to discover unexpected connections between a product's internal properties and its external attributes

#### Value - Based View

- In this case, quality is determined by the customer's willingness to pay for it. The value-based perspective combines two distinct concepts: excellence and worth, with quality serving as a measure of excellence and value serving as a measure of worth
- If a product does not make financial sense, it is of no use. The value-based perspective represents a cost-quality trade-off

Fig. 3.9 Five Views of Assessing the Quality

## 3.2.2 Key Performance Metrics for Analysis of New and Existing Products

Product metrics are measurable data elements that a company monitors and analyses to determine the success of a product. Conversion rate, churn rate, and monthly recurring revenue are examples of product metrics. All of these indicators should be related to the product plan. In the food sector, key performance indicators (KPIs) such as throughput, yield, and downtime are closely tied to operational efficiency.

Additionally, and get secondary data from publications like news stories, reports, marketing materials, and websites. Secondary data, however, might not be as trustworthy.

#### Analyse Data and Identify Opportunities for Developing New Products

Exploring new-product potential entails coming up with, developing, and testing new product concepts. Understanding the demands for new goods, uncovering existing and possible sources of ideas, articulating internal and external requirements, and assessing prospects are the key phases.

Estimate the price of the product

Determine the market potential for the product

Estimate the sales volume

Determine the breakeven point

Determine the minimal selling price

Consider the long term

Determine the scope of the marketing approach

Fig. 3.10 Steps to Identify Opportunities for Developing New Food Products

Benchmarking is a procedure used in business to evaluate the performance of the organization's goods, services, and operations. These metrics aren't very useful by themselves; the data has to be compared to a benchmark.

Following are the steps in benchmarking process:

#### 1. Select a subject to benchmark

Choosing which procedures are essential to the success of the organization should involve executives and other senior management. The processes should then be ranked in order of importance according to the criteria that are significant to all parties.

#### 2. Decide which organizations or companies need to benchmark

Determine if a corporation will benchmark procedures inside its own company, against a rival, or a company outside of the industry. If a corporation benchmarks a direct rival, it could be challenging to gather all the data it needs. Therefore, a corporation should choose several diverse organizations to research to obtain the information required.

#### 3. Document the current processes.

Create a flowchart of the present procedures so that the business can more readily compare them to the selected structure and find areas that require improvement.

#### 4. Collect and analyze data

This stage is critical, but it can be challenging when a corporation is attempting to obtain data from a rival because most of that information may be proprietary. Obtain information through research, interviews, informal interactions with connections from the competing firms, and through official interviews or questionnaires. Websites, studies, marketing materials, and news items can all be used to gather secondary data. Secondary data, though, might not be as dependable.

#### 5. Measure performance against the data collected

Examine the data that has been acquired in comparison to the metrics that were derived from a study of the internal processes. To overlay performance information on top of the process diagrams or map out the competitor's processes to discover where it is falling short.

#### 6. Create a plan

Make a strategy to put the adjustments into action that has been determined to be the most effective in closing performance disparities. Complete support from the top down is necessary for implementation. The strategy must have specific objectives and be created with the company's culture in mind to assist reduce any resistance it may encounter from workers.

#### 7. Implement the changes

Keep a close eye on the adjustments and staff performance. Find areas that need to be adjusted if new processes are not performing as intended. Make certain that every person knows what they are supposed to be doing, is properly taught, and has the knowledge to finish the duties they are given. To ensure that everyone is on the same page and working toward the same objective, be sure to record all procedures and give access to documents and instructions to all employees.

#### 8. Repeat the process

Once a new procedure has been effectively implemented, it's time to look for further methods to enhance things. Check the newly installed procedures to determine if any adjustments need to be made. If everything is going well, focus on other areas or larger projects that require benchmarking before starting the procedure all over again.

Now let's look more closely at the most popular product metrics, how to calculate them, and why the company would require them to enhance the customer experience overall.

1	Details of each performance metr	rics	
Parameters	Use cases	Calculation	
1. Conversion Rate The percentage of website visitors that do desired key actions is known as the conversion rate.	The conversion rate reveals how well users are drawn to and persuaded to take the aforementioned activities on the website.	The conversion rate is determined by dividing the total number of customers who have performed the desired activity by the total number of "visitors" who have not yet taken the next step and finished the same thing.	
2. New Customer Growth Rate When computed and used properly, this measure will provide the business with the ability to assess how successful they are at acquiring new clients.	This measure must be calculated by the organization each month to function effectively.	New customer growth rate = New customers this month Total customers last month	
3. Churn The percentage of users a firm loses over a specific period is known as the customer churn rate.	Depending on the product and business model, understanding the churn rate might assist to find out why customers are leaving the organization's services so that a better plan concentrating on customer retention can be developed to minimize that number as quickly as feasible.	Churn rate= Churned users Total users	
4. Cost per Acquisition CPA is a marketing measure that calculates the entire cost of a user performing a given action.	A single click, a purchase, a lead, or another action taken by potential consumers might all be considered that precise activity, depending on the marketing objectives of the business.	Multiplying the overall cost of a marketing channel or campaign by the number of customers helped the company gain.  Its formula is as follows:  CPA= Campaign cost  Conversions	

Customer lifetime value Customer Lifetime Value quantifies how much profit an organization's customers will bring during their association with the firm. Additionally, it demonstrates the present user base's performance and the likelihood of future business growth.	This measure may be utilized by the organization's sales/marketing team to make choices regarding sales, marketing analytics, product development, retention tactics, and even customer support.	The CLV is calculated by multiplying annual earnings by the average length of the partnership.  Customer lifetime value = Lifetime value x Profit margin
6. Net promoter score The indicator assesses long- term user happiness as well as the percentage of an organization's loyal customers. It is helpful to consider what is most important before making major product decisions.	The majority of the time, it's fantastic for figuring out user habits, client loyalty, and the likelihood that they'll notify others about the service.	NPS= % of promoters - % of detractors
7. Active trials It's great for determining user behaviors, customer loyalty, and the possibility that they'll recommend the service to others. If an organization's active trial number is consistently increasing, it suggests that what the group is doing is effective and that people are getting more involved and satisfied with it.	Tracking this statistic will allow us to identify trends in the organization's revenue growth and thoroughly evaluate the elements that need to be changed.	In the case of a music streaming app, for example, this works out to about 100 free trial accounts.

#### 8. Session length

The session length statistic measures how long a user spends using a website or application in a single session.

This statistic is excellent for assessing engagement.
With its assistance, organizations will have clear information on whether a user abandoned the app after a brief interaction or spent a significant amount of time using it. This data may be paired with other indicators to offer important information on the value of services provided to users.

Employees must precisely monitor exactly when a user begins and ends using the organization's product to determine the session length. This may be discovered by monitoring the first event that occurs when the website loads and the last event, which may be hitting a "Quit" button. Its formula is as follows:

Timestamp when the user left the app – Timestamp when the user started the app.

#### 9. Number of Sessions

The number of times a person visits the website is referred to as a specific session. This implies that a single user may engage in many browsing sessions if they desire to visit at various times or on various days.

A session is a collection of communications, visits, and web requests conducted during a specific period. A single session often includes several important actions like page visits, events, or transactions. These sessions can aid in the assessment of the frequency of active user participation and website interaction.

The number of people taking advantage of a year-end offer leads to a surge in interest, leading to an increase in sessions on the organization's website. It is extremely simple to calculate the session number. For example, 6,000 sessions are recorded in one week and 3,500 in the following week. This indicates that over those two weeks, 9,500 sessions were recorded on the website.

#### 10. Feature usage

Feature utilization is a measure that sheds light on the proportion of users of certain product features.

The most important elements are given priority by this assessment, while aspects that are not as important are given less attention. The number of users who are actively utilizing a feature must be divided by the total number of users to determine the active utilization of a product within a certain period.

Table 3.8 Performance metricsImage Source: (https://userguiding.com/blog/product-metrics/)

## **3.2.4 Document and Record Maintenance for Product Development Process**

Every organization has a variety of functions being performed in a specific manner. These functions can range from finance to marketing, sales, procurement, operations, IT, etc. Every organization can have some generic and some organization-specific set of functions. There are many records that an organization should be maintained. Like-



Figure 3.11 Example of Records

#### Importance of Record Keeping and Documentation-

The importance of paperwork for any organization cannot be undermined. Documentation and recordkeeping shall:

- 1. Micro-detail about each function and program in the Unit to keep the expectations' objective and explicit.
- 2. Prove that functions carried out in the Unit are valuable and being completed as prescribed.
- 3. Demonstrate due diligence an investigation, audit, or review performed to confirm the facts of a manner under consideration.
- 4. Meet the conditions for third party customer assessments/audits.
- 5. Meet regulatory requirements.
- 6. Establish a paper trail to keep a check as well as improve the functions.

#### Documentation is of great importance for the employees too.

- 1. Documented standards, policies, and procedures are written in simple, clear language to help the employees deliver as per the expectations.
- 2. Written directives are very useful and support in learning.
- 3. It leads to employees to completely understand the requirements and stay in a mode of

- 4. continuous improvement.
- 5. Good documentation helps employees keep a definitive check of their work, without necessarily having to rely on subjective elements.

#### Use of Software to Maintain Records

- 1. The processes are being digitalized for seamless management and effective usage of data for checks and improvements. Beyond mere digitalization and static data, the facilities are gradually transiting to the next level of complete organization automation by adopting excel or software like SAP.
- 2. Think of several processes and functions in an organization. They can range from inventory and order management to production, transportation, accounting, human resources, customer relationship, and the list can be exhaustive.
- 3. Software integrates these various functions into one complete system to streamline processes and information across the entire organization.
- 4. The central feature of the software is a shared database that supports multiple functions used by
- 5. different business Units. This means that whatever data is being fed into the system by the employees from various functions, other employees in different divisions—for example, accounting and sales—can rely on the same information for their specific needs.
- 6. For example, the data generated by the raw material management team gives insights to the procurement team on rationalizing the new procurements and vendor performance as well as help the production team to gain an idea on the availability of raw material and accordingly plan the outputs.

#### Summary **/E**



- There are five views of assessing quality transcendental view, product-based view, user-based view, manufacturing-based view, and value-based view.
- Product metrics are measurable data elements that a company monitors and analyses to determine the success of a product.
- Exploring new product potential entails coming up with, developing, and testing new product concepts. Understanding the demands for new goods, uncovering existing and possible sources of ideas, articulating internal and external requirements, and assessing prospects are the key phases.
- Good documentation helps employees keep a definitive record of their work without necessarily having to rely on subjective elements.

#### - Exercise 🔀



Answer the following questions-		
1.	Explain five views of assessing the quality.	
2.	List key performance metrics for analysis of new and existing products.	
3.	Explain the importance of Record Keeping and Documentation.	
4.	Explain the steps to identify opportunities for developing new food products.	

#### **Practical questions**

- 1. Benchmark the any 2 food company and their products Include market share, producr ingreients, pricing and all other parameters
- 2. Market research the opportunities for wafer biscuits growth in India for upcoming years
- 3. Find the opportunities for vegan products in the indian market
- 4. Make one document for the process development process any one innovative receipe of your own thinking.

#### Scan the QR Code to watch the related video



https://www.youtube.com/watch?v=q8nE0rRnJOY

FSSAI regulations









## 4. Perform tasks for product development

Unit 4.1 Organise and Perform Tasks

Unit 4.2 Perform Analysis of Various Products

Unit 4.3 Maintain Material Availability



# Key Learning Outcomes 👸



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

- 1. Perform various tasks and processes involved in product development and formulation
- 2. Perform various tasks for conducting shelf life study of product

## **Unit 4.1 Organise and Perform Tasks**

# - Unit Objectives 🥒

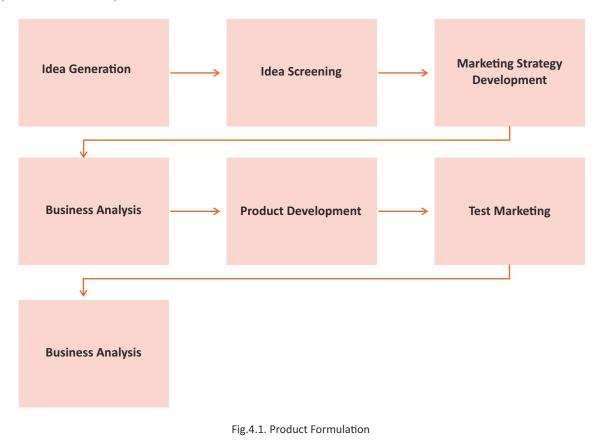


#### At the end of this Unit the trainee will be able to:

- 1. Discuss different processes involved in the product formulation
- 2. List the activities need to perform for product development in sequential manner as per SOP
- 3. Discuss the need of maintaining a list of multiple tasks have to perform simultaneously

## 4.1.1 Various Processes in Food Product Formulation

Food formulation is the creation of food recipes for specific food items. Some food items have substances that increase sugar, salt, fat, and additive intake. Food product compositions may pose potential health risks, and consumers should be aware of this through product labelling. The food product formulation process has a seven-step structure that will assist an organization in standardizing and defining its activities. It begins with those early brainstorming meetings in which a firm discusses a potential new food product.



## 4.1.2 Steps to Perform for Product Development as per SOP

#### 1. Idea Generation

The new development process begins with the creation of a plan. Working with a primary strategy is frequently the most challenging element of development. The reason behind this is that there are so many food items on the market, and developing a new food product that does not exist yet that customers want to buy might be difficult.

- a. Hence, it is advisable to jump right in and start brainstorming ideas.
- b. Later, improve and trim down the concepts for the food product.
- c. Originate inspiration or ideas from a multitude of sources. A few ideas are for fresh new products, while others are for line extensions of current food products.
- d. Once finalizing the concepts, it is critical to identify the target consumer.
- e. Closely monitor market trends to discover what is fresh and forthcoming. These market trends frequently inspire new product concepts.

#### 2. Idea Screening

It assists the organization in screening and evaluating prospective new food product ideas by utilizing predefined criteria, data (such as market research), or score models. For example, while considering new food product ideas, consider their relevance, limits, budgets, value, dangers, and/or practicality. This is by no means a full list, but it should help organizations understand how to conduct idea screening



Fig. 4.2. Idea Screening

Image Source: (https://www.freepik.com/free-vector/flat-tiny-people-innovation-concept-business-partner-generating-idea-projects\_22388673.htm#query=business%20idea&position=39&from\_view=search)

Following are the most essential steps that the food company must take to separate good ideas from had



Fig.4.3. Essential Steps Food Company to Consider to Separate Ideas

#### a. Evaluate ideas against specific criteria

To be effective, the new food product, service, or solution must be evaluated against a set of needs particular to the firm and target audience. For each of these requirements, the firm should establish questions to ask about the items to determine whether they fulfil the criteria. Some typical requirements are:

#### **Product benefits/value**

- How many advantages does this product provide the client, and what are those advantages?
- If the benefits are minor or non-existent, the new product concept is less likely to succeed.

#### Audience

- What is the potential for the target market to grow, and can create new offers help the firm to reach new customers?
- What are the audience(s)' needs and expectations, and how does the product meet those needs and expectations?

#### Simplicity/complexity

Will it be simple to manufacture/develop the product, service, or solution? Can it be
economically priced, or will it be prohibitively expensive for the typical user owing to
production costs?

#### **Profitability**

- How much money must be committed to effectively create the product, solution, or service?
- How much profit can a food organization expect to make after it enters the market?

#### **Market saturation**

- Is there an excess of similar items, services, or solutions on the market? Is there an obvious need for the concept, or is there a market gap? How many competitors will you face?
- This is by no means an entire list, but by considering a handful of these criteria, the organization may quickly choose its top ideas and build a shortlist.

Fig.4.4 Specific Criteria to Evaluate Ideas

#### b. Carry out qualitative and quantitative research

Having criteria to compare the product concept against is a wonderful approach to properly performing idea screening. However, organizations may lack the required data to address the questions presented by each type of criterion.

Qualitative and quantitative research can be used to address this issue. A qualitative research study (such as a focus group or survey) might disclose how the target market feels about the new food product concept. Quantitative research, on the other hand, will provide food organizations with statistics and actual data to back up whatever conclusions they reach.

#### c. Concept development and testing

A product concept is a complete version of a new food product idea expressed in consumer-friendly words. After gathering new food product ideas and doing market research, the following stage is to polish the thoughts into actual concepts that can be evaluated and tested by the food organization's target purchasers. This stage differs from detailed design engineering in that it focuses on detailing technical factors as well as marketing considerations for the product, service, or solution. Organizations should differentiate between the subsequent sub-stages, which include ideation, prototyping, design, and production.



Food organizations seek to depict their concepts so that stakeholders and teams may understand them. Consider employing computer-aided design (CAD), photorealistic rendering, simulations, animation, sketching, and drawings. If feasible, create actual mock-ups so that customers may have a better sense of the product.

The concept development and testing process includes phases such as establishing the study's purpose, selecting a sample group, deciding on a survey style, presenting the concept, assessing consumer reaction, and analyzing the results



Fig.4.6. Concept Development and Testing

(Image Source: https://www.freepik.com/free-vector/tiny-people-testing-quality-assurance-software-isolated-flat-vector-illustration-cartoon-character-fixing-bugs-hardware-device-application-test-it-service-concept\_ 10613736.htm#query=concept%20development%20and%20testing&position=0&from\_view=search)

Survey: The survey's anticipated goal is to collect customer purchasing intent. The questionnaire prepared for the survey contains three basic elements, however, they might change based on the product and the research business.

- a. Qualification: Assume a food company wants to sell new choco-chip cookies or protein bars for college students (new market).
- b. Product description: The new product idea, also known as conveying the concept, is described to respondents in a variety of ways, including: Photo, video, multimedia, 3-D model, Prototype in action, Storyboard \Simulation
- c. Purchase Intent: After explaining the product using one of the approaches discussed above, a potential consumer's purchase intention may be assessed using a basic likers scale:
- d. How likely are people to buy the choco-chip cookies in the next year if the price is as expected?
  - Probably won't buy
  - Not sure
  - Probably would buy
  - Definitely would buy

#### 3. Marketing Strategy Development

After a promising concept has been established and tested, it is important to create an initial marketing plan for the new food product based on the new food product concept. The marketing strategy statement is divided into three components and should be precisely documented.



Fig.4.7. Components of Marketing Strategy Statement

Steps to consider when marketing a product Packaging Price Place to sell Product Promotion

- a) Packaging: Packaging was created, labeled, and priced.
  - Must guard against damage, infection, and manipulation.
  - Designed to appeal to a certain demographic.
  - Appropriate serving size, available in a variety of sizes/multipacks.
  - Label satisfies legal requirements.
- b) Price: The initial price will depend upon the target group.
  - Product should be marketed initially at a low cost to attract interest.
  - Products could be marketed at Mid/High cost to denote quality for a particular group.
- c) Place to be sold: Where should the product be sold?
  - Before a product is marketed nationwide, it may be sold in specific supermarket branches to assess how well it sells.
  - Shops must pick where to place their products to attract the most customers.



Fig.4.8. Marketing Strategy Development

 $(Image\ Source: https://www.freepik.com/free-vector/digital-marketing-concept-with-online-advertising-media-symbols-flat\_7378401.htm\#query=marketing\%20strategy\&position=1\&from\_view=search)$ 

#### 4. Business Analysis

Management can assess the business attractiveness of a proposed new food product once the company has agreed on a product idea and marketing plan. The fifth phase is reviewing the new food product's sales, cost, and profit estimates to see whether they meet the company's objectives. If they do, the product will go to the product development stage.



Fig.4.9. Business Analysis

(Image Source:https://www.freepik.com/free-vector/analysis-concept -illustration\_7069167.htm#query=business%20analysis&position=5&from\_view=search)

The business analysis will also assist the food industry in eliminating ineffective concepts and avoiding unneeded expenses. To determine the feasibility of the new food product, perform the following stages.

- a) Calculate the product's cost.
- b) Determine the market potential of the product.
- c) Estimate the sales volume
- d) Determine the break-even point.
- e) Determine the lowest possible selling price.
- f) Think about the long term.
- g) Examine the marketing plan.

#### 5. Product Development

Many new food product concepts may simply have a verbal description, a picture, or a crude prototype up until this phase. The real product development continues during the new food product development phase. Depending on the new food product and prototyping processes, creating a good prototype might take days, weeks, months, or even years. Pre-release food products are often tested to ensure that they are safe and effective before going on sale. Consumers may test prototypes and collaborate with pre-release items. This can be quite beneficial throughout the product development stage. In many cases, marketers include actual consumers in product testing as part of their marketing efforts.



Fig.4.10. Food Product Development

- Product development key stages are:
  - a. Ideation
  - b. Prototype creation
  - c. Sensory evaluation
  - Pilot plant testing
  - e. Sensory evaluation and product modification
  - f. Consumer testing
  - g. Finalization of product specification market testing

#### 6. Test Marketing

Test marketing is the second last stage in the development of a new food product or service before it goes on sale. It allows the marketer to get expertise in marketing the product before incurring the high cost of a full launch. In reality, test marketing enables the firm to test the product as well as its complete marketing program, including targeting and positioning, advertising, distribution, packaging, and so on, before to making a large investment. A great deal of time and money is spent on test marketing, especially when a new food product or service is being launched. The quantity of test marketing required varies depending on the new food product and the risk associated with it.

IHUTs (in-home usage testing) is an excellent technique to gather input from a target population in their natural habitat. Participants in the test markets can consume or drink a new food product for several weeks, providing timely and accurate feedback. Rather than doing taste testing at a focus group facility, participants are permitted to use the food product at home just like they would if they purchased it from the grocery store.



Fig.4.11. Test marketing

(Image Source: https://foodtruckempire.com/podcast/test-market-your-food-product/)

- a) Step one: The IHUT recruiting procedure began with the development of an online poll to prescreen the audience via email invites.
- b) Step two: Those that qualified were contacted again to answer additional questions and validate the main qualification requirements (i.e., shipping address, details about how to fully participate in the project).
- c) Step three: Participants were divided into two groups throughout the recruiting process for the food product IHUTs:
  - Those who have never tried the product before but have previously purchased items manufactured by the brand.
  - Those who have already used the product.
- d) Step four: The client placed a one-page instruction sheet in the shipment to explain the app download and registration process.
- e) Step five: Following shipment, our team assisted with engagement and reminder phone calls, emails, and texts to ensure the highest potential participation.

#### 7. Commercialization

The ultimate stage of new food product development is commercialization. At this phase, the costliest expenses are incurred. During the first year, significant funds may be spent on advertising, sales promotion, and other marketing operations. Commercialization simply refers to the introduction of a new product to the market. Before the product is marketed, the following things should be considered:

a. Timing of introduction - For example, cookie product If the economy is weak, it may be smart to postpone the product debut until the following year. However, if competitors are preparing to launch their own goods, the corporation should rush to launch the new food product as quickly as possible.

b. Location of introduction - Where should the new product be launched? Should it be released in a particular area, a region, the national market, or the global market? Companies may lack the confidence, funding, and capacity to launch new food goods into broad worldwide distribution from the outset in many circumstances. Instead, they often anticipate a gradual market launch



Fig. 4.12. Commercialization

Image Source: (https://www.freepik.com/free-vector/coffee-advertisement-realistic-composition\_6413783.htm#query=food%20Product%20commercialization&position=2&from\_view=search)

Food production is costly and the presumption is that the food industry wants to make a profithence to get the profit, professionals must build something that everyone wants and can be produced at a fair cost.

- a) Step 1: Do the research
- b) Step 2: Make sure to have funding
- c) Step 3: Get an NDA/ Confidentiality agreement in place
- d) Step4: Decide if the food company going to be certified organic
- e) Step5: Find a Co-Packer
- f) Step6: Understand the product regulations
- g) Step7: Audit the co-packer
- h) Step8: Find a food science consultant
- i) Step9: Find a testing laboratory
- j) Step10: Create a prototype

## 4.1.3 Significance of Maintaining a List of Multiple Tasks

Maintaining various task lists and records during food product development is crucial since it helps in future studies of production processes, new formulations, and decision-making. Keeping records provides critical information on what worked and what did not, as well as the reasons why something did not turn out as expected. The job list and records to be kept during the food product development process are as follows.

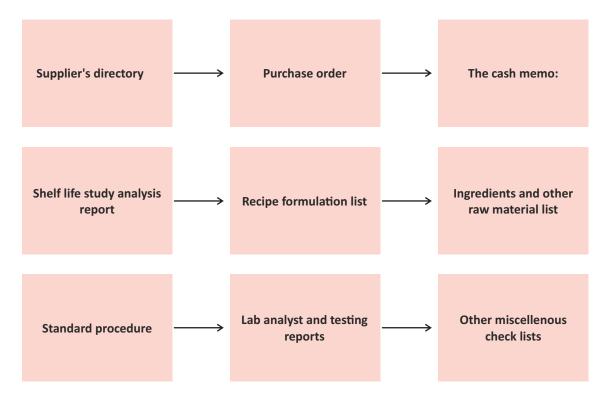


Fig.4.13. Various Task Lists and Records for Food Product Development

## - Exercise



#### Answer the following questions:

,	ower the following questions.
1.	Define Idea Screening.
2.	Explain the first three steps of various processes in food product formulation.
3.	Difference between commercialization and test marketing.
4.	Explain the last three steps to perform for product development as per SOP.
5.	Define record maintenance.
Fill	in the Blanks-
1.	The requires food firms to document every part of their operations that may influence food safety.
2.	A product concept is a complete version of a idea expressed in consumer-friendly words.
3.	The process of refining ideas to identify the best ones is known as
4.	Management can assess the business attractiveness of a proposed new product once the company has agreed on a and
5.	is the last stage in the development of a new product or service before it goes on sale.

## **Unit 4.2 Perform Analysis of Various Products**

## - Unit Objectives



#### At the end of this Unit the trainee will be able to:

- 1. List the preparatory activities steps to be performed for conducting the shelf-life study of food product
- 2. Describe parameters i.e., temperature, relative humidity, surrounding hygiene required to do shelf-life study
- 3. List the parameters to be maintained for sensory evaluation
- 4. Describe different sensory tests, chemical tests and nutritional analysis need to done on food product
- 5. Discuss the process of handling plant trials of food product
- 6. Elucidate proximate and ultimate analysis

## 4.2.1 Preparation for Shelf-Life Study of Food Product

A shelf-life study is the most efficient approach to determine a pre-packaged product's durable life or "best before" date. It aims to gather proof that the food will stay nutritious, pleasant, and nutritional until the end of its durable life. A food's shelf life can be influenced by several factors, including intrinsic characteristics related to the product and environmental factors.

Shelf-life studies determine how long a food may last under regular handling and storage conditions:

- a) Maintain the required palatability and quality
- b) Maintain its microbiological, chemical, and physical integrity
- c) Remain healthful and fulfil nutritional requirements

It is not necessary to undertake shelf-life research on every food product. The shelf life of a food is predicted utilising accelerated elements in an indirect shelf-life study. Acceleration factors, such as higher temperatures, are introduced to the meal to hasten its disintegration. Shelf-life studies are classified into two types, which include direct and real-time study.

#### 1. Direct or real time study

Real-time shelf-life study involves storing food under normal circumstances for a longer amount of time than the expected shelf life. The condition of the food is checked on a regular basis to detect when it starts to degrade and lose its quality, nutritional value and microbiological, chemical, and physical integrity.

#### 2. Indirect or accelerated shelf-life study

The shelf life of food is predicted by utilizing accelerated elements in indirect shelf-life study. Acceleration factors such as higher temperatures are introduced to the meal to hasten its disintegration. The data collected while evaluating the accelerated rate of degradation, such as microbial load, may be employed in a predictive mathematical model. Accelerated studies are frequently employed for foods with a long shelf life. To effectively interpret the results, you must first grasp the precise formulation and qualities of the meal. The data collected while evaluating the accelerated rate of degradation, such as microbial load, may be used to calculate the spoiling rate and bacterial growth under normal conditions.

An indirect study is a commonly used prediction model for measuring pathogen development over the product's shelf life. Dual studies, in which a real-time investigation is conducted alongside an indirect study, can assist in validating the anticipated shelf life of food and drink products.

Following are the four factors to be considered for conducting the shelf-life study of food product

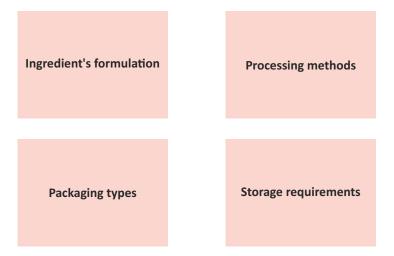


Fig. 4.14. Factors for Conducting the Shelf-Life Study of Food Product

#### a) Ingredient's formulation

Consider if the item will be accessible year-round or seasonally when selecting ingredients. To assess quality and cost efficiency, product creators would usually examine more than one provider of the same product. Larger firms may need to locate more than one provider of the same product to meet their demands. If more than one supplier is engaged, strict product requirements must be observed by all vendors.

#### b) Processing methods

Companies frequently try to build freshly designed food items on previously purchased equipment wherever possible. Because new equipment is an expensive investment, new food product development initiatives are frequently built on extending product lines utilizing existing facilities and equipment. As a result, product developers should be aware of the equipment accessible at the site where the product will eventually be manufactured.

If the product will be manufactured at more than one facility, the differences in available equipment should be considered, as well as how they might be reconciled to produce economically identical items.

#### c) Packaging types

Packaging is a significant aspect of a consumer's attractiveness for a product, particularly when purchasing for the first time. Consider how customers will perceive the packaging and if it will communicate the product's quality goals, such as whether it is a high-quality premium product or a generic grade. Marketing, product developers, and packaging engineers should think about the packaging materials used on rivals' products and how they might differentiate themselves.

#### d) Storage requirements

Frozen and refrigerated foods are examples of products that require particular storage conditions. Organizations should think about the expense of specialized storage space. To avoid spoiling and swelling canned foods, the location should be dry and cold. Temperatures should be between 10°C and 15°C (50°F and 59°F).

The storehouse should be simple to maintain and free of rats and insects. This implies that any openings in the walls, ceilings, and floors should be sealed and covered to prevent unauthorized entrance. Shelves must be at least 15 cm (6 in.) from the ground.

Storage conditions for various kinds of food products		
Different Food Products	Temp (° C)	
Dry products	10°C to 15°C (50°F to 59°F)	
Refrigerated products	4°C (39°F)	
Dairy products	2°C to 4°C (36° to 39°F)	
Sea food products	−1°C to 2°C (30°C to 34°F)	

Table.4.1. Storage Conditions for Different Kinds of Food Products

ImageSource:(https://opentextbc.ca/foodsafety/chapter/storage-temperatures-and-procedures/)

## 4.2.2 Parameters for Shelf-Life Study -

There is no individual parameter that determines a food's shelf life, but the most crucial to examine in shelf-life study include are:

#### 1. Temperature

Food product is influenced by a range of temperatures from the moment it is produced until it is consumed. Microbial growth is performed by enzymatic processes that are temperature dependent. Every 10° Celsius increase doubles the catalytic rate of the enzyme, whereas every 10° Celsius reduction cuts it in half. A system of practices, tactics, measurements, and circumstances known as temperature control is created to maintain the temperature requirements and specifications of a new food product. All in all, temperature impacts the shelf life of a food product. It contributes to the safety and wholesomeness of new food items at all stages of the food product development. It is crucial at the different stages:

#### **Pschrophiles**

• The cold-loving psychrophiles have an optimal temperature of 15 °C or lower and a growth range of -20°C to 20°C.

#### **Psychrotrophs**

- Psychrotophs, or cold-tolerant microorganisms, have a temperature range of 0-35°C, with an optimal temperature of 16°C or above.
- They are prevalent in many natural habitats in temperate regions and are responsible for refrigerated food deterioration.

#### Mesophiles

• Mesophiles ("middle-loving") organisms are suited to moderate temperatures, with optimal growth temperatures ranging from room temperature (approximately 20 °C) to around 45 °C.

#### **Thermophiles**

• Thermophiles ("heat lovers") are organisms that thrive best at temperatures ranging from 50°C to 80°C.

#### Hyperthermophite

• The hyperthermophiles are found further up on the extreme temperature scale, with growth ranges ranging from 80 °C to a maximum of 110 °C, with some extreme specimens surviving temperatures over 121 °C, the typical temperature of an autoclave.

Fig.4.15. Microorganisms Temperature Tolerance and Capacity to Live and Thrive

Reference From: https://ecampusontario.pressbooks.pub/microbio/chapter/temperature-and-microbial-growth/)

Temperature management is important for preventing spoilage and dangerous fungus and bacteria. Listeria monocytogenes is a gram-positive, non-spore-forming harmful bacteria that can develop even at cold temperatures.

#### 2. Relative humidity

Humidity, often known as relative humidity (RH), is the quantity of water vapor in the air. Food is one of the key factors influencing human health and well-being, it must be produced and stored in a safe and sanitary setting. Changes in food quality induced by surroundings with insufficient humidity levels can deteriorate customer experience. Maintaining proper humidity levels in storage rooms is critical for managing foods that have been produced or are being stored for future consumption. Excessive humidity can cause food products to lose their crispiness (e.g., chips). Mold development is also encouraged by humid environments, which reduces the quality of food goods. Moisture content is

important in influencing the new food items throughout the food development process. Changes in moisture content cause changes in the food development time necessary to achieve an appropriate balance of crispiness and softness.

Dehumidifiers are used to remove excess moisture from the airstream caused by food products, outside factors, and other disruptions to indoor air quality. It maintain ideal humidity levels and ensure that all products remain crisp and dry, preventing smashing and lumping and ensuring that the entire process runs smoothly and efficiently.

#### 3. Surrounding hygiene

Food product shelf life and cleanliness are critical aspects of the food business because they protect consumers' health from food-borne diseases and food poisoning. Sickness happens when food becomes contaminated by bacteria, viruses, and other pathogens, affecting individuals who eat the contaminated food. Utensils, equipment, and food contact surfaces must be clean and hygienic because they play a vital role in the procedures and aspects required to manage the risks of food product shelf life

Notes 🗒			

# 4.2.3 FSSAI regulations for sanitary and hygienic needs of food processing companies

One of the criteria of an FSSAI license is to follow the sanitary and hygienic requirements outlined in Schedule 4 of the Licensing and Registration of Food Business Regulations.

These criteria are nothing more than a Food Safety Management System (FSMS), which includes Good Hygienic Practices (GHP), Good Manufacturing Practices, HACCP, and so on.

The establishment in which food is handled, processed, manufactured, stored, and distributed by the food company operator must comply with the regulations. Food industry owners must guarantee compliance with the regulations. Food production businesses must meet sanitary and hygienic standards.

The following are the contents of Schedule 4 of the abovementioned Regulations:

## **Location and Surroundings** Food establishments must be placed away from pollution and industrial operations that cause offensive odours, fumes, smoke, chemical or biological emissions, and contaminants that pose a hazard to food safety. 2 The surroundings must be clean and free of pest contamination, and solid or liquid wastes. 3 Manufacturing facilities shall not have direct access to any residential area or property. **Layout and Design** The floor, walls, ceiling, doors, and windows, among other things, should be properly placed and built to allow for sanitary manufacturing. There should be effective internal and exterior drainage systems in place, and suitable measures to prevent pests, mice, and other creatures from entering. 3 Screened doors, windows, and other entries to prevent fly entrance. **Equipment and Containers** 1 No iron or corrugated iron equipment or containers may be used in food handling, preparation, or storage 2 Equipment should be constructed and positioned in a way that allows for simple cleaning and disinfection Food preparation and storage containers should not be used for other functions such as cleaning or garbage disposal

Continued...

#### **Food Operation Control**

#### (a) Storage and use of Raw Materials

- 1 Raw materials must be kept appropriately on pallets or racks to avoid risks.hazard to food safety.
- 2 Food should be stored separately to prevent cross-contamination, especially raw meat, poultry, seafood, and other animal products.
- 3 Raw materials should be handled by the First in First Out (FIRO) or FEFO (First in First Expire) systems.

#### **Sanitation and Maintenance**

#### (a) Cleaning and Maintenance

- Cleaning and maintenance of all machinery and equipment must be performed by a schedule that specifies the areas and equipment to be cleaned, the frequency of cleaning, and the cleaning chemicals used. Cleaning chemicals must be handled with care and stored in clearly labelled containers.
- There should be effective internal and exterior drainage systems in place, and suitable measures to prevent pests, mice, and other creatures from entering.

#### (b) Pest Control

- The food institution must be kept in good shape to prevent rats, pests, and insects from entering and breeding.
- 2 Holes and drainages must be thoroughly sealed to prevent rat entrance.

Table.4.2. Contents of Schedule 4 of the Abovementioned Regulations

(Source Credit: https://egyankosh.ac.in/bitstream/123456789/62284/1/3%20Sanitary%20and%20Hygienic %20Requirement%20in%20Food%20Processing%20Industry%20%28Write%20Up%29.pdf)

## 4.2.4 Standard Procedure for Shelf-Life Study of Food Product –

The Standard Procedures for Shelf-Life Studies of Food Products are as follows:

#### Step 1: Estimate the shelf life of the food

Examine facts and data from scientific journals, industry manuals, and other sources. For example, information on the history of linked diseases and outbreaks, as well as possible microbiological development within the food product type can be used to suggest a shelf life.

#### Step 2: Determine the characteristics of the food that may cause it to decay or become dangerous

Identify the attributes that are used to determine the shelf life of the product. This information is used to guide the tests required to analyze these attributes and determine whether the food has reached the end of its useful life. The qualities (intrinsic or extrinsic) may be evaluated depending on the food product. Intrinsic are those qualities that are inherent in the food products; Extrinsic are those qualities such as temperature, moisture, and other factors that determine how long the food can survive in the refrigerator.

Intrinsic Factors	Extrinsic Factors
Water Activity	Time-temperature profile throughout processing; pressure in the headspace
РН	Temperature control during storage
Redox potential (Eh)	Relative humidity (RH)
Oxygen Availability	Light exposition (UV and IR)
Nutrients	Environmental microbial counts during
Natural microflora and surviving microbiological counts	Composition of the atmosphere within the packaging
Preservatives used in product formulation	Subsequent heat treatment

Table.4.3. Intrinsic and Extrinsic Factors

#### Step 3: Identify the tests needed to determine when the food has reached the end of its durable life

The shelf-life research testing should include the following:

- a. Determine if the product is safe, has desired sensory, microbiological, chemical, and physical properties, and fits any nutritional or other label statements.
- b. Be appropriate for the particular food product.

#### Step 4: Begin the shelf-life research with the expected shelf life

The planning elements of a shelf-life study are crucial, and the food industry must undertake research on shelf-life studies that have been completed and are appropriate to the unique food product.

Shelf-life factors	Considerations
How frequently should samples be tested?	a. The frequency of sample testing is determined by the predicted shelf life of the product.
	b. Items with a limited shelf life of 7 to 10 days (perishable products) should be sampled and evaluated regularly.
	c. Products with extended shelf lives should be sampled and evaluated at the beginning, midway through, at the conclusion, and, at the very least, one point beyond the projected shelf life.
What are the storage circumstances?	a. The product samples should be maintained during the research under the worst circumstances (such as the maximum temperature, lighting intensity, and humidity level) that might reasonably be anticipated to exist for the duration of their shelf-life.
	b. Storage temperatures and humidity should be checked and documented regularly.

Table.4.4. Shelf-Life Factors and Considerations

#### Step 5: Conduct the study

- a. Carry out the shelf-life study by the planning procedures.
- b Document your strategy and keep track of all actions and outcomes.

#### Step 6: Analyze the data to establish the food's real shelf life

A food's shelf life is defined by the shortest period it takes for a product to fail any of the qualifying criteria, regardless of whether they are related to quality or safety. During the sampling and testing phase, the food will no longer fulfil safety, nutritional, or quality requirements. Analyze the collected data to determine how long the food may be stored safely.

#### Step 7: Create criteria for confirming the specified shelf life

Foods with a specified shelf life should be tested at least twice or three times a year to ensure that they meet food safety and quality criteria. The method involves collecting samples from various points in the distribution and retail systems and analysing them for the aspects that the shelf-life research revealed were the most essential, such as acidity, flavour, and rotting.

## 4.2.4 Parameters for Sensory Evaluation

There are five parameters for sensory evaluation which have already covered in previous modules. Let us understand it in detail.

#### **Appearance**

• The color quality of the food, in terms of intensity, color temperature, and authenticity, as well as the nature of the product's structure, all have an impact on the appearance.

#### Smell

- When a food product's volatiles enter the nasal channel and are recognized by the olfactory system, the odor is sensed.
- This sense is crucial in determining the quality of food goods.

#### Flavor

- The flavor is the combination of taste, smell, and texture.
- Mouthfeel includes textural and chemical sensations such as pungency, spicy heat, coolness, and sweet aftertaste.

#### Taste

- Taste is a chemical sensation caused by taste impulses falling on taste receptors found on the tongue known as taste buds.
- Human capacity to taste begins with taste receptors on the tongue. Sweet, salty, sour, bitter, piquancy (spicy), and umami are the six distinct flavor sensations detected by the tongue (savory).

#### Texture

- A food's texture represents its physical character and is sensed through touch, sight, and, in certain cases, sound.
- It is a comprehensive attribute that includes many different characteristics, such as hardness, gumminess, chewiness, elasticity, and so on

Fig.4.16. Sensory Evaluation Parameters

## 4.2.5 Food Product Analysis and Tests -

Following are the tests/ analysis involved in the shelf-life study of food product are:

#### 1. Sensory Testing/Evaluation

Sensory evaluation of a food necessitates the exclusive concentration of senses to analyze specific features. It is achievable in certain specialized testing settings, such as the exclusive sensory evaluation laboratory. Sometimes intermediary criteria such as saltiness, binding, crispness, tongue coating are evaluated independently since they have a significant impact on a product's overall quality.

A food item should be tested under regular consumption settings and be safe to intake. A trained sensory panel should compare the odour, look, flavour, and texture of a product to a reference sample. Panels should have at least three panellists who have set sensory criteria for the food product.

There are several approaches for sensory assessment.

#### **Triangle Test**

 In which three coded samples are given and the member must identify the odd one out

#### **Paired comparison**

 In which two coded samples are to be identified

#### **Hedonic expression**

 In which the facial expression indicates liking very much to not like at all

#### **Duo-Trio comparison**

• In which the reference sample is to be identified

#### **Paired preference**

• In which two coded test samples are to be identified

#### **Hedonic 9-point scale**

 The taste sensation is rated on a range of 1 to 9, for example, bitterness is categorised as slightly bitter to highly bitter on the Hedonic 9 point scale.

Fig.4.17. Approaches Sensory Assessment

#### 2. Microbiological Test/Analysis

This sampling and testing method is used to assess both food quality and safety. Microbiological tests can be performed to estimate:

Changes in the quantity and kind of spoilage organisms (yeasts, moulds, or bacteria) and pathogens that occur over time, as well as the level that food-borne diseases can reach if present in the food

Frequency of food pathogens is generally low, a challenge study may be required

Inoculating the food with a bacterium known to cause degradation in quality and/or safety if allowed to develop is used in challenge trials

Fig.4.18. Microbiological Tests

Microbial testing can be performed to establish a link between degradation of product quality/safety and microbial development. The point in time before bacteria reach a level that causes spoiling or food safety concern may be assessed, and the shelf life may be also be computed appropriately for different products.

#### 3. Chemical Testing

Chemical testing can identify changes in quality throughout a product's shelf life. The following are some examples: pH, headspace gas analysis, free fatty acids, and total volatile nitrogen.

#### 4. Physical Testing

Physical exams involve assessing the best, worst, and average retail circumstances as well as analysing texture, and viscosity, and looking at returned items from "traveling tests." A "travel test" aids in identifying potential risks associated with transportation and handling.

It entails carrying the food commodity through the intended distribution and storage chain and inspecting the food commodity at different locations along and after the chain. A data logger can be used to record the temperature at predetermined intervals for analysis. The experimental design should strive to replicate real-world processes (for example, transportation to retail outlets, consumer purchase, and consumer transport)

## 4.2.6 Process of Handling Plant Trials of Food Product

We are discussing bench experiments, pilot plants, and industrial plants. All of these methods serve as the foundation for the food production of safe goods that meet the quality expectations of corporate executives and the consumer market.

#### 1. Bench trails

Bench trials are experiments done with basic equipment. They are distant from the realities of industrial production. Although this form of test does not involve any difficulties in mass manufacturing, the food product's analytical capacity is dependable.

#### 2. Pilot trails

To be declared a pilot plant experiment, the size must be reduced and no substantial variations in the production system must be included. Process of food product Pilot plant trials is

After extensively testing and developing the production process, confidently introduce the product Scale-up difficulties are evaluated objectively Food product production for consumer research, internal product evaluations, test markets, demonstrations, and trade exhibitions Testing to see how a component affects a completed product dairy, bakery, wet goods, dehydration, extrusion, tortilla, and high pressure processing are all examples of processing diversity Fig.4.19. Process of food product Pilot plant trials

#### 3. Industrial trails

Finally, there are industrial experiments. In the natural sequence of R&D (research and development) testing, it is clear that this test is an analysis with the same circumstances as if it were big-scale manufacturing.

Simulations and superficial analyses are eliminated in order to make way for a more precise test. Precision is the key term for industrial trials; after all, what researchers want to know is the food product's real state throughout the manufacturing process. Because industrial trials must be large enough to replicate reality, they are frequently more expensive for the corporation. Even if it is expensive, it is required, and in many circumstances, more than one will be required to provide the appropriate analytical accuracy.

## -4.2.7 Proximate and Ultimate Analysis

#### **Proximate Analysis**

" Estimation of the essential components of food utilizing procedures that allow for reasonably rapid and satisfactory assessment of diverse food fractions without the use of specialist equipment or chemicals."

Moisture, ash, fat, protein, and carbohydrate content are all components of proximate analysis. These food components could be used in the food sector for product development, quality control (QC), or regulatory purposes.

Original Terminology	Alternative Terminology
Moisture	Loss on Drying
Ash	Mineral elements
Crude Fat	Fat
	Ether extract
Crude Protein	Protein
Nitrogen-free extractives	Carbohydrates
	Available Carbohydrates
Crude Fibre	Unavailable Carbohydrates
	Fiber
	Neutral Detergent Fibre
	Dietary Fibre
	Non- Starch Polysaccharides

Table.4.5. Components of Proximate Analysis

#### 1. Moisture

Unless the water content is included, the weight of food is meaningless. The difficulty in extracting all of the water from a food sample leads to an underestimating of moisture content. Harsh procedures to eliminate all moisture from a meal may result in product degradation and/or selection mass loss. Most methods for estimating water in food rely on weight loss during heating.

Analytical techniques for determining moisture can be divided into two types: direct and indirect methods.

- a) Direct method: Moisture analysis typically entails removing water from food samples via drying, distillation, extraction, and weighing, as well as measuring its quantity via weighing, titration, and other methods, such as oven drying.
- b) Indirect method: The indirect methods must be calibrated against standard moisture values determined precisely by direct methods, such as refractometry and infrared reflectance spectroscopy, microwave absorption.

#### 2. Ash

Ash is the product of burning a meal at 550°C until all the carbon has been burned out, but what is left is thought to reflect the food's inorganic elements. It may contain organic material, such as sulphur and phosphorus from proteins, and volatile material in sodium, chloride, potassium, phosphorus, and sulphur.

#### 3. Protein

The crude protein (CP) content is computed from the nitrogen content of the meal using a modified version of a process developed over 100 years ago by Kjeldahl. The meal is digested using sulphuric acid, which transforms all nitrogen present in the form of nitrate and nitrite into ammonia.

This ammonia is freed by adding sodium hydroxide to the digest, then distilled off and collected in standard acid, with the amount collected evaluated by titration or an automated colorimetric technique.

It is believed that the nitrogen is produced from protein, which contains 16 percent nitrogen, and an estimated protein value is determined by multiplying the nitrogen figure by 6.25 (i.e., 100/16).

#### 4. Fat

The oils and fats derived from oilseeds and fruits, as well as animal fatty tissues, are quite similar to those extracted by diethyl ether. All sterols and phosphorus-containing organic substances, particularly lecithin, are removed using glycerides. The main components of certain spices' ether extract are essential oils and resins. Similarly, pepper includes piperine, a nitrogenous ether soluble molecule (alkaloids).

#### 5. Carbohydrate

The carbohydrate in the meal is divided into two fractions: crude fiber (CF) and nitrogen-free extractives (NFE).

The former is measured by submitting the remaining food after ether extraction to sequential treatments with predetermined concentrations of boiling acid and alkali; the organic residue is the crude fiber.

#### **Ultimate Analysis**

The ultimate analysis technique is a straightforward way to report coal's principal organic elements content. The measurement of carbon, hydrogen, nitrogen, and sulphur in a wide range of organic and inorganic substances, including solid and liquid, is referred to as ultimate analysis. Proximate and ultimate studies performed in our cutting-edge facilities produce rapid, accurate, and independent findings from coal, coke, and biofuel samples.

#### Exercise -

#### Answer the following questions-

- 1. Define proximate analysis.
- 2. Explain the different parameters for sensory evaluation.
- 3. What is the difference between temperature and relative humidity.
- 4. Define any one component of proximate analysis.
- $5. \, Explain \, the \, first \, two-step \, of \, the \, standard \, procedure \, for \, the \, shelf-life \, study \, of \, a \, food \, product.$

-ill in the Blanks-	
	product of burning a meal at until all the carbon has been the food's inorganic elements.
2. The difficulty in extracti	ng all of the water from a food sample leads in an underestimating o
3	_ can identify changes in quality throughout a product's shelf life.
4analyze specific features.	of a food necessitates the exclusive concentration of senses to
5. Humidity, often known as	, is the quantity of water vapor in the air

## **Unit 4.3 Maintain Material Availability**

## - Unit Objectives



#### At the end of this Unit the trainee will be able to:

- 1. State the importance of list of available material for current and future trials
- 2. Discuss the documents and records such as BOM, final product etc. needed to be prepared and maintained by following organisational procedures

## 4.3.1 Material Availability for Future and Current Trials

Each food product has a distinct shelf life and storage condition. The purchase of food raw materials is the primary demand of the food industry and plays a vital role in the production of food products. Raw materials are food sources that fuel the synthesis of functional foods and nutrients.

The relevance of raw material availability is evident to upstream enterprises that extract, refine, and process material into products. However, as this study will show, material availability is crucial for all companies. If raw resources become difficult to get, market forces may shift demand to other items and, as a result, other supply chains.

Regardless of one's specific business, such disruptions might cause permanent economic devastation. Choosing fresh and high-quality raw materials in food processing preserves flavour, allowing the taste buds to appreciate freshness, texture, and delectable combinations. When we talk about raw materials, we don't just mean fresh food; there are many high-quality preserves that are also an explosion of flavour.

## **4.3.2** Documentation

#### 1. BOM Document

BOM management, also known as Bill of Materials management, is the process of managing and regulating the establishment, circulation, change, settlement, and other BOM relationships. A bill of materials (BOM) is a detailed inventory of all the parts, pieces, assemblies, subassemblies, intermediate assemblies, documents, drawings, and other materials needed to manufacture a product. The BOM may be thought of as a hierarchical recipe for creating a final product. It may comprise mechanical (hardware), electrical (e.g., ICs, PCBAs), and software, as well as accompanying papers and drawings, depending on the device.

The organization's necessity to prepare BOM documents and records:

Creating a structured material BOM makes it easier to specify material needs for manufacturing, procurement, and outsourced processing

At the same time, it is convenient to calculate the customer's product BOM based on the determined basic BOM when confronted with specific demands from a customer

Fig.4.20. Need of BOM Document and Records

#### 2. Final Product Document

Final product specifications are crucial papers that every manufacturing company should have, examine, and update on a regular basis. They are critical to ensure the profitability, quality, legality, and safety of products.

A well-controlled, comprehensive collection of active and archived product specifications, appropriately kept and understood by key staff, will be the hallmark of a successful organisation. These records are frequently partial, missing, or obsolete. Businesses are endangered in such instances. Having well-constructed and maintained completed product requirements will not generate a great business, but you will never establish a great business if they are not present.

#### Final requirements are essential to:

## Maximize product quality and consistency

 By giving a clear reference to important controls, manufacturing procedures, and product quality requirements

## Maintain company production continuity

 In the case of critical employee turnover, global sourcing crises, site breakdown, and so on

## Create manufacturing training materials

 Documents, together with Standard Operating Procedures, describe exactly how goods should be manufactured and what control limitations must be implemented

## Carry out effective process consistency optimization efforts

 By establishing the important goal criteria for optimum product consistency and quality

#### Show and validate

 Product's intellectual property rights and claims

# Produce and capture the Brand Diamond documentation

 Which articulates the core of a Brand or product in terms of concrete (claims, sensory performance, physical features) and intangible factors (how it makes consumers feel, perceived value, brand connection)

Fig.4.21. Need of Final Document

## Exercise \_\_\_\_\_

### Answer the following questions-

- 1. Define BOM document.
- 2. Define the Final document.
- 3. Explain the different packaging materials?
- 4. What is the purpose of the final document?

True and	False	/ Fill in	the	Blanks-
II ac alla	1 4130	,		Didiii

1.	BOM management, also known as, is the process of
	and regulating the establishment,, change, settlement, and
	other BOM relationships.
2.	are crucial papers that every manufacturing
	company should have, examine, and update on a regular basis.

## **Summary**

- Food formulation is the creation of food recipes for specific food items.
- Idea Generation The new development process begins with the creation of a plan.
- Idea Screening It assists the organization in screening and evaluating prospective new food product ideas by utilizing predefined criteria, data (such as market research), or score models.
- Marketing Strategy Development After a promising concept has been established and tested, it is important to create an initial marketing plan for the new food product based on the new food product concept.
- Business Analysis- Management can assess the business attractiveness of a proposed new food product once the company has agreed on a product idea and marketing plan.
- Product Development- Many new food product concepts may simply have a verbal description, a picture, or a crude prototype up until this phase.
- Test Marketing-Test marketing is the second last stage in the development of a new food product or service before it goes on sale. It allows the marketer to get expertise in marketing the product before incurring the high cost of a full launch.
- Commercialization- The ultimate stage of new food product development is commercialization. At this phase, the costliest expenses are incurred.
- From a commercial standpoint, record keeping is required for future study of production processes, cropping history, and decision-making.
- A shelf-life study is the most efficient approach to determine a prepackaged product's durable life or "best before" date. It aims to gather proof that the food will stay nutritious, pleasant, and nutritional until the end of its durable life.
- Shelf-life studies are classified into two types, which include direct and real-time study. Direct or real time study, Indirect or accelerated shelf-life study
- Temperature- Food product is influenced by a range of temperatures from the moment it is produced until it is consumed.
- Relative humidity- Humidity, often known as relative humidity (RH), is the quantity of water vapor in the air. Food is one of the key factors influencing human health and well-being, it must be produced and stored in a safe and sanitary setting.
- Surrounding hygiene -Food product shelf life and cleanliness are critical aspects of the food business because they protect consumers' health from food-borne diseases and food poisoning.
- One of the criteria of an FSSAI license is to follow the sanitary and hygienic requirements outlined in Schedule 4 of the Licensing and Registration of Food Business Regulations.
- Standard procedure for shelf-life study of food product includes seven steps.
- There are five parameters for sensory evaluation which are appearance, smell, flavour, taste, texture.
- Sensory evaluation of a food necessitates the exclusive concentration of senses to analyze specific features.
- Microbial testing can be performed to establish a link between degradation of product quality/safety and microbial development.
- Chemical testing can identify changes in quality throughout a product's shelf life.
- Physical exams involve assessing the best, worst, and average retail circumstances as well as analysing texture, and viscosity, and looking at returned items from "traveling tests."

- Bench trials are experiments done with basic equipment. They are distant from the realities of industrial production.
- To be declared a pilot plant experiment, the size must be reduced and no substantial variations in the production system must be included.
- Finally, there are industrial experiments. In the natural sequence of R&D (research and development) testing, it is clear that this test is an analysis with the same circumstances as if it were big-scale manufacturing.
- "Estimation of the essential components of food utilizing procedures that allow for reasonably rapid and satisfactory assessment of diverse food fractions without the use of specialist equipment or chemicals."
- Moisture, ash, fat, protein, and carbohydrate content are all components of proximate analysis.
- The ultimate analysis technique is a straightforward way to report coal's principal organic elements content.
- Each food product has a distinct shelf life and storage condition. The purchase of food raw materials is the primary demand of the food industry and plays a vital role in the production of food products. Raw materials are food sources that fuel the synthesis of functional foods and nutrients.
- BOM management, also known as Bill of Materials management, is the process of managing and regulating the establishment, circulation, change, settlement, and other BOM relationships. A bill of materials (BOM) is a detailed inventory of all the parts, pieces, assemblies, subassemblies, intermediate assemblies, documents, drawings, and other materials needed to manufacture a product.
- Final product specifications are crucial papers that every manufacturing company should have, examine, and update on a regular basis. They are critical to ensure the profitability, quality, legality, and safety of products.









# 5. Regulations for packed food product

Unit 5.1 FSSAI Regulations for Packed Food Products



# **Key Learning Objectives**



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

- 1. Perform various tasks and processes involved in product development and formulation
- 2. Perform various tasks for conducting shelf life study of product

## **Unit 5.1 FSSAI Regulations for Packed Food Products**

# - Unit Objective



#### At the end of the unit, the trainee will be able to:

- 1. Describe the methods used for safe disposal of expired material from the food processing workplace
- 2. Discuss the details such as calorific value, measurement unit, etc. needed to mark or label on the food product as per FSSAI standards
- 3. Describe use of colour coded labels for high fat, salt and sugar in product
- 4. List different food grade packaging material suitable for the food product type

# 5.1.1 Calorific Value, Measurement Unit, Etc. for Labeling as per FSSAI Guidelines

The Ministry of Health & Family Welfare of the Indian government established the Food Safety and Standards Authority of India (FSSAI) as a statutory organization. The FSSAI was created by the Food Safety and Standards Act, 2006, a consolidated law about food safety and regulation in India. FSSAI is in charge of safeguarding and promoting public health via food safety regulation and oversight.



Fig.5.1. Food Safety and Standards Authority of India

The calorific value, measurement unit, shown on labels of food goods that comply with FSSAI requirements, among other factors, are as follows:

#### 1 Calorific value

The calorific value is the amount of heat energy present in food or fuel that is measured by the full combustion of a defined quantity at constant pressure and under ordinary circumstances. Kilojoule per kilogram or KJ/Kg is the symbol for calorific value.

#### 2. Measurement unit

Every food package has distinct or distinguishing features, which may be divided into physical and chemical attributes. Many physical qualities of matter are quantitative, such as mass, length, volume, temperature, pressure, density, and so on. These attributes, also known as physical quantities, are quantified using units, and we will realize units of measurement.

SI Units and Symbols		
The SI quantity declaration must implement the following units of mass:		
Unit Name	Symbol	
kilogram	kg	
gram	g	
milligram	mg	
milliliter	mL or ml	
liter	Lorl	
Term	Abbreviation	
net	No abbreviation	
weight	wt	
drained weight	dr wt	

 $Image Source: (\ \underline{https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1020.pdf})$ 

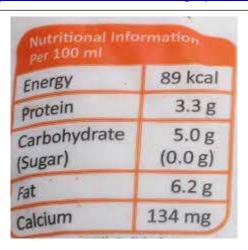
Table.5.1. SI units and Symbols

Examples of calorific value and measurement units presented in packed food as per FSSAI guidelines



Bread

ImageSource:( https://shopsale.storesonline2022.ru/category?name=bread%20food%20label)



Milk

Image Source: (https://www.amazon.in/Mother-Dairy-Milk-Cream-500ml/dp/B01IA43GSU)



Net weight for cashew nuts packet is 500g

Image Source: (https://deltafoodsthanjavur.com/products/cashew-nut?variant=37171121651893)

Table.5.2. Calorific Value and Unit Measurement for Packed Food

### 5.1.2 Colour Codes and Labels in Food Products

Foods containing 5% or more GM components should be labeled, according to the draft rules by Food Standards Service (FSS). Total GM components must be among the top three ingredients in terms of proportion.

Most pre-packaged goods include a nutrition label on the back or side of the packaging. These labels feature information on energy in kilojoules (kJ) and kilocalories (kcal). They also obtain data on fats, saturated fat, carbohydrate, sugars, protein, and salt. All nutrition information is supplied per 100 grams and, in certain cases, per serving of food.

Illegal imports of sugar, salt, and fat must be labeled in the manner prescribed in the law, according to a new European Union (EU) directive. The restriction applies to both solid and semi-solid foods as well as those imported into the EU from other countries.

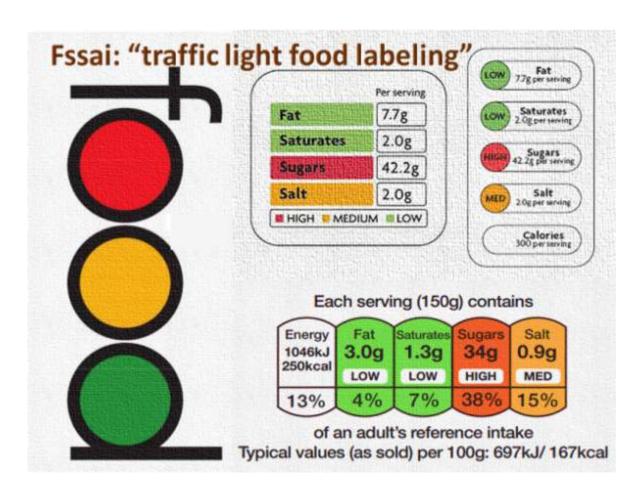


Image Source: (https://healthylife.werindia.com/food-activism/fssai-traffic-light-labeling-measure-packaged-food-drinks)

Fig.5.2. Colour Codes and Labels in Food Product

Label color indicates if a product contains a high, medium, or low quantity of fat, saturated fat, sugars, and salt. Red denotes a high level, amber denotes a medium level, green denotes a low level, and green means it's healthy to eat. Any red on the label indicates the meal is heavy in fat, sugar, salt, or saturated fat.

#### Colour coded labels for high fat, salt and sugar in product are:

#### 1. High Sugar

Sugar is a simple carbohydrate that the human bodies use for energy. Excessively added sugar can be hazardous to health, especially in diabetics. The American Heart Association recommends that healthy individuals consume fewer than 36g of sugar per day for males and less than 25g for women.

When it comes to added sugar, the amount of energy from added sugar must be greater than 10% of the total energy (kcal) offered by a product's  $100\,\mathrm{g}/100\,\mathrm{ml}$ . Let's use Bournvita biscuits as an example to demonstrate this. These biscuits contain  $30\,\mathrm{g}$  of sugar per  $100\,\mathrm{g}$  and give  $457\,\mathrm{kCal}$  of energy - much above the 10% threshold for added sugar.

#### The total amount of sugar found in solid or semi-solid foods

Total sugar content (per 100g)	The logo's primary colors
More than 22g	Red
5g to 22g	Amber
Less than 5g	Green

#### Reference Source:

 $: (\underline{https://extranet.who.int/nutrition/gina/sites/default/filesstore/LNK\%202019\%20Food\%20\%28Colour\%20Coding\%20formwidth} \\ \underline{r\%20Sugar\%2C\%20Salt\%20and\%20Fat\%29\%20Regulations\%202019\%20-\%20No\%2026\%201980.pdf})$ 

Table.5.3. Sugar Content in Solid and Semi-solid Food

#### 2. High Sodium

At least half of all hypertensive persons have blood pressure that is impacted by sodium ingestion, indicating that they are salt sensitive. Table salt, also known chemically as sodium chloride, contains 40% sodium. The risk of salt sensitivity increases with age and can be caused by eating a diet high in sodium.

Britannia's ready-to-eat breakfast cereals contain 0.35 mg of salt per 100 gm of product, but the sodium content of the Saffola Masala oats box is not even shown in the nutrition information table. With this

level, Maggi noodles will be colour-coded RED - far more than the 0.25 gm criterion.

#### The total amount of salt found in solid or semi-solid foods

Total salt content (per 100g)	The logo's primary colors
More than 1.25g	Red
0.25g to 1.25g	Amber
Less than 0.25g	Green

#### Reference From:

: (https://extranet.who.int/nutrition/gina/sites/default/filesstore/LNK%202019%20Food%20%28Colour%20Coding%20form/20Sugar%2C%20Salt%20and%20Fat%29%20Regulations%202019%20-%20No%2026%201980.pdf)

Table.5.4. Salt Content in Solid and Semi- Solid Food

#### 3. Saturated Fat

Saturated fats are named after fat molecules that have been saturated with hydrogen. For example, butter, shortening, or coconut oil are solid at room temperature. They can boost the blood cholesterol level and increase the risk of stroke and heart disease if taken. Saturated fat is linked to elevated LDL cholesterol levels, which can lead to clogs in the heart.

The total amount of fat found in solid or semi-solid foods

Total fat content (per 100g)	The logo's primary colors
More than 17.5g	Red
3g to 1.75g	Amber
Less than 3g	Green

#### Reference From:

: (https://extranet.who.int/nutrition/gina/sites/default/filesstore/LNK%202019%20Food%20%28Colour%20Coding%20for%20Sugar%2C%20Salt%20and%20Fat%29%20Regulations%202019%20-%20No%2026%201980.pdf)

Table.5.5. Fat Content in Solid and Semi-Solid Food

# 5.1.1 Calorific Value, Measurement Unit, Etc. for Labeling as per FSSAI Guidelines

**Packaging** is the art, science, and technology of enclosing or protecting things for distribution, storage, sale, and usage. It is a process of planning and assessing how to make packages. It's primary role is to protect its contents from harm during transit, handling, and storage. Packaging safeguards the goods from the maker to the final consumer.

Packaging materials utilized in the food company include a variety of materials, forms, and colors that serve various tasks in terms of protecting the quality of the food item that they transport within. Food packaging's primary function is to show, preserve, and keep food safe because impulse purchases of food are frequent.

Choosing the right food packing material is thus a result of what an food industry want to do with it. This might include protecting the food from humidity, temperature, oxygen, radiation, and biological microorganisms. Metal, paper, glass, and polyethylene are the most common food packaging materials.

There are three levels of packaging. Each level of packing has a specific purpose. It is mandatory to distinguish between the three levels since each is targeted for a particular packing situation.



#### **Primary Pacaging**

 It is the sort of packaging that has a direct touch with the completed product. E.g. Puches, bottles, sachets, drums



#### **Secondary Packaging**

 It is the sort of packaging that Comes into touch with the primary package. E.g. Cartons(filled with jam bottles)



#### **Tertary Packaging**

 It is the sort of packaging used to safeguard secondary packaging, Eg. shipping box

Fig. 5.3 Types/ Levels of Packaging

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#### **Types of Packaging Material**

#### **Metal Containers**



- Metal containers are a frequent packaging solution for a wide range of contents. Tin cans have been around for a long time.
- Before plastic containers became readily accessible, glass containers were replaced by metal containers.
- Metal containers are still frequently utilized today in a wide range of applications.
- Although metal cans are being used less for food packing.
- As metal corrodes when exposed to acid, tin cans used for soft drink packaging are laminated on the interior with a plastic layer.
- Metal-based food packaging comes in a variety of shapes, including enclosures, cans, containers, tubes, films, and caps.
- Aluminum or steel cans are the kinds most frequently used for wet or liquid food and beverages.
- Modern manufacturers employ recyclable materials that are covered with organic substances to prevent additional contact with metal.

#### **Plastic Packaging**



- Plastic is another widely utilized material in food packaging.
- Its usage is often found in bottles, bowls, pots, trays, foils, cups, bags, and pouches. Indeed, 40% of all plastic produced is utilized in the packaging business.
- Its comparably reduced cost and lightweight are both win-win considerations.

#### Glass Containers



- Glass is an inert substance that is impermeable to gases and vapors.
- Although in interaction with food, it provides a good and entirely impartial oxygenation buffer. However, it is a delicate, heavy substance that needs a lot of energy to produce.
- Silica, one of the planet's most plentiful raw resources, is used to make glass, although it is not a sustainable resource.
- Despite this, it is a recyclable product because it may be reused as a container.
- Glass jars are used in the food business more than 75 billion times annually, mostly for wines, juices, infant food, and soft beverages.
- Glass containers include bottles (the most common), jars, glasses, ampoules, jars, and other similar items.
- Due to the chance of breaking, the material is not utilized for frozen goods.

#### **Paper Packaging**



- Paper bags are a feasible alternative to plastic bags at retail establishments, workplaces, and grocery shops.
- Paper bags are completely customizable, with any size, shape, or strength available at an affordable price.
- Low-grammage paper bags are typically seen in department stores and supermarket stores; larger establishments utilize higher-quality paper bags.
- Paper is a low-cost, lightweight substance with a high printing capacity.
- Despite its sensitivity to moisture, it may be remedied using a mix of paper and other materials such as plastic or paraffin.
- Paper can also be laminated to increase its strength and barrier characteristics. It may be polished in gloss or matt.
- Foils and plastics for laminating paperboard are also utilized.



- Flexible packaging is a method of packaging items that use non-rigid materials, allowing for more cost-effective and customized solutions.
- It is a relatively recent approach in the packaging business that has increased in popularity due to its great efficiency and low cost.
- Flexible packaging is especially beneficial in sectors requiring adaptable packagings, such as food and beverage, personal care, and pharmaceutical.
- Flexible packaging minimizes the permeability to oxygen, made up of metallized polyester/polyester/ polyethylene are used for hot fill packaging method. These are used either as flat pouches or stand-up pouches.

Table.5.6. Types of Packaging Materials

As long as this is an indicative list, the use of any other packaging material that meets the required specifications is not restricted.

Paper and	board materials are intended to come in contact with food products.		
SI. No	List of Standards		
1.	Greaseproof paper- IS 6622		
2.	Vegetable parchment or Greaseproof paper or Aluminium Foil Laminate – IS 7161		
3.	Aluminum Foil Laminates for Food Packaging — IS 8970  Wrapping Paper or General purpose packing — IS 6615		
4.			
5.	Uncoated, Folding Box Board – IS 1776		
6.	Corrugated Boxes of Fiberboard: Specification (Part 1) - IS 2771		
Metal and	Metal and Metal Alloys intended to come into touch with food goods		
S.N	List of Standards		
1.	Cold-reduction Electrolytic Tinplate – IS 1993/ISO 11949		

2.	Cold reduction Electrolytic Chromium or Chromium Oxide — Coated Steel — IS 12591/ISO 11950
3.	Wrought Aluminium as well as Aluminium Alloy Sheet and Strip for General Engineering – IS 737
4.	Aluminum and Aluminum Alloy Raw Foil for Food Packaging Material- IS 15392
5.	Crown Closures Specification – IS 1994
6.	Round Open Top Sanitary Cans for Foods and Drinks Specification – IS 9396 (Part 1)
7.	Round Open Top Sanitary cans for Foods and Drinks Specification – IS 9396 (Part 2)
Plastic Ma	aterials were created to come into touch with food products
SI. No	List of Standards
1.	Polyethylene for its safe use in contact with foodstuffs, pharmaceuticals, and drinking water specification – IS 10146
2.	Polystyrene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water specification – IS 10142
3.	Polyvinyl Chloride (PVC) and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water specification – IS 10151
4.	Polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals, and drinking water specification – IS 10910
5.	Ionomer Resins for its safe use in contact with foodstuffs, pharmaceuticals, and drinking water specification – IS 11434
6.	Ethylene Acrylic Acid (EAA) copolymers for their safe use in contact with foodstuffs, pharmaceuticals, and drinking water specification – IS 11704
7.	Polyalkylene Terephthalates (PET & PBT) for their safe use in contact with foodstuffs, pharmaceuticals and drinking water specification – IS 12252

Image Source: (https://foodsafetyhelpline.com/fssai-notifies-the-new-packaging-regulation-2018/)

Table.5.7. List of other Packaging Material

## 5.1.4 Waste Disposal

**Waste management** refers to the activities and actions that handle waste from its conception to its disposal. It comprises garbage collection, transportation, treatment, and disposal, along with waste monitoring and control.

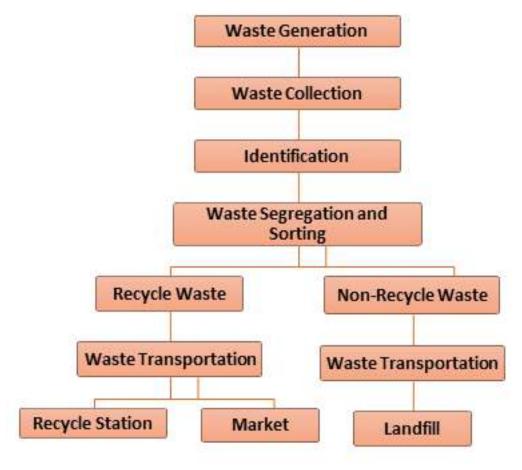


Fig.5.5. Waste Management Process

**Waste elimination** is one of the most effective methods of increasing the profitability of any company or corporation. To eliminate waste, it is critical to first understand what trash is and where it exists. While products vary greatly between locations, the usual wastes encountered in electronic production operations are rather similar.

Each waste has a plan to reduce or eliminate its impact on a firm, consequently improving overall performance and quality. Everything done in a company is classified as either value-adding or waste. Generally, value-adding is something that the customer pays for, whereas waste is something that the consumer does not care about. All non-value-added activities are considered waste. Waste metal, in particular, is frequently challenging for enterprises in the electrical sector to handle. Especially companies that generate large volumes of metal debris, appropriate scrap metal disposal is a constant concern since it is sometimes quite heavy and difficult to store. That is where understanding the concept of waste mineralization becomes critical for all employees. Waste mineralization can be defined in a variety of ways. However, in its broadest definition, waste mineralization encompasses all actions like waste reduction, reuse, and recycling that minimize the quantity of trash entering the environment.

**Utilization of Resources** 

Reuse/Recycle of the Scrap Material

Quality Control improvemnt and Process Monitoring

Exchanging waste

Supply chain

Fig 5.6 Waste Minimization

#### **Waste Segregation**

In general, waste is classified as dry or wet. Dry trash contains recyclable materials such as wood, paper, plastic, and glass, whereas wet garbage includes organic and biodegradable waste. Waste may be separated using color-coded containers.



Fig 5.7 Waste Segregation

#### 1. Green Bin

The green bin is used to dispose of biodegradable garbage, such as wet/organic material such as cooked or leftover food, vegetable, and fruit rinds, eggshell, rotten eggs, chicken/fish bones, tea or coffee grinds, coconut shells, and garden debris such as fallen leaves/twigs or dead flowers/garlands.

#### 2. Blue bin

The blue container is used to separate dry or recyclable waste. This category includes waste such as plastic covers, bottles, boxes, cups, toffee wrappers, soap or chocolate wrappers, and paper waste such as magazines, newspapers, tetra packs, cardboard cartons, pizza boxes, or paper cups/plates, as well as metallic items such as tins/cans, foil paper, and containers.



Fig 5.8 Dry &Wet Waste Bins

#### **Recyclable Waste**

# Recycling garbage is a renewable resource. Waste materials, such as paper, corrugated cardboard, glass, plastic containers and bags, hard plastic, metal, wood goods, e-waste, cloth, and so on, can be reused or turned into new products or raw materials.

#### **Non-Recyclable Waste**

Non-recyclable garbage frequently contains elements that decompose quickly in nature. For instance, fruit shells, vegetable leaves, food scraps, flowers, and other natural materials. It also includes cigarette ends, muck, coal, cinder, building trash, and paint waste, all of which have little value after being thrown.

Table 5.8 Recyclable and Non-Recyclable Waste

#### The most commonly used methods of waste disposal are:



#### Landfill

It is a man-made method of disposing of solid and hazardous waste on land.



#### Incineration

It is a waste treatment method that involves the combustion of organic substances found in waste materials.



#### **Waste Compaction**

It is the process of compacting waste in order to reduce its size.

Continued...



#### **Biogas Generation**

It is a renewable fuel that is created through the breakdown of organic matter. It can be used for vehicle fuel, heating, and electricity generation.



#### Composting

It is the natural process of decomposing and recycling organic material into a humusrich soil amendment.



#### Vermicomposting

It is the process by which worms are used to convert organic materials (usually wastes) into a humus-like material known as vermin-compost.

Fig 5.9 Methods of Waste Disposal

The food processing business generates a large amount of liquid and solid waste annually. These waste items are mostly biodegradable organic stuff, and their disposal causes significant environmental difficulties. Systems should be positioned up that waste items are detected, collected, removed, and disposed of in a way that prevents contamination of goods or production areas. The following are the standard methods for waste disposal in the food processing business.

Waste must be separated, stored, and removed.

Provide an adequate-sized wheeled bin with a lid and foot-operated opening mechanism on the premises for garbage collection and a mechanism for opening it without touching it.

Have the trash can emptied, disinfected, and dried before the subsequent usage

Separate liquid and solid garbage when putting them in the bins.

Waste, non-edible byproducts, and other trash should not be permitted to accumulate in food handling or storage facilities. Labelled items, or printed packaging designated as waste shall be disfigured or damaged to ensure that trademarks cannot be reused and removal shall be carried out by approved disposal contractors.

Keep all garbage in enclosed containers and get disposed of at regular intervals as required by local legislation.

Follow all rules and regulations, particularly those for plastic garbage and other non-environmentally friendly items.

Ensure that stored garbage and inedible material do not contaminate potable water, food preparation equipment, or the building/premises.

Continued...

Ensure that no pests or rodents get access to inedible garbage.

Waste trolleys and bins must be labeled with identifying symbols or have distinct colors for biodegradable and non-biodegradable waste/refuse containers.

Fig.5.10 Standard practices for Waste Disposal

Use expired food that has been thrown away in huge quantities in conjunction with the recycling processing regeneration system to create a green recycling business model.

By substituting manure for organic fertilizer, the harm of bio-fertilizer to soil caused by local farmers' lack of composting equipment may be efficiently remedied, allowing the local ecological ecosystem to thrive sustainably. Many expired foods are nutrient-dense and make excellent composting materials. Composting organic fertilizer from expired food is a revolutionary method, and the cost of composting organic fertilizer is lower than that of chemical fertilizer.

## Summary 2



- Most pre-packaged goods include a nutrition label on the back or side of the packaging. These labels feature information on energy in kilojoules (kJ) and kilocalories (kcal).
- Label colour indicates if a product contains a high, medium, or low quantity of fat, saturated fat, sugars, and salt. Red denotes a high level, amber denotes a medium level, green denotes a low level, and green means it's healthy to eat. Any red on the label indicates the meal is heavy in fat, sugar, salt or saturated fat.
- Sugar is a simple carbohydrate that human bodies use for energy. Excessively added sugar can be hazardous to health, especially in diabetics.
- Table salt, also known chemically as sodium chloride, contains 40% sodium. The risk of salt sensitivity increases with age and can be caused by eating a diet high in sodium.
- Saturated fats are named after fat molecules that have been saturated with hydrogen. For example, butter, shortening, or coconut oil are solid at room temperature.
- Packaging is the art, science, and technology of enclosing or protecting things for distribution, storage, sale, and usage. It is a process of planning and assessing how to make packages.
- Packaging materials utilized in the food company include a variety of materials, forms, and colors that serve various tasks in terms of protecting the quality of the food item that they transport within.
- There are three levels of packaging.
- **Primary packaging,** the fundamental role of primary packaging is to confine, protect, and preserve

the completed product from contamination.

- **Secondary packaging**, facilitates the ability to handle smaller items by integrating them into a single pack.
- **Tertiary packaging**, this sort of packing makes it easier to move massive and bulky cargo safely and securely.
- Waste management: refers to the activities and actions that handle waste from its conception to its disposal. It comprises garbage collection, transportation, treatment, and disposal, along with waste monitoring and control.
- **Waste elimination:** is one of the most effective methods of increasing the profitability of any company or corporation.
- Waste Segregation: in general, waste is classified as dry or wet. Dry trash contains recyclable materials such as wood, paper, plastic, and glass, whereas wet garbage includes organic and biodegradable waste.
- **Green Bin:** the green bin is used to dispose of biodegradable garbage, such as wet/organic material such as cooked or leftover food, vegetable, and fruit rinds, eggshell, rotten eggs, chicken/fish bones, tea or coffee grinds, coconut shells, and garden debris such as fallen leaves/twigs or dead flowers/garlands.
- **Blue bin:** the blue container is used to separate dry or recyclable waste. This category includes waste such as plastic covers, bottles, boxes, cups, toffee wrappers, soap or chocolate wrappers, and paper waste such as magazines, newspapers, tetra packs, cardboard cartons, pizza boxes, or paper cups/plates, as well as metallic items such as tins/cans, foil paper, and containers.

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Aliswei	LITETO	IU WIII E	questions:

<b>~</b> !!	swertheronowing questions.
1.	Define waste disposal method
2.	List the different types of food packaging material?
3.	Explain the color codes and labels in food products?

4.	What is the difference between recyclable waste and non-recyclable?
5.	Define waste elimination
Tru	ue and False/ Fill in the Blanks-
1.	Kilojoule per kilogram, or KJ/Kg is the symbol for
2.	The recommends that healthy individuals consume fewer thanof sugar per day for males and less than for women.
3.	frequently contains elements that decompose quickly in nature.
4.	Foods containing or more GM components should be labeled, according to draft rule by Food Standards Service (FSS).
5.	are named after fat molecules that have been saturated with hydrogen.

Scan the QR Code to watch the related video



https://www.youtube.com/watch?v=osA74cAqMLc Food Packaging



https://www.youtube.com/watch?v=oFCMk1Dj0pM

New FSSAI Guidelines









# 6. Basic Food Safety Standards

- Unit 6.1 Food Hazards and Contamination- Causes and Prevention
- Unit 6.2 Food Safety Standard Operating Pocedures
- Unit 6.3 Food Safety Audits- Measures & Management
- Unit 6.4 Food Production Pocess—Record and Documentation



# Key Learning Outcomes



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

- 1. Explain the various food safety standards to be followed during the production pocess
- 2. Prepare sample reports regarding food safety regulations, inspections, aults observavationtc

# Unit 6.1 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 contaminaation
- 4. Discuss various types of allergens and their management at the workplace

## - 6.1.1 Food Safety Hazards

A food safety hazard can be defined as anything that could contaminate the food and has the potenntial to cause adverse health consequences to consumers. Hazards may be introduced into the food product at any timeduring harvessting, formulalati and processing, packaging and labelling, transportantation, storage, preparation, and serving. Food hazards can be categorized into the following types:

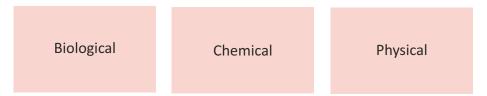


Fig 6.1 Types of Food Safety Hazards

#### **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 infiltratratand contaminaminathe food along the enhee 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 productionand preparaatiostages. For example, fruits, vegetables, root crops, and grains are usually treated with pesticides and ffertilers. Although these foods are washed during the harvesestiprocess, some contaminants may remain.

Here are some examples of hazardous chemicals that can contaminate food:

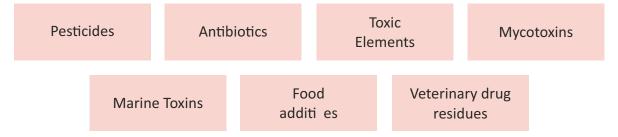
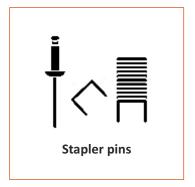


Fig 6.2 Examples of hazardous chemicals

#### **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.



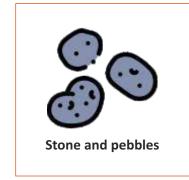








Fig 6.3 Sources of Physical Hazards

#### 6.1.2 Food Contamination

Food contaminationis 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. Additionall, 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 sanitied
- 3. Flies, cockroaches, insects, and pests contaminate the environment

# **6.1.3 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 6.4 Types of Food Contamination

#### **Chemical Contamination**

Chemical contaminationhappens when a chemical substance pollutes food. Chemicals are oen used in the workplace for cleaning and disinfection, so, understandably, they could contaminate food. Contaminationcan occur when food is prepared on a surface that sstilhas chemical residue on it, or when cleaning chemicals are sprayed near unprotected food. Furthermore, pesticidescan affect food even before it reaches the kitchen. Fertiliers and pessticidesfor 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 chemi als

Procure raw material from approved who can guarantee the safety of the food they provide

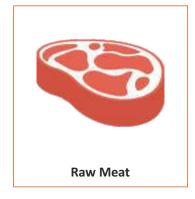
Adhere to SOP while cleaning and sanitation of orkplace and equipment

Fig 6.5 Prevention fom Chemical Contaminaation

#### **Biological Contamination**

One of the most common causes of food-borne illness is biological contamination. Biological food contaminationrefers to the contaminaatioof food by other living creatures. The hazardous germs spread on the foods during biological contamination. Even a single bacterium can multiplquickly when proper growth circumstances are found. Biological contamination may happen from different sources. Some of them are:







Continued...

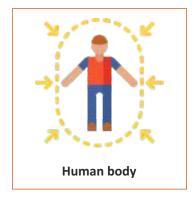








Fig 6.6 Sources of Biological Contamination

It is essential to follow strict, high-standard food hygiene measures to avoid this form of contaminaation. Some of them are as follows:

Separating aw 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 6.7 Prevention fom Biological Contaminaation

#### **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 contaminatio can result in catastrophic consequences for consumers, such as fractured teeth or choking. Jewelry, hair, plastic, bones, tones, 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 impuritiesmay transmit hazardous microorganisms, puttin you at even more risk.

Physical contamination an be prevented through the following prractices:

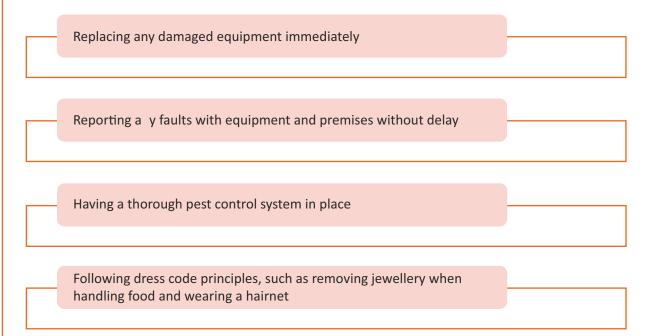


Fig 6.8 Prevention fom Physical Contaminaation

#### **Cross-Contamination**

Cross-contaminationrefers to the contamination a food product from some other sources. There are three main ways cross-contamination occur:

#### Food-to-food

- Food can become contaminated by bacteria from other foods. This type of cross-contamination is especially dan erous 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

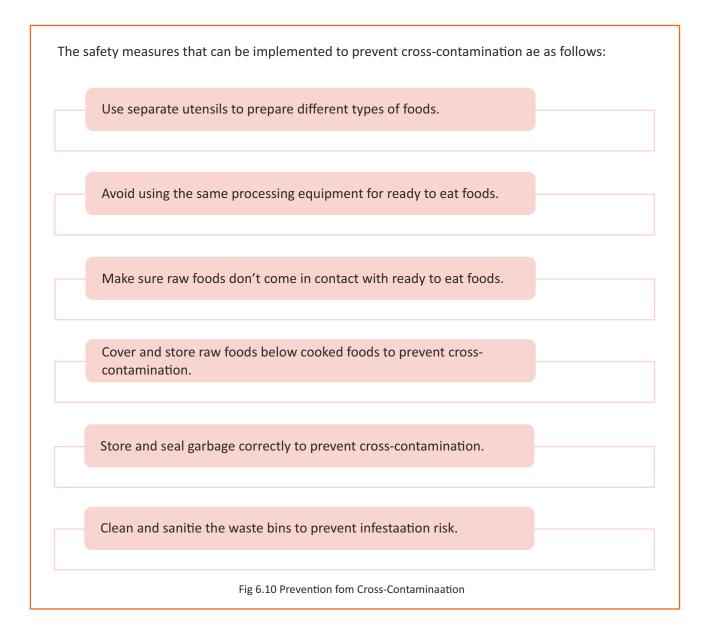
- People can also be a source of cross-contamination o foods. Some examples are:
  - Handling foods afer using the toilet without first properly washing hands.
  - Touching raw meats and then preparing vegetables without washing hands between tasks.
  - Using an apron to wipe hands between handling different foods, or wiping a counter with a towel and then using it to dry hands.

#### **Equipment-to-food**

- Contamination an also be passed from processing equipment and utensils to food. This type
  of contamination occus because the equipment or utensils were not properly cleaned and
  sanitied 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 unsanitied container that previously stored raw meat.

Fig 6.9 Cross-Contamination

Notes 🗐			



# **6.1.4** Importance of Isolating M terials 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 productionareas for food safety or hygiene reasons.

Furthermore, a series of higher hygiene zones are created to protect the product from microbiological cross-contamination events ager it has been heat-treated or decontaminated.

## 6.1.5 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 atenntioto all the aspects involved in the management and prevenentiof allergens during the food production process.

Like many other concepts, allergen preventionand management will only work properly if each and every aspect of food productionis 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 c conditiolike anaphaphylachock leading to death.

Some of the common symptoms of food allergy are as follows:



Fig 6.11 Symptoms of Allergen

Allergen management practices ae crucial for good hygiene prractices (G s), and, HACCP systems, in manufacturing, retail, and food administration. Theefore, allergens should be overseen through the supply chain and production pocess.

The steps of Allergen management are as follows:

#### 1. Cross Contact Prevention during pocessing:

In this step,

- a. Allergenic and non-allergenic production aeas 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 ags or colour codes, etc. while on the processing line

#### 2. Validated and verified allergen cleaning

In this step,

- a. Appropriate cleaning and sanitizing of equipment
- b. Writen protocols to be maintained
- c. No dead spots should be present in the production
- d. Cleaning validation and verificacatiprocedures should be present with their records
- e. Identif acatiof the eff eff eness of the allergen control plan to be done through internal and external audits

#### 3. 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 ProtectionAct of 2004
- b. Labels should be reviewed prior to their receipt for their accuracy

#### 4. 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 rresponsibilities
- c. Consequences to be highlighted if the plan is not followed during training and the reasons for the protocols followed

Notes 🗐			

# **Unit 6.2 - Food Safety – Standard Operating Pocedures**

# - 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.

## - 6.2.1 The Food Safety and Standards Act-2006

The Act covers all kinds of food that is consumed by human beings including unprocessed/semiprocessed/processed foods, genetially 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, horticultue, 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. Regulationon Food Addit e

Food shall not contain any food additi e or processing aid unless it is in accordance with the provisions of this Act and regulations.

#### 2. Regulationon Contaminants or Toxic Substances

Food shall not contain any contaminant, naturally occurring toxic substances or toxins, or hormones in excess of such quantitie as may be specified by regulaulations.

#### 3. Regulationon Pessticides Veterinary Drugs, An Antibio Residue, Microbiological Counts

Food shall not contain insecticidesor pessticidresidues, veterinary drug residues, anantibioresidues, solvent residues, pharmacologically actve substances, and microbiological counts above such tolerance limit as may be specified by regulaations.

#### 4. Regulationon Geneetally Modified Foods, Organic Foods, and nd FunctioFoods

No person shall manufacture, distribute, sell or import any genetially modified distribute, 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 noty in this behalf.

#### 5. 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
- informationwhich is made available about them through whatever medium

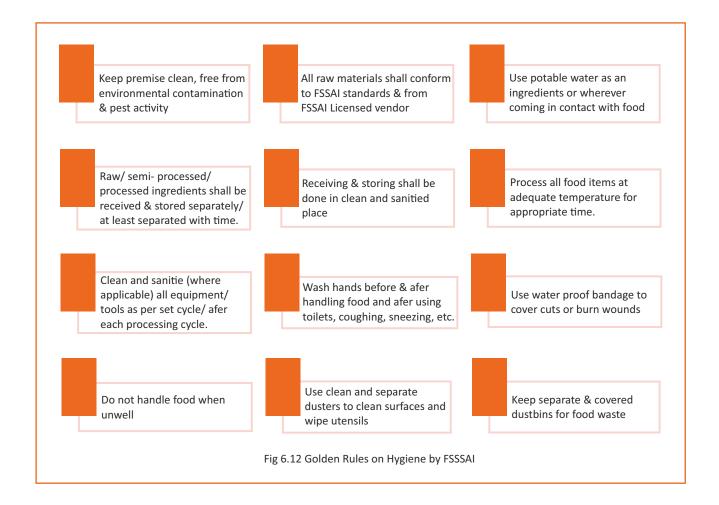
No person shall manufacture, distribute, sell or deliver to any agent or broker any packaged food products that are not marked and labelled in the manner as specified by regulaations.

#### 6. Regulationon Advvertisem t and PrProhibitias to unfair trade pr practices

- No advertiseme t shall be made which is misleading or deceiving or in contradictio to the provisions of this Act, the rules and regulationsmade thereunder.
- No person shall engage in any unfair trade practice for the purpose of prromotinthe sale, supply,
   use, and consumption of article of food
- No unfair practiceshould be adopted that falsely represents that the foods are of a particular standard, quality, quantit, or grade ccomposition.

Furthermore, there are 10 golden rules on hygiene laid down by FSSAI to ensure food safety

<b>Notes</b>		



# **6.2.2** 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 afffectin 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 critial both financially and ethically. The outcomes of failing to comply with food safety standards are multiarious. In additio to being extremely costly for organizationsthat must recall their products, revamp their processes, and manage the public relationscrisis, inadequate food safety in manufacturing involves a significant human cost.

#### The cost of food recalls for companies

The failure in implementingan effffece food safety protocol may lead to contaminated products entering the food chain. Once a defectie product is noticedfood businesses are subject to dramamatic disruptions their operationas 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 essti ted 420,000 people die every year because of eaeating contaminated food.

In addition to the human cost, unsaatfactory 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 atain sufficient food safety measures by training and educaucateveryone who handles ingredients in a food business.

# **6.2.3 HACCP (Hazard Analysis and Criti al Control Points)**

Hazard Analysis and Criti al Control Point (HACCP) is primarily an internaationafood safety regulalation 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 food in prroduction, packaging, and distributionenvironments. The HACCP concept is designed to deal with health hazards by identiying potenntiafood safety problems before they happen, rather than n inspectifood products for hazards afer the fact. The HACCP implies controlling for contaminants at several key stages in the food production process and strict adherence to hygiene prractice 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, preparaation packaging, and disistributio 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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## **Identify Crital Control Points Conduct a Hazard Analysis** •Identify the crital points in the • Evaluate the productio npocess process plan where a hazard may •Identiy the points where hazards (physical, chemical, and biological) •Plan preventi e measures at that may be introduced criti al point to control the risk **Establish Criti al Limits Establish a Monitoring System** •State the boundary line between safe and unsafe processes State the process of monitoring criti al poinnts and crital limits •State the limit until which a crit al point maybe controlled **State Verification Pocedures** •State the verification pocess to check **Establish Correcti e Measures** whether HACCP principles are applied and followed •Specify the correcti ve actions t t should be followed when criti al •Test the HACCP plan and ensure limits are crossed compliance on a regular basis •Check whether the HACCP plan helps to prevent hazards effecti ely

#### **Keep Records of All the Criti al Points**

- Maintain a log of situations when criti al limits were exceeded
- •State the correctie e measures that were applied
- •Include records of development and maintenance of the system

Fig 6.13 HACCP Principles

# 6.2.4 VACCP (Vulnerability Assessment Criti al Control Points) -

VACCP stands for 'Vulnerability Assessment Criti al Control Points.' The VACCP examinaatiois a tool to assess vulnerability in a criti al control point. It is used to idennty any potenentiweaknesses in the system and develop a plan to address them. The examinationis 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:

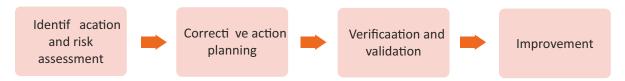


Fig 6.14 Steps of VACCP Analysis

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 productionprocess.

Though, it is not a comprehensive food fraud control strategy but can be an efffecte tool to ideneny the risks in food product 'developers' supply chain.

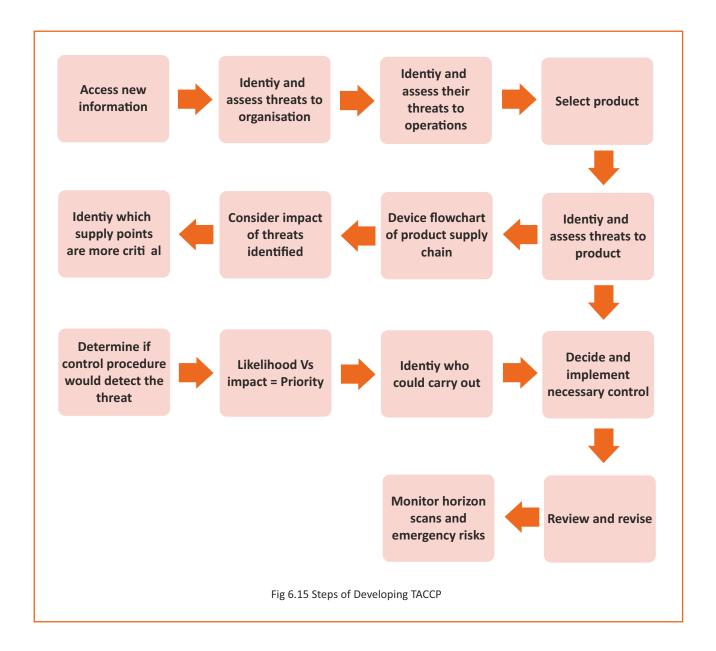
This is not the only aspect to ensure product integrity. The implementation of several control measures along with VACCP can increase the effecteness of prevenentifood fraud and other forms of food crime.

# 6.2.5 TACCP (Threat Assessment Criti al Control Point)

With regards to food safety across the entie 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 potentialthreats, like intenntionacontaminanatiof 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 systematicstrategy for prottectin a food supply chain from deliberate contamination. Contaminations s moated by behavioral or ideological al mes with the desire to damage individuals.

The key steps for an organization to follow while developing TACCP include:



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# **6.2.6** Significance of Training the Team on Food Safety Procedures

Training sta ffon methods to ensure food safety will help reduce the risk of contaminaationRegulalations require that food handlers are supervised and well-trained in food hygiene practicessuitable for their work activit.

Certain areas which sta ffshould 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 reactionsmay cause severe health issues.

Where bacteria in contaminated food are allowed to multiplyand ultitely 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 rreactionare 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.

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## **Unit 6.3 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 productionand other processes
- 3. Discuss the procedure of performing root cause analysis and taking correcti e and prevennte actionsagainst workplace problems
- 4. Discuss the correcti e measures to be applied to ensure food safety

## 6.3.1 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 multiplebenefits. Some of them are as follows:

Miti ate Risk

Save Time and Money

Inspire Confidence

Enhanced quality and productivity

Fig 6.16 Benefits of Food Safety Audit

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## **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 initialstage of the food safety audit which consists of seetti a clear ar objee and determining the audit scope, i.e., which areas need to be targeted. This stage also includes cost and resource considerationswhile planning for a food safety audit.
- ii. **Execution:** Audit assesses the status of the quality management system and operationsin real-time. It helps identify the problems that may arise now and encourages to take a prproace approach rather than a reacti e one. Identifying areas where prevenene strategies can be implemented based on audit findings can help improve operationaefficiency and prevent problems in the future.
- iii. **Preventve and Correccve AcAons:** The gathered audit information along with problem descriptions and proper documentaatiocan provide valuable data with h actionabinsights.
- iv. **Verificaation!** this phase, it is crucial to evaluate how efficient are the prevenene and corrorree 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 validatingthe success of the audit process. Even the audit process should comply with the food developer's business objecti es 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 sta fffrom within the organisaationThe employees can be from a different department or another unit of the same organisaationThese audits are carried out to identiy problem areas and rrecty them. They can also be carried out as a pre-audit prior to the audit by external agencies to ensure that all the standard operatingprocedures 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 corrrece ve actioAll the findings and actiontaken to resolve them are documented.

External or third-party audits are carried out by auditors from outside the organisation. They are oen used to get a certif acatio. 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 leter, cancel the registraatio of the company, or stop the producti of products/services.

## - 6.3.3 Root Cause Analysis

Root cause analysis ofen 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 is considered one of the core building blocks in an 'lorganization's conntinuou 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 multipletools 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 6.18 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 beter 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 identifie
   root cause(s).

A typical design of a root cause analysis in an organization might follow these steps:

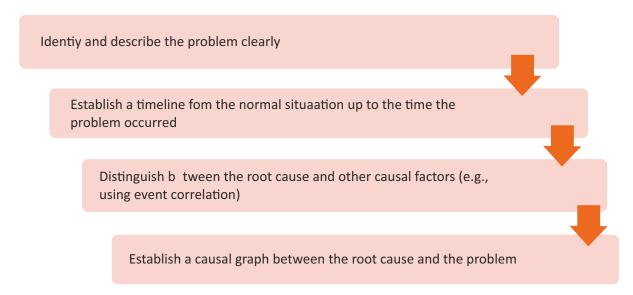


Fig 6.19 Design of RCA

- 1. A small team is formed to conduct the root cause analysis.
- 2. Team members are selected from the business process/area of the organizationthat 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 formulaatina a solution to the problem.
- 4. Weekly team meetings are conducted during the analysis period, someetimetwo or three e tima week. The meetings ae always kept for a maximum of two hours, and since they are meant to be creati e 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 solutionhas 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.

## 6.3.4 Correcti e and Prevenntive Action ( A)

Correcti e Actio and Prevenene ve Acti 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.

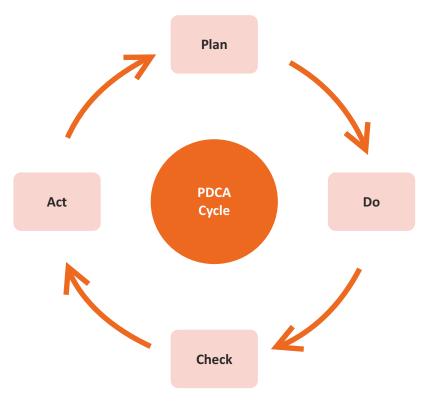
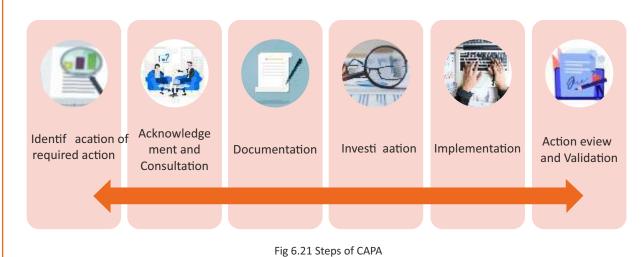


Fig 6.20 PDCA

The steps involved in CAPA are as follows:



A thorough and efffecte 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

- 6.3.5 Common Issues during Food Production ————————————————————————————————————
Sometimesthe 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 emerge, largely because of:
Changes in food production and suppl, including more imported foods
Changes in the environment leading to food contamination
Beter dettection of mul tate outbreaks
New and emerging bacteria, toxins, and antibiotic esistance
Changes in consumer preferences and habits
Changes in the tests that diagnose foodborne illness
Fig 6.22 Reasons for Common Issues during Food Production

Some of the common issues during the food production pocesses are listed below:

Condensation on Pipes and other Equipment

Occurs when humid air contacts cold pipes in a food processing plant and resulting condensaton can then drip from the pipes into the food product, causing contamination.

Contamination by eworked Product

Using product from one product line in another product line (reworking) can cause food contamination.

Contamination During Pocessing

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 contaminationoccurs 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 contaminationThisis 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 identifythe presence of an allergen when it should be labeled.

Failure to Develop a Crisis
Management Protocol

The lack of writen 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 routne equipment maintenance tasks (such as lubrication f a machine) from causing food contamination.

Failure to Reconcile Equipment
Parts afer Repairs

Afer 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 Not having a product recovery protocol, including no coding, traceability, or recall systems, can lead to food safety problems. When a machine breaks down or performs improperly, that can be a cause of food Failure to Perform safety problems. Therefore, it's beter for a food processing plant to rroutinely Preventi e Maintenance perform preventve maintenance instead of simply reaccng to maintenance problems. If employees at a food processing facility have poor hygiene, that can cause Poor Employee Hygiene contamination in the food products. It's essentialfor 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 Inadequate Pest Control document this). Poor sanitationmay result from poor (or absent) sanitaatiopolicies, poor sanitatation Inadequate Sanitation of Pla t procedures, and/or poor monitoring and verificaatio that those policies and and/or Equipment procedures are being enacted. Plant design and constructioncan have a good or bad effect on food safety within a Improper Plant Design and food processing facility, and some design and constructionissues make food safety Construction problems more likely. For example, floors with poor drainage and/or cross-over between the process flows of raw and finished products. In some cases, a finished food product can be contaminated aer it's been Post-Process Contamination t processed. This can occur between the lethality treatment and packaging or post-**Manufacturing Plant** packaging. Dead-Ends in Plumbing Leading to Plumbing connections that don't drain into other areas and therefore result in Accumulation of Sagnant Water sittin water may harbor contaminants that t ult tely create food safety problems. Using Unpotable Water It's always important to use fresh, clean, sanitary, potable water for food processing. **During Food Processing** 

Fig 6.23 Common Issues during Food Production

## **6.3.6 Food Safety and Correcti ve 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 6.24 Factors for Ensuring Food Safety.

Food product developers ofen define e crial limits to ensure food safety.

Criti al limits represent the minimum or maximum acceptable level of a food safety hazard at each Criti al Control Point (CCP). Corrrecte e acti is taken when the he cral limit is exceeded at any step of food production(e.g., delivery, storage, preparaationetc.).

There are two types of correctie action:

- Immediate
- Preventati e

Immediate correcti e actionare r reac e, but preventante ive actare prre pr e.

#### **Examples of immediate correcti e actions**

An immediate correctie actio resolves an exisisti problem or any deviaviatfrom a macal limit. It prevents a food safety breach that is happening at present.

Some examples of immediate correctie actionare:

- 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 preventati e actions**

A preventati e, actio prevents a potenentiproblem from happening. It stops a breach from occurring in the future.

Some examples of preventatie actionare:

- Broken, cracked, or chipped equipment, dishware, or glassware being repaired.
- Food preparationsurfaces (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

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## **Unit 6.4 Food Production Pocess**– Record and Documentaation

## - Unit Objecti es 🧐



#### 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 informationand consumer awareness, product recall and withdrawal, and traceability

## -6.4.1 Product Specificaation

In Quality Management, several documents and certif ates related to the purchased products and raw materials are required by the buyers. One of the most important product-related documents is the product specificaaon. This document contains a detailed descripion of the product, all the requirements related to the production process as well as technical and function aspects of the product. A product specificaatiodocument can be released for any kind of product, from the raw materials (raw material specificaations to the machine parts or the packaging goods.

The specificaatiodocuments are useful at all stages of the prproducti 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 specificaationsheets primarily inform about the ingredients of each product and its conditionof prroduction.

## 6.4.2 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 prroductionprocessing, and disistributioTraceability within food control systems is applied as a tool to control food hazards, provide reliable product information, and guarantee product authenticit. Traceability systems should be capable of documenntina product's history and/or locacating it in the food chain. The traceability exercise is part of the recall procedure. Traceability has two components:

#### Tracing: Backward

 Tracing is the ability to reconstruct the history of a product in the food chain and identity the origin, movement paaerns, and relevant associated information of a specific unit and/or batch of product located within the supply chain by referencing records held upstream.

#### **Tracking: Forward**

 Tracking is the ability to trace the final destin atioof 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 organizationsto the final point of the process, point of sale, point of service, or point of consumption.

Fig 6.25 Backward and Forward Traceability

In a food traceability exercise, records and documents are prepared for the following areas.

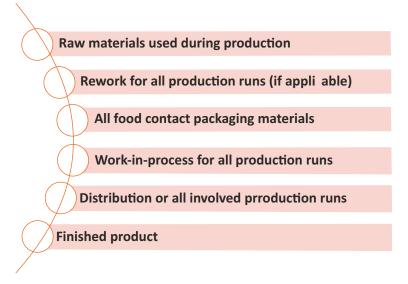
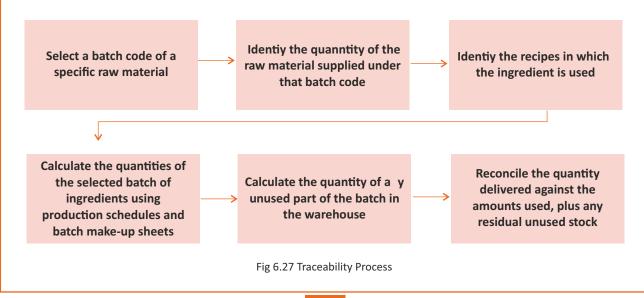


Fig 6.26 Document and Record Details for Traceability Exercise

The following figure below demonstrates the steps in the traceability exercise process.



**Recall** or **Product Recall** is defined as the actico 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 writen recall strategy
- 2. To conduct a food recall
- 3. To ensure the efffecteness of the e acti 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. Notiy the appropriate regulatory bodies
- 3. Product removal from the market in a proper and timelymanner

The following are the reasons for food recalls in the food industry:

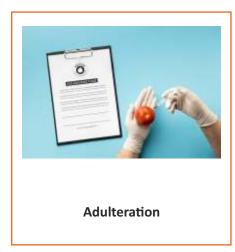








Fig 6.28 Reasons for Food Recalls

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 informaaon of recall personnel, suppliers, and consumers)
- 3. Determine and modify aspects of the recall plan that are problematicor 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 elalatino the recall and manage other team members

#### **Communications** xpert

 Handle public relations (pess releases and media statements)

#### Quality assurance specialist

 Identifies the oot causes and issues that led to the recall

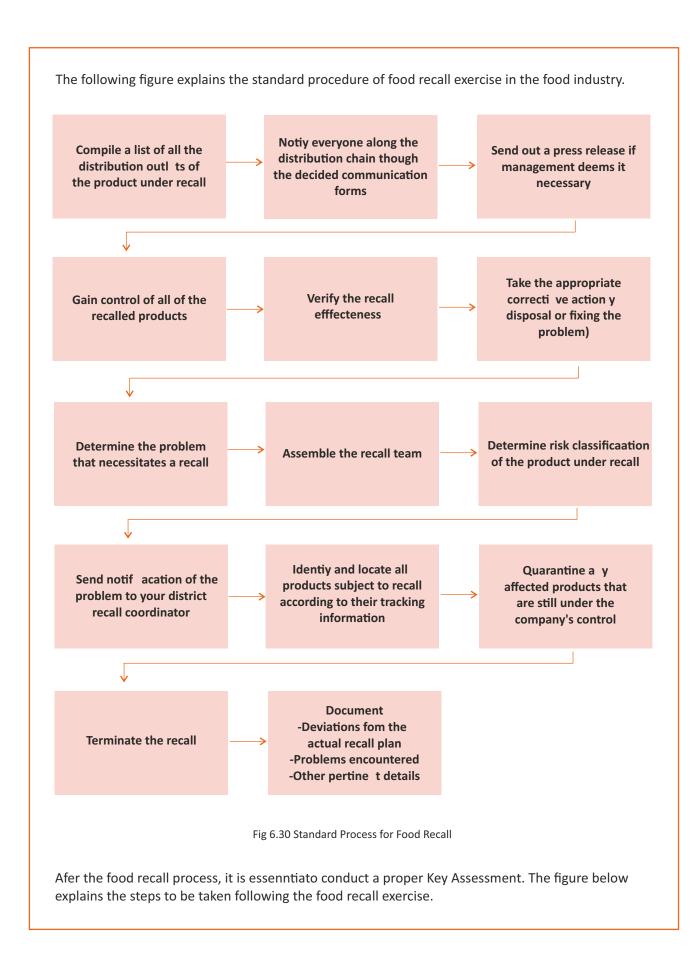
#### Sales/Customer representati es

Communicates with consumers

#### Legal counsel

 Advise on the legal requirements for a recall

Fig 6.29 Recall Team





#### Key questions to ask aaer 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-todate?
- How difficult was it to:
  - Trace the recalled product?
  - Gather the informationnecessary to act ate the recall?
  - Contact regulatory agencies?
  - Prepare documents for media correspondence (press releases and media statements)?
  - Maintain a log of activities?

Fig 6.31 Key Assessment for Recall Process

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## **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 correcte and prevennte e actioagainst workplace problems
- Correcti e measures to be applied to ensure food safety
- Information to be recorded in the work process
- Product informationand consumer awareness, product recall and withdrawal, and traceability

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- F	kercise 🔀
I.	Answer the following questions:
1.	List the types of different hazards in the Food Processing Industry.
2.	List down different types of Food Contaminaation.
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.

#### Scan the QR Code to watch the related video



https://www.youtube.com/watch?v=6W Xc6cH\_gil&t=1s

Personal Hygiene



https://www.youtube.com/watch?v=d5k n5ns0zWM

General Requirement on Hygiene and sanitation



https://www.youtube.com/watch?v=KBvU4Bmu5O0

**Food Safety** 









# 7. Follow Preventive Measures to avoid Accidents

Unit7.1 Workplace Hazards and Risks

Unit7.2 Safety Signs

Unit7.3 Health and Safety Practices



## Key Learning Outcomes



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

- 1. Explain the standard procedure to be followed for dealing with workplace hazards safely
- 2. Describe how to minimize potential risks and accidents at the workplace
- 3. Demonstrate how to train the workforce on accident preventiontechniques effffecely

## **Unit 7.1 Workplace Hazards and Risks**

## - Unit Objecti es



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

- 1. Explain the standard procedure to be followed for dealing with workplace hazards safely
- 2. Describe how to minimize potential risks and accidents at the workplace
- 3. Demonstrate how to train the workforce on accident preventiontechniques effffecely

### - 7.1.1 Hazards and Risks -

A hazard can be defined as a potenntial soce of harm, damage, or adverse health effect on a person, persons, or equipment. It can cause injury or ill-health to people and damage to the environment, equipment, and/or property.

A risk can be defined as the likelihood that a person or equipment may be harmed, damaged, or suffer an adverse health effect if exposed to a hazard.

Though these two terms are associated with one another, they are distinctenntiti with en eely different meanings. Hazard could be an agent which can cause undesirable effects, whereas, risk refers to the likelihood that the effect will occur.

Occupational hazards are risks associated with working in specific occupapation There are six categories of occupationalhazards as shown in the figure below:

Notes 🗒			



Safety Hazards - Includes any condition, object or substance that can cause harm

Spills on floor, exposure to unsafe electrical devices, working in confined spaces, working from heights, etc.



Chemical Hazards -Includes exposure to toxins and hazardous chemicals.

Cleaning products, smoke, flammable materials, pessticidesetc.



Biological Hazards -Includes harm caused by organic mater.

Microorganisms, mold, contaminated poultry and animals, allergens, etc.



Physical Hazards- Includes exposure to unsafe work environment. Loud noises, very high and low temperatures, radiation, etc.



Ergonomic Hazards- Includes harm caused by improper working techniques.

Repetit e e motion, liftheavy objects, wrong postures, etc.



Psychological hazard- Includes damage caused by work culture, organisation and management.

Poor relationshipwith colleagues and supervisors, poor working cconditions, poor morale, etc.

Fig. 7.1 Occupational Haards and Risks

## 7.1.2 Hazards and Risks in Food Industry

Hazards may result from different aspects of the workplace, including equipment, dangerous materials, unsafe working practices, and behaviour of individuals. Workers in food manufacturing and processing industries face numerous hazards and risks. The following are some of the common hazards and risks:

Many raw materials require thorough washing, as a result workers keep their hands constantly in water, which affect the nerves in their hands gradually. Meat, seafood and poultry has
to be processed in low
temperatures; hence workers
need to work in refrigerated
rooms for long hours. This
could lead to respiratory
disorders, rheumatic disoders
and frostbites. Along with the
risk of exposure to infectious
diseases.

Workers carrying out activities I e baking, roastin , boiling, etc. are constantly exposed to high temperatures causing dehydration and also exposing to risk of burns.

Workers carrying out processes like grinding, mixing of grains and spices are exposed to dust in the air causing respiratory disorders and allergies.

Overexertion due to lifti , pushing, pulling heavy objects and repetit e motions an cause injuries to back, neck, hands, wrists, arms and shoulders.

Working on machines exposes workers to moving parts, conveyors, collapsing structures, pressurized equipment, falling objects, hot surfaces, etc. causing injuries and even death in some instances.

Ammonia is a common refrigerant used in food processing and manufacturing units, exposure to ammonia can cause damage to eyes, skin and lungs. As it is flammable, it can cause an explosion if released in enclosed spaces with a source of ignition.

Usage of high volumes of liquids (water, oil, sticky substances) in food industry leads to exposure of workers to wet surfaces. This increases the risk of slips, trips and falls.

Processes and equipment employed in operations like grinding and milling can cause loud noise, that can cause long term hearing problems in workers.

Fig. 7.2 Hazards and Risks in Food Industry

## - 7.1.3 Causes for Workplace Hazards and Risks

The factors that cause workplace hazards and risks are as follows:



#### Men

Men are the first factor that can create a working hazard. Employees carelessness, ignorance and/or lack of training can be a threat in the workplace.



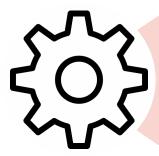
#### **Machines**

Machine, tools and equipment are part and parcel of every manufacturing unit. Improper usage of tools and poor maintenance of equipment can be a potential theat in the workplace.



#### Material

Food industry deals with a wide variety of materials ranging from cold to hot, solid to liquid, perishable to non-perishable, combustible o non-combusstible. rong handling improper processing, storage and disposable of these materials can be a threat to people as well as property and equipment.



#### Method

The term method refers to the way things are done in the workplace as a whole. To carry out a method all the above four elements - men, machines, materials and environment are required. A fault in any one of them can be a cause for a hazard during the process.



#### **Environment**

The term environment covers all aspects of a workplace. Situations like overcrowding, inadequate ventil ation, poor li ght, extreme temperatures, noise, slippery floors, blocked entries and exits, poor housekeeping can all lead to a hazardous environment.

Fig. 7.3 Causes for Workplace Hazards and Risks

## 7.1.4 Preventi e Measures for Workplace Hazards and Risks

Every workplace has hazards and almost all workplaces have an appointed person for conductingformal risk assessments but still, it is every individual's responsibility to be conscious of hazards in the workplace and minimize the risk of harm. Not all hazards are obvious and they are distinct e to a workplace. It is also not always possible to identiy and protect employees from such hazards. Therefore, it is crucial for both employers and employees to understand these factors, and build and particip te in activiti to minimize hazards and prevent accidents.

The following steps can be taken to identiy and assess hazards:

## Identiy the probability of a hazard

- Frequent- occurs continously
- Likely- occurs several times in a period of time
- Occasional- occurs rarely
- Remote- occurs very rarely
- Unlikely- almost impossible

## Assess the severity of the hazard

- Catastrophic- cause death, total disability or damage to equipment and property
- Criti cal- partial perman t disability or significant damage to equipment and property
- Marginal- minor wound or minor damage to equipment and property
- Negligible- a very small wound or damage to property

#### **Determine the risk level**

- Extremely high- loss of ability to perform task
- High- significantly degrades ability to perform task
- Moderate- degrades the ability to perfrom task
- Low- little or no impact on ability to perform task

Fig. 7.4 Steps to Identify and Assess Haards

## 7.1.4.1 Steps to Prevent Hazards

Control measures include actions that can be taken to reduce the potenntia of exposure to the hazard, or the control measure could be to remove the hazard. Control measures can be adopted in different ways at different levels, it can range from the usage of personal prottecte equipment to the complete elimination of the source of hazard as shown below:

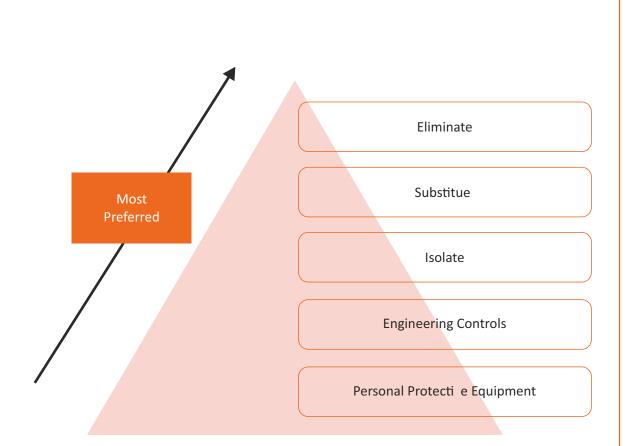


Fig. 7.5 Steps to Prevent Hazards

#### 1. Eliminate the hazard

Elimination of the dan er is not always feasible, but it does totally eliminate the hazard and hence the risk of exposure.

#### 2. Substitue the hazard with a lesser risk

Although substituting the h ard may not eliminate all of the risks associated with the process or activit, it may pose lesser risks, and the overall harm or health effects will be reduced.

#### 3. Isolate the hazard

Isolating the haard is managed by resstricting accesso plant and equipment, or, in the case of substances, locking them away under severe restrictions.

#### 4. Use engineering controls

Engineering controls, such as machinery monitoring, proximity guarding, extraction ystems, or shifting the opeator to a remote locaationway from the hazard, include redesigning a process to create a barrier between both the person and the hazard or separate the hazard from the person.

#### 5. Use administrati e controls

Adoptingstandard operaatinprocedures or safe work prpracticeas well as providing adequate training, education, or informaatioto limit the risk of injury or ill-health impacts to people, are examples of administrati e controls. Administraate controls include isolalati and permit-to-work processes.

#### 6. Use personal protecti e equipment

Personal protecti e equipment (PPE) mainly includes gloves, safety footwear, glasses, aprons, earmuffs, and dust masks which are designed to reduce exposure to the hazard. PPE is typically considered the last line of defense, and it is typically employed along with one or more additional control measures.

# 7.1.5 Standard Practices o Control and Prevent Hazards, Risks, and Accidents

Workplace accidents can be detrimental to the organisation. It can cause injury to workers, damage to equipment and property, loss of production, tc. All these can reduce the morale of workers and may lead to financial losses as well. Safe work prracticecan be adapted to control, manage and prevent hazards, risks and accidents. These practiceshelp in performing the tasks with minimum risk to people, equipment, materials, environment, and processes. Some of the safe practicesto follow are:

- 1. Follow good housekeeping practices.
- 2. Use proper tools, equipment, and machinery to perform tasks.
- 3. Follow all safety procedures while working on machinery.
- 4. Replace/repair malfunctioningequipment and machinery.
- 5. Maintain all tools, equipment, and machinery.
- 6. Discard all expired, spoilt and outdated ingredients and materials.
- 7. Maintain fire-fighghtiequipment and train people to operate fire ere extingus.
- 8. Maintain appropriate protocols while working in confined spaces and restrict entry into confined spaces.
- 9. Use appropriate equipment to lift, pull or push heavy objects to avoid overexxertion.
- 10. Ensure safety guards and railings are installed around moving parts of machinery.
- 11. Ensure all electrical devices are inspected, repaired, and broken/exposed wires are replaced.
- 12. Ensure there are no chemical leakages, spills, or fumes in the work area.
- 13. Ensure that the workplace is well ventilted, illuminated, and free of obstacles.
- 14. Follow appropriate guidelines while handling raw meat, poultry, and seafood as they can be a source of infections.

- 15. Ensure that the work area is disinfected and sanitied to prevent contaminaatioof food.
- 16. Follow appropriate procedures to dispose of wastes.
- 17. Ensure to wear personal protectie equipment appropriate to the work being carried out.

Notes			
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## **Unit 7.2 Safety Signs**

## - Unit Objecti es



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

- 1. State the importance of maintaining the equipment efffectely
- 2. Discuss the various types of safety signs and their relevance at the workplace
- 3. State the significance of displaying the common hazard signages wherever required

## -7.2.1 Importance of Maintaining Equipment Efffectely

Equipment in the food industry consists of a wide range of components, and processing machines used in cooking, handling, packaging, preparing, and storing food and food products along with vessels, utensils, and cutlery used in serving and consuming food. Equipment maintenance is the process of keeping tools, equipment, and machinery in good working conditon to prevent them from malfunctionin , or stoppage during use. Unexpected equipment failure at a prroductiounit can disrupt productionand result in costly downntimewhich can have a substanantiimpact on the he om line. Preventingcatastrophic equipment failure requires regular equipment maintenance.

The benefits of maintaining equipment effffecely are as shown below:

It ensures safe operations and educes risk of accidents.

It reduces machine breakdown and stoppage.

It increases the life of the equipment.

It prevents defecti e products.

It ensures timely production.

It increases efficiency.

Fig. 7.6 Benefits of Maintaining Equipment Effffecely

It may cause injury to workers.  It may cause damage to machine parts.  It may slowdown the equipment due to wear and tear.  It may reduce the quality of product.  It may cause breakdown of the equipment.  Fig. 7.7 Drawbacks of not Maintaining Equipment Effectely  Notes		
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It may reduce the quality of product.  It may cause breakdown of the equipment.  Fig. 7.7 Drawbacks of not Maintaining Equipment Efffectely	It may cause injury to workers.	
It may reduce the quality of product.  It may cause breakdown of the equipment.  Fig. 7.7 Drawbacks of not Maintaining Equipment Efffectely	It may cause damage to machine parts.	
It may cause breakdown of the equipment.  Fig. 7.7 Drawbacks of not Maintaining Equipment Efffectely	It may slowdown the equipment due to wear and tear.	
Fig. 7.7 Drawbacks of not Maintaining Equipment Efffectely	It may reduce the quality of product.	
	It may cause breakdown of the equipment.	
Notes ————————————————————————————————————	Fig. 7.7 Drawbacks of not Maintaining Equipment Efffectely	
	- Notes —	

## 7.2.1.1 Types of Maintenance

## It is also known as periodic maintenance and is carried out on a daily, weekly, or monthly basis. It is mostly carried out by the equipment user or Routine operator. It involves simple cleaning, washing, wiping, and oiling operations. It helps in stopping equipment due to the accumulation of dirt. It is carried out by conductingrroutin checks and inspections or when the user feels that there is a problem. It helps in reducing downtimeand surprise repairs. Preventi e For example; excessive vibrations, unusual noise or heatingup of the equipment, etc. if the problem is minor, then the operator can carry out minor repairs otherwise maintenance personnel should carry out the repairs. The performance of the equipment is tested using gauges and meters and if there are any variations, Predicti e then, the maintenance personnel carry out the remedial procedures. It is carried out when the equipment stops working and the repairs are carried out by maintenance **Breakdown** personnel.

Fig. 7.8 Types of Maintenance

# 7.2.1.2 Steps for Equipment Maintenance Plan in Food Industry

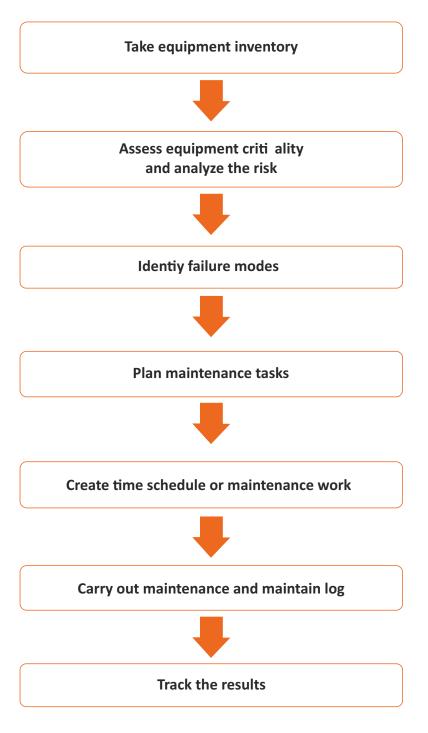


Fig. 7.9 Steps for Equipment Maintenance Plan in Food Industry

## -7.2.2 Safety Signs

It is necessary to have safety signs in the workplace. A visible warning from a safety sign provides a clear indicationand reduces the risk of accidents for both employees and non-employees, rresultinin a safer working environment. Employers are legally obligated to implement safety procedures and display several types of basic safety signage to protect people and equipment from potentialhazards. Safety signs should be clear, easily recognizable, and require no explanations that it is easy for everyone to follow without language barriers and even for illiterate people. They should be placed or displayed prominently in the required areas. The different categories of safety signs are as shown below:



#### **Prohibition signs**

Indicates an action or beh viour thaat is not permied, shown as a red circle with a red slash over a black icon of the action.



#### Mandatory signs

Provides specific insstuctions t t must be carried out, shown with white icons on a blue background



#### Danger signs

Communicates a hazard or a life-threatning situation, shown in ed or black background and icons



#### Warning signs

Indicates hazards or conditions the tean be harmful but not life-threatening, shown on a black triangle and icon on a yellow background



#### Fire safety signs

Indicates the location of f e fighighting equi t and fire alarms, shown as white symbols on a red background



#### **Emergency signs**

Indicates the directions or lo aationo emergency f facilities, shown with we symbols on a green background



#### Information signs

it communicates general information egarding house-keeping, company practices, tc.

Fig. 7.10 Categories of Safety Signs

The following table represents some of the common workplace safety signs:

SI. No.	Signage	Message
1.	<b>(</b> **)	No entry
2.		No smoking
3.		Hot surface
4.	Fire exit	Fire exit
5.	FIRST AID	First aid
6.	Fire alarm	Fire alarm
7.		Danger flammable material

Sl. No.	Signage	Message
8.	Wet Floor	Wet floor warning
9.		Wear protecti e gloves
10.	NOTICE This is a food processing area keep it clean at all times	Food processing area
11.	M	Wear PPE before entering
12.		Wash hands before starting ork
13.	NOTICE KEEP AISLES CLEAR	Keep aisles clear
14.		Stack correctly

Table 7.11 Common Workplace Safety Signs Image source: www.creati e safetysupply.com and freepik.com

# -7.2.2.1 Significance of Safety Signs

The main purpose of workplace safety signage is to warn people of possible exposure to various hazards. It helps to constantly communicate important instructions and reinforce safety messages. Organisations and workplaces that lack or do not have the necessary safety signage will be booked for violating safety regulation and regulatory y actiand legal fines by the the audilegal egal authorilf appropriate safety signs are not displayed and an accident occurs, then the employer and other responsible people may face legal consequences. The main highlights of safety signs can be summarized as shown below:

Provides instant visual communication of ey safety messages

Highlights safe methods of work as well as hazards

Fulfils legal requirements

Helps in warning and protecting empl yees and the public alike

Provides beter safety benefits for everyone

Fig. 7.12 Significance of Safety Signs

# 7.2.2.2 Safety Signs in Food Industry

In the food industry, along with the safety of the workers, food safety, hygiene, and contamination preventionplay an important role. Employees have to be constantly reminded of the proper procedures to follow in the workplace. This can be achieved by displaying signage at all the strategic points. Some of the commonly seen safety signage in the food industry are shown below:



































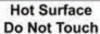




Fig. 7.13 Safety Signs in Food Industry Image source: www.creati e safetysupply.com

Notes 🗏		

# **Unit 7.3 Health and Safety Practices**

# – Unit Objecti es 🔯



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

- 1. Outline the importance of ensuring the availability of general health and safety equipment at all times
- 2. Describe the causes of fire, ways to prevent them and rescue techniques to be followed at timeof fire at the workplace
- 3. Outline the purpose and usage of various Personal Protecti e Equipment (PPE) required at the workplace

# 7.3.1 Health and Safety Protocols

Health and Safety laws place the duty of care on employers for ensuring the safety of their employees and others. It is a huge task for a single person to be responsible for workplace health and safety regulations. Therefore, in an organisaatiovarious people including workers, supervisors, managers, business owners' legal advisors and health and safety executi es are equally responsible. Employers bear more responsibility than employees because they are accountable for the safety of not only employees but also visitors to the workplace, customers, contract, and temporary workers.

Companies have to perform the following tasks to maintain health and safety requirements:



# -7.3.1.1 Importance of Health and Safety Equipment

The risk of injuries can to some extent be minimized by the use of health and safety equipment. Health and safety equipment or commonly known as personal protecti e equipment (PPE) protects the user against health and/or safety risks at work. Some of the common items include protecti e eyewear, gloves, face masks, hairnets, boots, aprons, etc. they are designed to protect the wearers. They are designed to protect employees from serious workplace injuries and illnesses resultingfrom biological, chemical, physical, radiological, electrical, or mechanical hazards. Every organisationshould maintain a PPE manual that helps both employers and employees in understanding the various types of PPE.



Fig. 7.15 A Food Product Developer with Safety Equipment Image source: www.freepik.com

# 7.3.1.2 Personal Protecti e Equipment

Personal protecti e equipment refers to accessories designed to protect the employees in the workplace from occupationalhazards. It should be ensured that PPE used are well maintained and free of defects. Workers should be informed to wear and use PPE that are damage free and of the appropriate size. Workers should also be trained to clean and maintain them afer use. In case of disposable PPEs, worker have to trained in safe disposable techniques to prevent contamination.

The following are examples of basic personal protection equipment (PPE) that can assist protect employees:

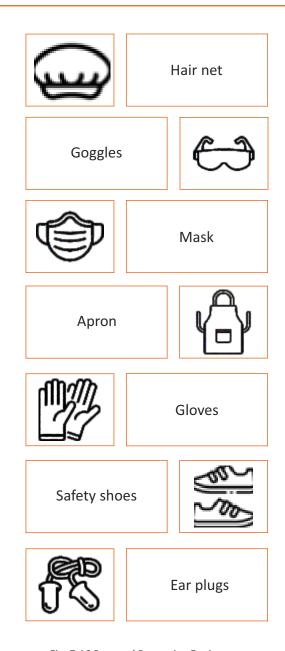


Fig. 7.16 Personal Protecti e Equipment Image source:www.flaaton.com

## Hair nets

Disposable hairnets should be worn to prevent hair from falling into food products.

## **Safety Suggestions**

- Ensure that the hair nets cover the entie head and hair.
- People with long hair should first titheir hair into a bun and insert it into the hair net.
- Disposable hair nets should be replaced afer each usage.
- If the hair net is damaged or soiled, replace it right away.

## **Face and Eye Protection**

PPE, such as safety goggles and face shields, should be worn for tasks that could result in eye damage or loss of vision, such as liquid sprays, splashes, or burns.

## **Safety Suggestions**

- Check to see if the safety glasses meet the standard eye protectionrequirement.
- Make sure the lenses are free of fractures and abnormalities.
- Check that the strap is in good functioning oder and that it is securely fastened to the cheek and forehead.
- Afer each use, clean and disinfect.

#### Face mask

Face masks are worn when performing an activitythat could result in the inhalaatioof fumes, gases, and chemicals. It also protects against the contamination of ood from germs and viruses in case the food product developer is carrying any infection.

## **Safety Suggestions**

- Before wearing any equipment, be sure it has been fit-tested.
- Ensure that the mask covers the nose and mouth adequately.
- Replace masks as recommended.
- Disposable masks should be replaced afer each usage.
- Avoid sharing masks with others.
- If the mask is broken or soiled, replace it right away.

## **Body Protection**

PPE for body protectionincludes aprons, safety vests, and suits for tasks that expose workers to extreme temperatures, flames, sparks, hazardous chemicals, etc.

## **Safety Suggestions**

- Make sure they are clean and not damaged.
- Washable and reusable aprons should be washed afer each usage.
- Disposable aprons should be replaced afer each usage.

## **Hand Protection**

PPE, such as safety gloves, should be worn when performing tasks that could result in hand and skin burns, absorption of hazardous substances, wounds, or cuts.

## **Safety Suggestions**

- Check that the hand protectionfits well and is free of cuts and damages.
- If there is any sign of contamination, replace them immediately.
- When dealing with heat and electricity, wear rubber gloves to prevent the danger of burns or electrical shock.

Wear metal mesh gloves while chopping meat.

#### **Foot Protection**

Knee pads and safety boots are examples of personal protectie equipment (PPE) that should be worn for tasks that could result in catastrophic foot and leg injuries due to falling or rolling objects, hot liquids, electrical hazards, or slippery surfaces.

## **Safety Suggestions**

- Check that the boots have slip-resistant soles that can withstand compression and impact.
- Check that the sole plate is in good working order.

## Ear plugs

Ear plugs should be worn when performing noisy operationslike grinding to avoid hearing loss.

## **Safety Suggestions**

- Make sure the equipment fits snugly in the ear canal.
- It is recommended that formable earplugs be used to fit various ear canal sizes.
- Use noise-reducing protectors to create a space for communication.
- Check that the earplugs are clean and in good working order.

## 7.3.2 Fire Safety -

Personal protecti e equipment refers to accessories designed to protect the employees in the workplace from occupationalhazards. It should be ensured that PPE used are well maintained and free of defects. Workers should be informed to wear and use PPE that are damage free and of the appropriate size. Workers should also be trained to clean and maintain them afer use. In case of disposable PPEs, worker have to trained in safe disposable techniques to prevent contamination.

The following are examples of basic personal protecti e equipment (PPE) that can assist protect employees:



Fig. 7.17 Fire Safety Image source: www.freepik.com

Fires and explosions are the leading causes of death and property loss in industries across the globe. Fire safety refers to a set of protocols to be followed to reduce the devastation caused by fire. The following figure shows the different classes of fires, causes, and ed extinguist hat can be used:



## Class of Fire - A

- Type of Fire Ordinary Combustible : wood, paper, rubber, fabrics and many plastics.
- Type of Extinguishe- Water, dry powder, halon



## Class of Fire - B

- Type of Fire Flammable liquids and Gases: Gasoline, Oils, paint, lacquer and tar.
- Type of Extinguishe- Carbon Dioxide, dry powder, halon



## Class of Fire - C

- Type of Fire Fires involves live electrical equipment .
- Type of Extinguishe- Carbon Dioxide, dry powder, halon



## Class of Fire - D

- Type of Fire -Combustiblemetals or combusstiblmetal alloys
- Type of Extinguishe- Special Agents



## Class of Fire - K

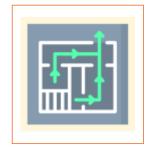
- Type of Fire Fires in cooking appliances that involve combustible cooking media: vegetable or animal oils and fats.
- Type of Extinguisher- Wet Chemical

Fig. 7.18 Types of Fires Image source: www.flaaton.com

## Fire safety checklist:



Are all the employees trained in fire safety procedures?



Are fire evacuaation plans with emergency contact numbers displayed on all floors?



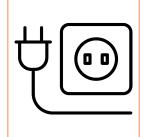
Is the fire fighghting equip t maintined in ood working condition?



Are the exhaust systems clear and maintained well?



Are all the safe assembly points identified and ma ed?



Are all the electrical gadgets and other processing equipment maintained and checked regularly?



Are there 'no smoking' signage posted?



Are there location signa e of 'fire' alarm posted?



Are flammable items stored appropriately?

Fig. 7.19 Fire safety checklist Image source: www.flaaton.com

# 7.3.2.1 Ways to Prevent Fire

The proverb 'Preventionis beeer than cure' can be aptly applied in the case of workplaces to prevent fires. Even a small fire can be e disrupe causing injury to workers, damage to equipment, wastage of material, loss of time,prroductivi, and output. Therefore, the following ways can be implemented to prevent fires at the workplace:

- 1. Follow good housekeeping practices to keep the workplace clean and safe.
- 2. Create employee awareness through training programmes.
- 3. Store combustibleand flammable materials properly.
- 4. Keep inventory of combustibleand flammable materials as low as possible.
- 5. Take adequate precautions around ignitio sources.
- 6. Ensure all electrical devices are grounded well.
- 7. Replace all exposed electrical wires.
- 8. Follow a good equipment maintenance programme.
- 9. Avoid electrical overload.
- 10. Conduct fire safety audits regularly.
- 11. Dispose of waste properly.
- 12. Report unsafe conditions that may cause a fire.

# 7.3.2.2 Precautionay measures to handle fire emergencies

In spite of taking all measures to prevent, there could be a possible fire incident in the workplace. In the food industry even a small error or carelessness can lead to a fire. Therefore, the management has to take adequate measures to tackle the situation planning the infrastructure and training the staff. The precautionary measures to handle fire emergencies are:

## be taken are:

- 1. There should be enough exit gates for people to come out from the premises to safe assembly point.
- 2. All exit gates should be indicated properly.
- 3. Floor layout should be displayed on every floor.
- 4. There should be sufficient fire ee extinguis to eto extingdifferent classes of fire in the premises.
- 5. Workers need to be trained for the following roles to handle fire emergencies:
  - a. Fire alarm box runners- workers trained to break alarm boxes and inform the fire department
  - b. Fire brigade- workers trained to extinguishsmall fires
  - c. Fire wardens- workers trained to coordinate evacuation of workers

- d. **Searchers-** workers trained to search for people in restrooms, shop-floors, canteen and elsewhere in the premises to ensure that nobody is leftbehind during evacuaation
- e. **Door holders-** workers trained to hold doors open when people are being evacuated and close the door when all people are out
- 6. All employees should be trained in emergency evacuation procedures.
- 7. Fire drills should be conducted as per the organizational government guidelines.

Notes			
ivotes			

# 7.3.2.3 Fire Evacuation Pocess In case of a fire emergency, people should be evacuated in the initiastages of a fire. Fire brigade should be informed immediately. The first priority is to save people, next fire containment and lastly property protection. Some of the important points to follow during a fire evacuaatioprocess: Follow emergency evacuation instructions Raise a fire alarm Fight only small fires Use a fire eextinguisher on the type of e that it is labelled for Switch o ffelectrical devices Do not carry any personal belongings or equipment Give preference to elderly, expectant mothers, specially-abled persons, children, if any If it is smoky, try to cover nose and mouth with a wet cloth to prevent inhaling smoke and crawl to the nearest exit Give preference to elderly, expectant mothers, specially-abled persons, children, if any If it is smoky, try to cover nose and mouth with a wet cloth to prevent inhaling smoke and crawl to the nearest exit Fig. 7.20 Points to follow during Fire Evacuation Pocess

# Summary



- A hazard can be defined as a potenntiasource of harm, damage, or adverse health effect on a person, persons, or equipment.
- A risk can be defined as the likelihood that a person or equipment may be harmed, damaged, or suffer an adverse health effect if exposed to a hazard.
- The various types of occupationalhazards are safety, chemical, biological, physical, ergonomic, and psychological hazards.
- The factors that cause workplace hazards and risks are men, machines, materials, environment, and methods.
- The first step in prevenntinhazards is to ideneny and assess hazards by idendeying the probability of a hazard, assessing the severity of the hazard, and determining the risk level.
- The preventi e measures for workplace hazards and risks are eliminationsubsbstie, isolaolation, engineering controls, administrati e controls, and personal prottecte equipment.
- Safe work practicescan be adapted to control, manage and prevent hazards, risks and accidents. These practiceshelp in performing the tasks with minimum risk to people, equipment, materials, environment, and processes.
- Equipment maintenance is the process of keeping tools, equipment, and machinery in good working condition to prevent them from malfunctionin or stop during use. Prevenenti catastrophic equipment failure requires regular equipment maintenance.
- A well-defined maintenance plan is of most importance in the food industry because of the high cleanliness standards required, wet environment, complex equipment, perishable products, continuousprocesses, stringent quality control, etc.
- The steps for equipment maintenance plan in the food industry are taking equipment inventory, assessing equipment criticality and analyzing the risk, identifying failure modes, planning maintenance tasks, creating a tim schedule for maintenance work, carrying out maintenance, and maintaining a log and track the results.
- Maintenance planning is not a one-timejob, it needs to be dynamic.
- A visible warning from a safety sign provides a clear indicationand reduces the risk of accidents for both employees and non-employees, resultingin a safer working environment.
- Safety signs should be clear, easily recognizable, and require no explanationso that it is easy for everyone to follow without language barriers and even for illiterate people.
- The different categories of safety signs are prrohibitiosigns, mandatory signs, danger signs, warning signs, fire safety signs, emergency signs, and informaatiosigns.
- The main purpose of workplace safety signage is to warn people of possible exposure to various hazards. It helps to constantly communicate important instructions and reinforce safety messages.
- If appropriate safety signs are not displayed and an accident occurs, then the employer and other responsible people may face legal consequences.
- In the food industry, along with the safety of the workers, food safety, hygiene, and contamination prevention play an important role. Employees have to be constantly reminded of the proper procedures to follow in the workplace. This can be achieved by displaying signage at all the strategic points.

- Health and Safety laws place the duty of care on employers for ensuring the safety of their employees and others. In an organisation people including workers, supervisors, managers, business owners, legal advisors, and health and safety executes are equally responsible.
- The risk of injuries can to some extent be minimized by the use of health and safety equipment.
- Some of the common items include protecti e eyewear, gloves, face masks, helmets, boots, aprons, etc. They are designed to protect employees from serious workplace injuries and illnesses resulting from biological, chemical, physical, radiological, electrical, or mechanical hazards.
- Personal protecti e equipment refers to accessories designed to protect the employees in the
  workplace from occupationalhazards. Workers should be informed to wear and use PPE that is
  damage-free and of the appropriate size. Workers should also be trained to clean and maintain them
  afer use.
- Fires and explosions are the leading causes of death and property loss in industries across the globe. Fire safety refers to a set of protocols to be followed to reduce the devastationcaused by fire.
- The different types of fires are classified as Class A, B, C, D, and K based on the cause and each class of fire can be eextinguisheby a a particultype of ef extingui.
- Companies should take adequate measures to prevent a fire like following good-housekeeping practices, storing combusstiblmaterials safely, providing training to staff, maintaining equipment, conducting fire safety audits, etc.
- Organisations should take all preccautionarmeasures to handle fire emergencies including regular fire drills.
- In the event of a fire emergency, proper evacuaatioprocess should be followed.

Notes 🗐			

# - Exercise



<b>An</b> 1.	swer the following questions:  Define the terms 'Hazard' and 'Risk'.
2.	Write a note on hazards and risks in the food industry.
3.	Explain the importance of the maintenance of equipment in the food industry.
4.	List any five personal prottecte equipment that workers in the food industry need to wear.
Fil	l in the blanks:
1.	hazard is caused by exposure to unsafe work environment.
2.	is a common refrigerant used in food processing units.
	type of fire is caused by cooking oils and fats.
4.	type of gloves should be worn by workers while
	ultiple-choice Questions:  Choose the correct answers (MCQ)  a. Which one of the following is an example for an ergonomic hazard?
	a. William one of the following is an example for an ergonomic nazard:

- 1. Contaminated poultry
- 2. Electrical devices
- 3. Flammable materials
- 4. Repetit ive motion
- b. Which type of maintenance is performed when equipment stops working?
  - 1. Periodic maintenance
  - 2. Preventi e maintenance
  - 3. Predicti e maintenance
  - 4. Breakdown maintenance

- c. Which one of the following signs indicate an action or beh viour thaat is not permied?
  - 1. Danger sign
  - 2. Prohibition sign
  - 3. Warning sign
  - 4. Mandatory sign
- d. Which type of fire can be eextinguished with ater?
  - 1. Class A
  - 2. Class B
  - 3. Class C
  - 4. Class D









# 8. Manage Workplace Emergencies

Unit 8.1 Workplace Emergency

Unit 8.2 First Aid

Unit 8.3 Health, Safety and security breaches



# Key Learning Outcomes

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

- 1. Apply appropriate practices to deal with the emergencies at workplace effffecely
- 2. Describe the trainings to be provided for dealing with emergencies at the workplace

## **Unit 8.1 Workplace Emergency and Evacuation Pocedures**

# - Unit Objecti es 🎯



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

1. Discuss workplace emergency and evacuation procedures and the importance of following them

# 8.1.1 Workplace Emergency -

A workplace emergency is an event that causes disruption of workplace operaation by posing an immediate risk of significant harm to the health and life of people, equipment, property, or the environment. Preparing for emergencies is not only important for the health and safety of the workplace, it is a legal requirement as well.

## **8.1.2 Types of Workplace Emergency**

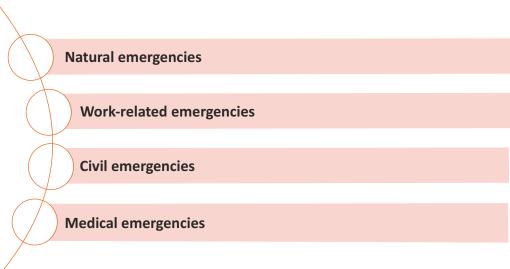


Fig. 8.1 Types of Workplace Emergency

Natural emergencies are the hardest to predict and plan for. Natural emergencies can occur due to floods, earthquakes, hurricanes, tornadoes, forest fires, etc. Most t en it will not be limited only to the workplace. Hence it can affect the logissticas the whole neighborhood would be affected.

Work-related emergencies are caused by factors relating to the workplace like explosions, machinery malfunction, power outages, chemical spills, dangerous gas releases, etc.

Civil emergencies are caused by civil unrest like strikes, protests, employee-employer conflict, workplace harassment or violence, terrorism, etc.

Medical emergencies commonly seen at the workplace are heart atack, electrrocutionaccident, burns, choking, etc.

# 8.1.3 Emergency Situations in the ood Industry

Emergency situations not only cause temporary damage immediately aaer the incident, but they can also lead to a permanent closure of the business. The occurrence of an emergency situationleads to costs associated with loss of material, damage to equipment and property, loss of staff, cost of paying sta ffthat is idle, loss of business, customer confidence, and loyalty. Therefore, it is always good to prevent such a situation. It is not always possible to prevent an emergency, hence the next best thing is to be prepared for it so as to reduce or minimize the damage. Every food production facility should have a Food Safety Manager who will be responsible to ensure consistent compliance with food safety requirements.

Some of the emergency situations in the food industry are:

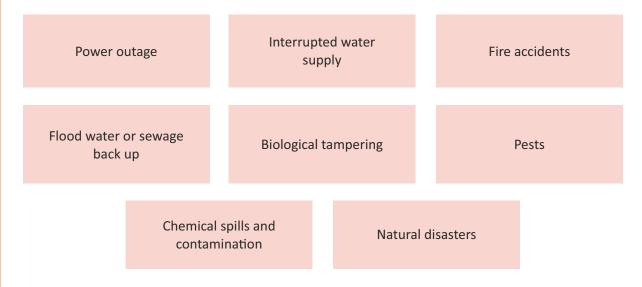


Fig. 8.2 Emergency Situations in the ood Industry

**Power outage:** The food industry is dependent on the power supply for the functioning of refrigeraation and freezer units, hot water heaters, lightin , etc. if there is a power outage for a long duraation, itan lead to the spoiling of food leading to staleness and contamination. This can pose a food safety threat and loss of material as well as production.

**Interrupted water supply:** Water is the most common ingredient in cooking. It is also required for drinking, cleaning, and sanitiaatiopurposes. If there is not enough water available it can lead to loss of productionand wastage. If water is sourced from external agencies, then it needs to be checked for quality to prevent contamination.

**Fire accidents:** The food industry is prone to combustibledust, electrical fires, and explosions compared to other industries. This is because of the presence of materials like flour, grains, spices, cooking oils, etc. When oil is heated for cooking at high temperatures, it degrades and becomes combustible. Processing, cooking, and other production equipment are operated using electricity or gas, both of these have a high potential for fire accidents. Poor housekeeping and maintenance can also lead to fire accidents due to oil and grease buildups clogging exhaust systems and ductwork.

**Flood water or sewage back up:** Flood water or sewage can enter the premises and damage raw material and equipment. Flood water can contain chemicals, feces, disease-causing microorganisms, pests, insects, etc. If the flood water or sewage cannot be contained immediately, then the facility has to be closed be prevent contamination.

**Biological tampering:** It involves the deliberate use of biological contaminants and toxins in food and water. They can be in the form of powder or liquids. Food safety managers and supervisors have to be watchful to prevent or minimize these kinds of threats.

**Pests:** Pests ofen pose a huge threat to the food industry, they can damage food, raw materials, equipment, and buildings. Pests like rodents and insects like cockroaches and flies are a common problem in most food productionunits. Stagnant water becomes a breeding site for mosquitoes and other insects. Sewage and floods can also bring pests into the facility. Poor housekeeping and improper handling and disposal of garbage can further aggravate the problem.

**Chemical spills and contamination:** Chemical spills, the release of fumes and gases into the air can cause damage to workers' health and contaminate food and water.

**Natural disasters:** Natural disasters like earthquakes, hurricanes, tornadoes, floods, heat waves, etc. are striking more and more ofen. Some regions are more prone to certain natural disasters; therefore, the organisationhas to be well prepared to tackle the situationThese disasters can n en cause irreversible damage to the facility, destroy buildings and equipment and also harm people leading to disruptionin prroductiocapacity.

# Prevention: Create policies and procedures to minimize the occurrence of emergencies. Preparation: Carry out activities, ocedures and training to make sure the workplace is ready to respond efffectely. Response: Determine the action o be taken in the event of an emergency situation. Recovery: Prepare to resume normal work operations. Fig. 8.3 Emergency Management Plan

# 8.1.5 Planning for Emergencies

Irrespecti e of the type of emergency, it is important to be prepared to tackle emergencies to keep the employees and other people free from harm and life-threatening situations, minimie damage to the equipment, machinery, tools, etc. minimize damage to the environment, minimize downtime. This can be achieved by devising an emergency plan. The emergency plan should have a clear outline of the steps and actions to be taken, as making decisions during a crisis can be tough.

The first step is to create a plan assuming the worst-case scenarios that can happen. Different types of emergency situationscall for different steps to be taken. Each workplace will have different kinds of emergency situationsarising. A list of the most likely emergency situationthat can arise based on the location and sie of the organisaation, the kind of ocesses carried out, and the kind of people on the premises like employees, visitors, customers, etc. has to be made. For example:

- Some locationscan be prone to frequent natural ccalamitielike earthquakes, hurricanes, floods, etc.
- Food industries can be prone to fires, biological hazards, chemical spills, fumes, etc.
- Food cooking and serving places like restaurants will have employees, visitors, and customers, who may or may not have the training to deal with emergency situations.

In most cases, the likelihood of workplace emergencies is high compared to other types of emergencies. Therefore, a good way to start is by evaluating emergencies that may result from factors directly related to the work. This can be done by using a previous risk assessment that identifie the risks and ways to alleviate them. Along with those other emergencies that may befall should be accounted for. A single plan will not suit every workplace.

Notes 🗐 –		

## 8.1.6 Emergency Response Plan

A writen document of the emergency response plan should be made available to the emergency response team consisting of the following details:

Scope and outline potential emegencies

Site-specific response procedures

Details and location of emegency equipment

Alarms, alerts and other announcements of initiating aesponse

Emergency response team members, their roles and responsibilities

Procedures for shutting down p er, water, equipment and machinery

Evacuation and assembly pocedures

Procedures for first-aid and medical help

**Emergency contact lists** 

Resource lists

Fig. 8.4 Documentation guideline or Emergency Response Plan

The response plan should include:

**Emergency response team-** The emergency response team should have people appointed at various levels along with backup personnel, in case the primary appointees are not available. The team should consist of a coordinator and a few emergency response personnel.

- Coordinator should be a responsible person who can help prevent any confusion during an
  emergency. The person should be able to oversee the emergency response, communicate and
  mediate with internal and external emergency response teams, ensure that all the at-risk personnel
  is informed and evacuated, and ensure that operations are shut down and secured.
- Emergency response team should consist of people who can be responsible for dedicated tasks like
  fire safety, medical assistance, safe evacuaatioof people, handling, control, cleanup of hazardous
  or toxic material, etc.

**Emergency equipment-** Immediate response in case of emergencies is very crucial in limitingdamage. A list consisting of the details and locaatio of all the emergency equipment should be prepared and made available for both internal and external emergency personnel.

Some examples of emergency equipment are fire eextinguishs, chemical containment equipment, automaticexternal defibrillators (AED), machinery controls, electricity mains, water main access points, first-aid kits, etc. Personal prottecte equipment may include safety glasses, goggles, face shields, head protectiongear, safety shoes, chemical suits, gloves, and special prottecte clothing for combabating emergencies.

Training and practicedrills- Regular training and drills should be conducted so that every employee knows the procedures to be followed during different kinds of emergencies. Employees should be made aware of their responsibilities during an emegency like responding to an alarm system, following the announcements, knowing the place to gather during an emergency, knowing whom to approach, reportingan emergency, actio to be followed for specific emergencies, being aware of when to reenter the premises afer emergency and the using of emergency equipment if trained/authorized to. Some of the key features of employee training are:



**Evacuationprocedures-** A detailed plan should be drawn for the actions to be taken for different emergencies including personnel in charge of the evacuation, localatioof various shelter and meeeeting places inside and outside the premises, evacuation outes and map, alert or alarm systems, procedure to follow if someone is injured and employee responsibilities.

- Personnel: People in-charge of evacuationshould be able to evacuate workers safely, hold doors
  and assist people with special needs, aged people, expectingmothers, etc., and look for people in
  washrooms, canteens, shop-floor, and elsewhere on the premises to ensure that nobody is leeft
  behind during an evacuation.
- Shelters and meetingplaces: In places where hurricanes and tornadoes are a possibility, safe
  shelter places inside the building should be identified For incidents like fire emergencies, safe
  outside assembly or meeting poi ts should be designated so that employees ccan assemble. Aer
  complete evacuation, a roll call can be taken in these places to see if all the employees have been
  safely evacuated from the building.
- Exit and evacuationroutes: There should be a sufficient number of wide, well-lit, and easily
  accessible exits so that all employees can be evacuated rapidly. All exits should be free from any kind
  of blockage.
- Alarm systems: Alarm systems should be such that they are easily visible, heard, and understood by all personnel.
- Procedures to follow if someone is injured: First-aid kits should be provided, and a few personnel should be trained to provide first aid and Cardiopulmonary Resuscitaatio(CPR) and assess when to call for medical help. Employees should be informed whom to approach if medical atenntiois required.

Following an evacuationplan is very crit al to keep control of all employees. Confusion in the assembly areas can cause a delay in rescuing anyone trapped within the building, as well as unnecessary and dangerous search-and-rescue operations.

Notes 🗐			

1.7	Measures to be taken afer Evacuaation ofeople ——
-[	Ensure that all the evacuated people have gathered in the designated assembly areas.
-[	Perform a headcount afer the evacuaation.
-[	Identiy all the people rescued and make a list.
-[	Establish a method for accounting all visiors, contract workers, suppliers and customers.
-[	Prepare and establish procedures for further evacuation in the ase the incident expands.
_[	If required send all the empoyees home.
	Fig. 8.6 Measures to be taken afer Evacuaation ofeople
ote	es ====================================

## **Unit 8.2 First Aid**

# - Unit Objectives 🏻 🧐



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

- 1. Explain the procedure to be followed for administering immediate first aid to victimin case of cuts, bleeding, burns, choking, electric shock, poisoning, etc.
- 2. Discuss the procedure to be followed for providing artificia respirarati and cardio-pulmonary resuscitation(CPR) to the affected person and highlight its significance

# 8.2.1 Objectives of First Aid -

First Aid is the emergency care given to an injured person as soon as the injury occurs and at the location where it occurred. It ofen consists of a short one-tim treatment given by a first aider un unproper medical help can be provided. Every kind of injury does not require treatment at a medical centre, some minor injuries can be treated with only first aid.

First aid can include treatinga minor burn, a minor cut, applying bandages and dressing, administering non-prescriptionmedicine, etc. All workplaces have to provide at least some level of first aid. The type of first aid, equipment, and training depends on the type of hazards present in the workplace, the number of employees, and the distance to the nearest hospital or medical facility. Provision for first-aid is also a legal requirement as per the law.

## Objecti es of first aid:

- To minimize injury and future complications, disability, or in some cases prevent death.
- To make the person as comfortable as possible to conserve strength untilmedical help comes by.

Notes 🗒		

Points to remember while providing first aid:

Obtain medical help immediately. Call the doctor and ambulance to take the person to the medical centre.

Always remember to treat the most dangerous first, for example: take measures to prevent bleeding before atending to bruises.

Avoid moving a seriously injured person from lying position, unless a solutely required. If it is inevitable, then handle very gently.

Make sure that the person is stable and comfortable.

Do not give any food, water or any fluids orally to an unconscious person.

Observe if the person is breathing normally and check pulse periodically.

Cover any open wound with a sterile gauze bandage or clean cloth.

In case the victim omits, then gently lower the head and turn to a side to ensure the fluids do not chokke the victim and ter the lungs.

Fig. 8.7 Points to remember while providing First Aid

## 8.2.2 First Aider

Be a good observer and be able to act quickly.

Be self-confident, calm and composed.

Be able to control the crowd, lead and take from onlookers, if required.

Be able to judge the extent of injury, communicate the same to paramedics.

Be able to understand the severity of the injuries and treat the most dangerous one first.

Be able to counsel the victim, eassure and make the victim eel calm and comfortable.

Fig. 8.8 Qualities of a Fist Aider

## 8.2.3 First Aid Kit -

Every workplace should have at least one first aid kit. The contents of the first aid kits should be based on the risks the workplace poses and the kind of injuries it can cause. First aid kits should have the following features:

It should be large enough to hold all the required items.

It should have the first-aid signage (white cross on a green background) displayed.

It should be able to protect the contents from dust, moisture, heat and contamination.

It should have the list of contents for that kit.

It should have all tools and other materials required to give first aid.

It should have medicines within the expiry date.

It should be periodically checked expired medicines, damaged tools and contaminated material and replaced.

Fig. 8.9 Features of First Aid Kit



Fig. 8.10 Items in a First Aid Kit

- First aid manual
- Tools- torch, scissors, magnifiers, thermometer, safety pins, forceps, syringes, needles, etc.
- Materials- coton rolls, alcohol swabs, sterile gauze dressing, crepe bandage, medicated bandages
  of different sizes, plasters, tape, disposable gloves, disposable face masks, N95 masks, tissue
  papers, soaps, sanitiers, etc.
- Non-prescriptionmedicines- annti-septcreams and ointments, an anti-se ptic soluparacetamol, painkillers, anti-hitamines, eye-wash, etc.

# 8.2.6 First Aid Procedures for Various Injuries

Safety precautions to be followed before, during, and aaer administraratiof first aid:

- Always wash, dry, and sanitie hands before and aaer performing first-aid.
- Wear disposable gloves while dressing wounds, and avoid contact with blood and other body fluids.
- Use alcohol swabs to wipe tools.
- Sterilize reusable tools afer every use.

## Bleeding:

The colour of blood and the way it bleeds from the wound indicates the severity of the injury. Bleeding from capillaries, which are small blood vessels, comes out as a trickle and stops on its own. Blood bleeding from veins is darker in colour than capillary blood and exhibits a consistent flow, the flow intensity can be from mild to severe. Blood coming out of arteries carry oxygen and is bright red in colour and the flow intensity is typically severe, leading to severe blood loss quickly. All types of bleeding can be arrested with quick interventionand care. If bleeding is allowed to conntinufor a long timeit can end in shock and eventually death.



Fig. 8.11 Bleeding from a cut

The following first aid steps should be taken to stop bleeding:

## Severe bleeding

- Do not pull out or remove large and deeply embedded objects.
- Stop the bleeding by placing a sterile gauze bandage or clean cloth on the wound and apply constant pressure until bleeding stops.
- Secure the bandage and if the bleeding is in the hands or legs, then keep them at an elevated position.
- Keep the injured person in a lying position and immobilize the injured body part as much as possible.
- Call an ambulance and seek medical help

## Minor cuts and scratches

 Clean the cut with clean water, raise the injured area above the heart and cover the cut with a sterile gauze dressing or bandage.

Fig. 8.12 First Aid steps to Stop Bleeding

## **Burns:**



Fig. 8.13 Burn injury

Burns are caused due to direct contact with fire or flame, by touching very hot surfaces, spilling hot fluids on the body, or due to electric shock. The general preccautioto be taken for burns is to not put ice directly on the burn and not to break blisters. Burn injuries can be categorised as follow:

First-degree burn						
<b>Impact</b> The outer-most layer of the skin is affected	<b>Symptoms</b> Skin redness Swelling Pain	<b>Treatment</b> Cool the burn Cover with a sterile bandage Administer a pian killer if required				

Second-degree burn						
<b>Impact</b> The first and second layers of the skin are affected	<b>Symptoms</b> Blisters Swelling Severe pain	<b>Treatment</b> Cool the burn  Cover with a sterile bandage  Administer a pian killer if  required				

Third-degree burn		
Impact All layers of skin, fat, muscle and bone are affected	<b>Symptoms</b> Dry white/black areas Sign of shock Severe pain	Treatment Remove contact with smoldering material Check for circulation Co er with sterile bandage Seek medical help

Fig. 8.14 Categories of burns

#### **Electrocution:**

When a person comes in contact with a live wire or faulty electric equipment, the person gets a shock (electrocution). It may cause burns or it may not leave any visible mark on the skin. In both cases, it can cause cardiac arrest, internal damage, or other injuries. In some circumstances, even a small amount of electricity can be fatal. A person injured by contact with electricity should be thoroughly examined by a doctor. Medical help should be sought immediately if the victimexperiences: severe burns, difficulty in breathing, confusion, heart rhythm problems, seizures, muscle pain cardiac arrest, or loss of consciousness.

## Shock due to trauma, severe infection, or an allergic rreaction:

When a person is suffering from any kind of severe inffectionallergic r reactioor trauma it can lead to a shock. The symptoms of shock are cold and clammy skin, shallow breathing, low blood pressure, yawning, staring eyes, yawning, delirium, or unconsciousness. In such situations, the peson has to be immediately taken to a medical care facility.

## **Choking:**

Choking occurs when an external object gets stuck in the throat or windpipe blocking the flow of air. It cuts o ffoxygen to the brain, therefore first aid has to be given immediately. The common symptoms of choking are coughing, inability to talk, heavy and noisy breathing, skin, nails, and lips turning blue, and loss of consciousness. If the person is finding it difficult to breathe and has fallen unconscious seek medical help immediately.

## Poisoning:

Poisoning can cause injury or death due to inhaling, swallowing, touching or injecting various gases, chemicals, drugs, venom, etc. Some substances are poisonous only in high dosages or concentrations. The symptoms of poisoning are vomitin , drowsiness, difficulty in breathing, confusion, seizures, etc. Depending on the severity of the effect of the poisoning the person has to be taken to a medical facility or can be given first-aid by a trained first-aider.

# 8.2.8 Artificial espiraration and diopulmonary Resuscitaitation (CPR)

Artificia respirarati is breathing induced when natural respirairat has stopped. It can be performed manually by providing air to a person who is not breathing or with the help of mechanical ventil tors. One of the manual methods of providing artificiarespiraratiis Cardiopulmonary Resuscitaitat(CPR).

CPR is a life-saving technique in many emergencies like heart atacks or when a person has stopped breathing because of various reasons like trauma, choking, shock, etc. CPR keeps the oxygen-rich blood flowing to the brain and other organs unntimedical treatment can restore the heart rhythm. CPR has to be performed only by a trained person. An untrained person can perform hands-only CPR. Hands-only CPR consists of giving uninterrupted chest compressions of about 120 per minute untilmedical help arrives.

# Unit 8.3 Health, Safety, and Security Breaches

# - Unit Objecti es



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

1. State the impact of health, safety and security breaches on self, team, and work process

# 8.3.1 Health, Safety, and Security Breaches The term breach can be defined as 'an act of breaking or failing to observe a law, agreement or code of conduct.' The responsibility of following health, safety, and security procedures are on both the employers and employees at the workplace. Responsibilities of employers: Carry out periodic inspections and risk assessme t. Provide a safe working environment. Provide safety signage to warn workers of potential haards. Provide information about ris s and hazards. Implement health and safety procedures. Provide training related health and safety. Provide adequate training to safely use tools and equipment. Keep log of all work-related injuries, accidents and incidents. Comply to all organizational rules and egulaation. Fig. 8.15 Responsibilities of Employer

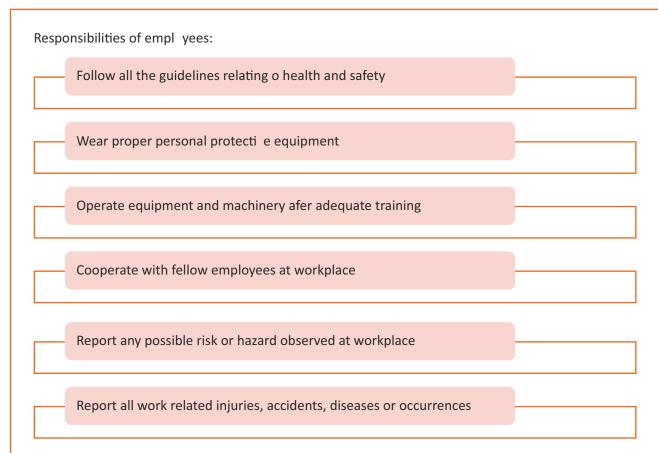


Fig. 8.16 Responsibilities of Emplo ees

The management can be booked for breach:

- If any action hat exposes a person to the risk of injury, illness or death in the workplace.
- If adequate steps are not taken to prevent a risky situation from occurring.
- If the organisationdoes not comply with regulatory requirements.

The organisationmay face financial I penaltie industry disqualification industry disqualification and benefits by the authorities.

The employers may face the following consequences for breach:

- Warning from management.
- Loss of benefits like bonuses, prromotions and incenenes.
- Loss of employment.

# Summary



- A workplace emergency is an event that causes disruption of workplace operaation by posing an immediate risk of significant harm to the health and life of people, equipment, property, or the environment.
- The different types of workplace emergencies are natural, work-related, civil, and medical emergencies.
- Some of the emergency situations in the food industry are power outage, interrupted water supply, fire accidents, flood water or sewage backup, biological tampering, pests, chemical spills and contamination, and natural disasters.
- The objecti es of an emergency management plan are prevenntionprepararatioresponse, and recovery.
- Irrespecti e of the type of emergency, it is important to be prepared to tackle emergencies to keep the employees and other people free from harm and life-threatening situations, minimize damage to the equipment, machinery, tools, etc. minimize damage to the environment, minimize downtime.
- A list of the most likely emergency situation that can arise based on the localatio and size of the organisation, the kind of processes carried out, and the kind of people on the premises like employees, visitors, customers, etc. have to be made.
- In most cases, the likelihood of workplace emergencies is high compared to other types of emergencies.
- A writen document of the emergency response plan should be made available to the emergency response team.
- The response plan should include an emergency response team, emergency equipment, training and practicedrills, and evacuaatioprocedures.
- Following an evacuationplan is very crit al to keep control of all employees. Confusion in the assembly areas can cause a delay in rescuing anyone trapped within the building, as well as unnecessary and dangerous search-and-rescue operations.
- First Aid is the emergency care given to an injured person as soon as the injury occurs and at the
  locationwhere it occurred. It oen consists of a short t one-ti treatment given by a first aider unr until
  proper medical help can be provided.
- First aid can include treating a minor burn, a minor cut, applying bandages and dressing, administering non-prescription medicine, etc. All workplaces have to provide at least some level of first aid.
- A first aider is a person trained to identity the problem and provide emergency care ummedical help arrives.
- Every workplace should have at least one first aid kit. The contents of the first aid kits should be based on the risks the workplace poses and the kind of injuries it can cause.
- Employees should be trained to create awareness of first aid.
- Safety precautions to be followed before, during and aaer administraratiof first-aid.
- When a person comes in contact with a live wire or faulty electric equipment, the person gets a shock. It may cause burns or it may not leave any visible mark on the skin. In both cases, it can cause cardiac arrest, internal damage, or other injuries.

- When bleeding is caused by an injury, the colour of blood and the way it bleeds from the wound indicates the severity of the injury. All types of bleeding can be arrested with quick interventionand care. If bleeding is allowed to continue for a long timit can end in shock and eventually death.
- Burns are caused due to direct contact with fire or flame, by touching very hot surfaces, spilling hot fluids on the body, or due to electric shock. The general preccautioto be taken for burns is to not put ice directly on the burn and not to break blisters.
- When a person comes in contact with a live wire or faulty electric equipment, the person gets a shock (electrocution). It may cause burns or it may not leave any visible mark on the skin. In both cases, it can cause cardiac arrest, internal damage, or other injuries. In some circumstances, even a small amount of electricity can be fatal.
- When a person is suffering from any kind of severe inffectionallergic r reactioor trauma it can lead to a shock. The symptoms of shock are cold and clammy skin, shallow breathing, low blood pressure, yawning, staring eyes, yawning, delirium, or unconsciousness.
- Choking occurs when an external object gets stuck in the throat or windpipe blocking the flow of air. It cuts o ffoxygen to the brain, therefore first aid has to be given immediately.

Notes 🗐 —		
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# Exercise



Answer th	ne fol	lowing	questions:
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An	swer the following questions:
1.	What is the importance of workplace emergency?
2.	Write a brief note on first aid.
3.	What is meant by health, safety and security breach?
Fil	l in the blanks:
1.	is an example of natural emergency.
2.	is a person trained to perform first aid.
3.	is an act of breaking or failing to observe a law, agreement or
	code of conduct.
Ch	oose the correct answers (MCQ)

- a. Which one of the following is most likely to afffect the functioning of aefrigerator?
  - 1. Biological tampering
  - 2. Chemical spills
  - 3. Power outage
  - 4. Interrupted water supply
- b. In which of the following types of burns, only the outer-most layer of the skin is affected?
  - 1. First-degree burn
  - 2. Second-degree burn
  - 3. Third-degree burn
  - 4. Fourth-degree burn
- c. Which one of the following is breach by employee at the workplace?
  - 1. Wearing PPE
  - 2. Reporting a haard
  - 3. Following safety guidelines
  - 4. Operating machines without taining

## Scan the QR Code to watch the related video



https://www.youtube.com/watch?v=DaYwcH1GMEg

**Emergency Procedures** 









# 9. Manage Infection Control

Unit 9.1 Infection and Control Measures

Unit 9.2 Efffective Inffection Control Practices



# Key Learning Outcomes



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

- 1. Describe the various steps to be followed for managing infectionsat the workplace
- 2. Perform various tasks to train the workforce on infectioncontrol prracticeeffeffeely

# **Unit 9.1 Infection and Control Measures**

# - Unit Objectives 🏻 🏻



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

- 1. List the general sources of infections
- 2. Discuss various types of potentialinffectionalong with the precedutionameasures to be taken, and safety protocols to be followed at the workplace
- 3. Discuss the procedures to be followed to tackle infectionspread and the importance of carrying out the sanitiaatioof the work area, equipment and related f faciliti as per standards
- 4. Explain various ways to store the sanitiaatiomaterials appropriately

## 9.1.1 Infection

Infectionrefers to the process of a micro-organism entering a person's body and causing harm. We can also say that the invasion and multipliaatioof micro-organisms such as viruses, bacteria, and parasites that are generally not present within the body are called infections. It may be asymptomaatiand subclinical or cause symptoms and be clinically evident. Also, it may remain localized or spread through the blood or lymphaticvessels to become body wide. There are numerous micro-organisms that live naturally in the body, and they are not considered infections. For example, bacteria that usually live within the mouth and intestineare not inffections.

The micro-organism uses the human being's body to sustain itself, reproduce, and colonize. These infectiousmicroscopic organisms are called pathogens, and they can multiplquickly. Few examples of pathogens include:







Fig 9.1 Pathogens

## - 9.1.2 Sources of Infection

Infection an spread in various ways like:



Skin contact



Transfer of bodily fluids



**Contact with feces** 



Ingesting ontaminated food or water



Inhaling airborne particles or droplets



Touching an object that a person carrying the pathogen has also touched

Figure 9.2 Sources of Infection Spead Image source: www.stock.adobe.com

The significant sources of inffectiont the workplace are:

Blood and other body fluids (e.g. saliva) and

Sources of blood/body fluids such as human bodies, animal carcases and raw meat Human or animal waste products such as faeces, urine and vomit

Respiratory discharges such as coughs and sneezes

Direct skin contact

Fig 9.3 Sources of Infection t the Workplace

Placing contaminated hands, fingers or pens into the mouth, nose or eyes

Breathing in infected aerosol droplets from the air

Splashes of blood and other bodily fluids into the eyes and other mucous membranes i.e. nose and mouth

Broken skin if it comes into contact with micro-organisms or anything that may have been infected by the biological agent

A skin penetrating injury fom a contaminated sharp such as a needle and bone splinters

Fig 9.4 Transmission of Infection

## 9.1.3 Potential Inffections

The spread of infectionand its effects on the human body depends on the pathogen type. The immune system is an efficient barrier against infinfectioagents. However, pathogens may someometioverpower the ability of the immune system to fight them off. At this stage, an infinfectican become harmful.

Some pathogens can have littleeffect, while others can produce toxins or inflammatory substances that trigger negati e responses from the body. We can also say that some inffectionare mild and barely noticeable, while others can be severe and life-threatening.

There are different pathogens like viruses, bacteria, fungi, and parasites. They vary in several ways, including:

- Size
- Shape
- Function
- Geneticcontent
- Effect on the body

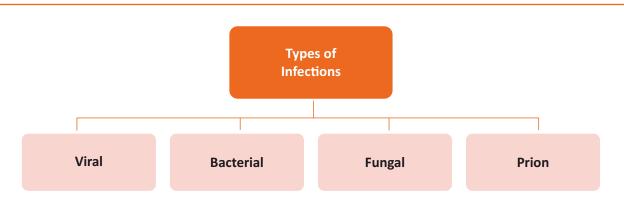


Fig 9.5 Major Types of Infections

The entrance of a particulartype of organism into the body is the cause of that specific infnfectioFor example, a particular virus will be the cause of a viral inffectionSimilarly, any y particulbacterial will be a cause of bacterial infection. Someetimesswelling and running nose can be seen due to an infnfectioThis happens as a result of the atempt of the immune system to get rid of the invading organism.

## 1. Viral Infection

An infectioncaused by a virus is known as a viral inffectionThere are millions of different viruses, but researchers have only identifie approximately 5,000 types. Viruses have a small piece of genenetcode and are protected by a coat of protein and lipid (fat) molecules.

Viruses atack a host body and aaach themselves to a cell. They release their genenetmaterial upon entering the cell. Then, this material forces the cell to reproduce the virus, and it multiplies. Aer that, when the cell dies, it further releases new viruses, which infect the other cells.

However, all viruses do not destroy their host cell. Some of the viruses:

- change the function of the cell
- replicate in an uncontrolled way which leads to cancer

Viruses might remain inactie for some timbefore e multiplyi again. The person with the viral infinfection can seem to have fully recovered, but they might get sick again when the virus re-acties.

Viral infectionscan include the following:

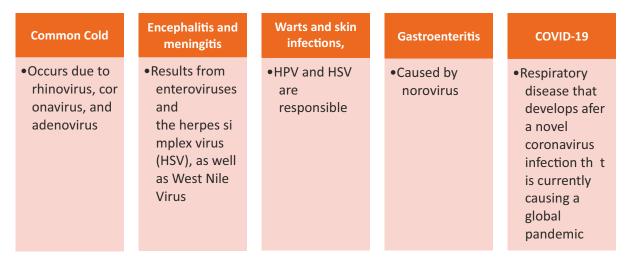


Fig 9.6 Major Viral Infections and their Causes

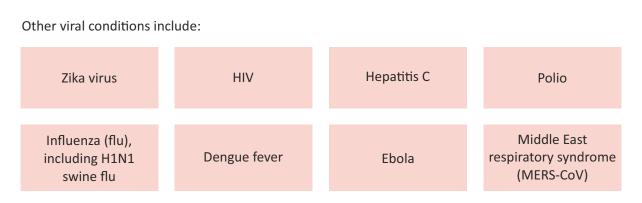


Fig 9.7 Other Viral Conditions

## Symptoms:

Viruses target specific cells, like those in the genitals or upper respiratory tract. For example, the rabies virus targets the nervous system. Some viruses may target skin cells and can cause warts. Some others might target a broader range of cells, which leads to several other symptoms. A flu virus might cause muscle aches, upset stomach, or a runny nose.

### Medication:

While the disease passes, **antivial medicaations**can help relieve the symptoms. They work in either of the following ways:

- prevent reproduction of the virus, or
- boost the immune system of the host to deal with the impact of the virus

## 1. Bacterial Infection

When bacteria get into a body, grow there in number, and cause a reaction, it causes bacterial inffection. Bacteria are single-celled micro-organisms that can enter the body through an opening in the skin like a cut or a surgical wound or through the airway.

## Symptoms:

Common symptoms of bacterial infectionare redness, heat, swelling, fever, and pain at the site of infection, as well as swollen lymph glands.

### Medication:

Bacterial infectionscan be treated with anntibioti though some stains become resistant and can survive the treatment.

## 2. Fungal infection

A fungus is usually a multicellularparasite that decomposes and absorbs organic maaer with the help of an enzyme, but some types are single-celled like yeasts. Some fungal infectionsdevelop in the upper layers of the skin, while some get into the deeper layers. Inhaled yeast or mold spores could also lead to fungal infections, like pneumonia, or inffectionthroughout the body. The human body generally has a lot of good bacteria that aid in maintaining the balance of micro-organisms. People who have a weakened immune system (e.g. HIV or diabetes), have undergone a transplant (take medication to prevent the body from rejectingthe new organ), or have used anntibiotifor a long ng t are more prone to fungal infection.

## Symptoms:

A rash on the body can indicate a fungal infection of the skin. However, bacteria and viruses too can cause skin conditions and rashes.

### 3. Prion Disease

A prion is basically a protein containing no geneticmaterial and is generally harmless. Scienntts have not yet classified prions as living micro-organisms, but if a prion folds into an abnormal shape, it can become a rogue agent and cause infection. Prions can affect the brain's structure or other parts of the nervous system.

## Symptoms:

Some of the common symptoms of prion diseases are rapid onset of brain damage, cognite difficulties, and memory loss.

# 9.1.4 Infection Spead Control at the Workplace

Infectious disease risks oen cause serious problems in the workplace. Be it seasonal flu or respiratory diseases, a lot of infectious diseases are responsible for worker illnesses which in turn have a considerable effect on workplaces through absenteeism and disruptio of services. So, controlling the infections pread in the workplace is very crucial. Inffectiocontrol is very similar to any other element of health and safety and can be handled simply with common sense, i.e.

## **Identiy the hazards**

To determine the hazards associated with the spread of infectious disease in the workplace, determine what infectious disease ould occur and how each infectious disease is spead.

## Assess the risks

Risk is the likelihood that a harmful consequence will occur when people are exposed to a hazard. A risk level is made up of two elements:

- (a) the likelihood of an incident happening
- (b) the consequence if it did happen

## **Control the risks**

Standard precautions or infection ontrol are basic work practices the tassume that all blood and body substances are potential sources of infection, independent of perceived risk.

Fig 9.8 Infection Co trol Process

Infectioncan be represented as a chain and if one of the links is broken in the chain at any point, the risk of infectioncan be controlled. Once the hazard has been idenntifiethese links should be idendentified then the best way to break it should be incorporated to control the risk.

To ensure good infection ontrol in the workplace, it should be assumed that everybody is potenntially infectious. Following proper procedures at all time is the key to infinfecti spread and control. The workplace should have an appropriate first aid kit. Personal prottecte equipment like gowns, gloves, eye goggles, and face shields should be provided, if necessary.

It is advisable to check employees prior to them startingwork and ensure that they are effffecely protected. On the other hand, some people might be naturally immune to disease because they have had the illness as a child or immunisation.

Thus, it is crucial to ensure that the workplace is kept clean and tidyand the areas that are likely to be contaminated with any infection—ausing micro-organism are deep cleaned thoroughly on a regular basis. It is also essentialto make sure that all employees are trained to complete the cleaning tasks satifactorily using the appropriate cleaning agents.

All employees should regularly wash their hands afer blowing their nose, visitin—the toilet, touching raw food, bodily fluids, etc, with appropriate soap. It is not always possible for employees to thoroughly wash their hands, especially if they are away from the premises. Thus, it is vital to ensure that suitable personal protecti—e equipment is provided for them to wear as well as a supply of alcohol-based sanitier which can reduce the number of micro-organisms being transferred by individuals' hands.

## 9.1.5 Standard Procedures for Infection Control

The infectionspread can be controlled by following the standard procedures:

## i. Personal Hygiene Practices:

- Washing Hands: Regular hand washing can avoid the spread of many pathogens. Hands should be washed thoroughly with water and soap for a minimum of fi een seconds post t visiti the toilet, prior to developing any food product, and afer touching somebody else or equipment.
- Unbroken Skin: Intact and healthy skin is a major hindrance to pathogens. Any cuts or abrasions shall be covered with a waterproof dressing.
- Gloves: Gloves should be worn while handling raw material or performing other food-related procedures.
- Personal items: Don't share personal things with anybody else.

## ii. Food Preparation:

- Hands should be adequately washed prior to and afer handling food.
- Touching the hair, nose or mouth should be avoided.
- Store hot food and cold food separately at the required temperature.
- Separate storage, utensils, and preparationsurfaces should be kept for cooked or uncooked foods.
- Afer use, all utensils, equipment, and preparaatiosurfaces should be washed thoroughly with hot water and detergent.

## iii. Workplace Cleanliness:

- Wash the floors, bathrooms, and surfaces (such as tables and benchtops) and equipment regularly with hot water and appropriate detergent.
- The walls and ceilings should be washed periodically.

- Wash and dry brushes, mops, and clothes afer every use. Drying clothes and mops is essenntial, as many pathogens rely on moisture to grow.
- Use specified disinfectants to clean up spills.
- Always wear gloves while using disinfectants. Clean the surfaces before using the disinfectant and follow the manufacturer's instructions.
- Perform spot cleaning when necessary.

# 9.1.6 Importance of Sanitiaation

Maintaining a clean work environment at the workplace is critial in prevenntininfnfectionBacteria can quickly grow on unsanitary surfaces and can contaminate food. A work surface that looks clean does not mean that it is sanitary. It must be ensured that the work area is cleaned and sanitied before strattinto prepare food.

Cleaning the surfaces with soap and appropriate detergents is just one step of the cleaning procedure. It is equally necessary to sanitie. Cleaning can remove any dirt or grease but will not kill any bacteria or other pathogens. Only a prescribed sanitier can kill bacteria and ensure that the area is safe for food preparation. Most commonly used saniters in the foodservice industry are chlorine e solutio (bleach), quaternary solutions (quats), and iodine. These materials should be used according to the insstructions of the manufacturer using the appropriate personal protectie equipment.

Let's understand the most commonly used processes for keeping the equipment and premises clean and disinfected.

**Cleaning:** It is the removal of "soil" or debris and the reduction of the number of germs from a surface. Cleaning is usually sufficient for most areas and surfaces and should be carried out using warm water and detergent, followed by rinsing and thorough drying.

**Sanitizing:** It is the reduction the number or slowing of the growth of bacteria. Saniters are appropriate for food contact surface sanitizing(e.g. dishes, utensils, cutt, boards, high chair trays, tables).

**Disinfection:** It is the inacti aatioof bacteria, viruses, and fungi and can be achieved by heat or chemical means e.g., autoclaving, boiling, and bleaching. It is important to clean surfaces thoroughly prior to disinfection remove organic maaer present in blood and body substances.

Fig 9.9 Processes for keeping equipment and premises clean and disinfected

## **Steps for Cleaning and Sanitizing**

## Step 1: Remove any debris or dirt from the food contact surface

- Remove any debris or dirt from the food contact surface using a brush to sweep the surface, air to blow o ffthe dirt or debris, or water to rinse off.
- Applying the right pressure is crucial.
- High-pressure washers or air compressors can spread the debris or pathogens over a large area.
- Overly low-pressure water or air do not essentiallyremove soil and debris from the surfaces.
- Use appropriate pressure to remove the dirt or debris.
- A designated area shall be provided for using the tools. Color-coding is an efffecte way to achieve this. For example, blue handles can designate use on food contact surfaces such as conveyor belts, and black handles can designate use on floors.

## Step 2: Apply a detergent and scrub the surface

- Ensure using an appropriate detergent as per the type of soil that needs to be removed. For example, some detergents efffectely eliminate fats (e.g., from animal slaughter) while others are efficient at eliminanaticarbohydrates (e.g., sugars from fruit) or proteins.
- Appropriate detergents should be used on food contact surfaces.
- Apply the detergent at the recommended level as per the label and physically scratch the surface to remove any soil or debris.
- Removing the soil and other organic build-up helps in minimizing the formation of biofilms.

## Step 3: Rinse the surface using clean water to remove the detergent and soil

- Rinse out the surface with clean water. Ensure all the detergent and soil are removed
- Avoid rinsing with high-pressure washers. This can spread the pathogens over a large area which can recontaminate an area that has already been cleaned.
- Minimize the splashing or aerosolizing to avoid contamination from one surface (e.g., floors, floor drains) to another using high volume and low spray water.

## Step 4: Apply a sanitier approved for use on food contact surfaces

Note: All materials cannot be sanitied.

- A sanitier is basically a substance that lowers the number of micro-organisms to an acceptable level. Sanitiers are usually considered to be part of a broader group of substances known as antimicobial pessticidesThe label describes the approved uses, such as for water or for food contact surfaces, as well as the appropriate concentrations.
- Apply a sanitier that is approved for use on food contact surfaces. Make sure the product being used has proper concentrationper the insstructions.
- Use the sanitiers as per the label insstructions.
- There might be a 5th step if the sanitier requires a final rinse.

- Allow the surface to air dry.
- The application of a saniter needs to be followed by a potable water rinse in organic operations. The requirements of the certificate for applical catand residue management on food contact surfaces shall be followed.

# 9.1.7 Storage of Sanitiaation Material

We have already discussed the importance of sanitiaatioat the workplace to avoid the spread of infectious diseases. It is equally important to store the cleaning and sanitazatimaterial appropriately. If the material is not stored correctly, it might lead to inefficiency as well as can introduce another hazard.

- A list of standard cleaning and disinfectingmaterials should be maintained
- Efficacy of these materials should be checked for meeeetithe requirements of disinfection for specified areas or as per specific use like disinfection of the surface areas and for cleaning and disinfection of equipment
- It must be ensured that all the disinfectants, cleaning materials, and sanitiers are approved by an appropriate authority to ensure the efficacy of these agents and materials
- A chart mentioningthe name of the chemicals, dilutionto be used, areas where it is s permed for use, and the intended application(for what to use - floor/equipment/blood spill cleaning, etc.) should be prepared and placed in the storage room
- It is to be ensured that separate equipment is used for cleaning general and critial areas
- All the cleaners, sanitiers and disinfectants, and prepared solutionshould be clearly labelled
- All cleaners, sanitiers, and disinfectant chemicals should be stored at the designated locaation
- All the inflammable should be stored on lower shelves
- The storage should be at or above adult shoulder height
- Preferably, use a closed cupboard with a lock, in a cool place away from direct sunlight and heat sources
- While storing more than one bottleof the same chemical, use the one with the earliest expiry first (first-in-first-out principle)
- There should be a biohazard label on the cupboard and the chemical containers
- Keep bottlesand cans ti tly closed when not in use
- Discarded chemicals should be disposed of as per the manufacturer's instructions

## **Unit 9.2 Effective Infection Control Practices**

# - Unit Objectives 🏻 🏻



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

- 1. Discuss appropriate actions to be taken during illness to self and others at the workplace
- 2. State the importance of undergoing preventi e health checkups organized by the organisaatioin compliance with FSSAI guidelines
- 3. Describe the parameters to be assessed during health and safety audits, their acceptability levels of appropriateness and the procedure to conducting these audits
- 4. Discuss various parameters to be assessed and compliance issues to be addressed during the review of SOPs and the ways to improve them as per required quality and safety standards
- 5. List various types of documents and records to be maintained in the work process

# 9.2.1 Handling Illness at the Workplace

The employees who are not feeling well should be allowed and encouraged to stay at. If any employee is showing any symptoms, allow them to go or remain at home. In case of doubt, if a person is sick, they should stay at home untilthey feel good and are able to return to their regular activities.

For instance, if a person becomes ill at work, they should report to first aid or ask for medical aaenentiolf the employee is severely ill (such as difficulty breathing or chest pain), call medical help immediately. If not, they should:

Put on a mask Wash or sanitie their hands Isolate themselves in a designated room untilthey are able to return to their home, avoiding public transit. Contact the HR or local public health authority Clean, sanitie and disinfect surfaces or items that the ill worker makes contact with Fig 9.10 Steps to handle illness at the workplace

# 9.2.2 Preventive Health Check-ups

The Food Safety and Standards Act of India (FSSAI) has an established bill associated with food safety and regulationin the country. The importance of food safety has been raised due to the increase in diseases and illnesses in India. FSSAI is accountable for protectingand prromotin public health by maintaining the regulationand supervision of food safety.

FSSAI has issued a set of rules and regulationson food safety norms and keeps updaatinthese rules frequently. These rules are applicable from food development to street food and online food delivery. It is essentialfor these companies to guarantee and demonstrate their employees' fitness, especially those who come under direct contact with food. As per the FSSAI guidelines for food handlers, annual health check-ups for employees should be organized in order to confirm their physical fitness to pursue their trade. A medical examination of food handlers defines them as a verified and authenheated food production or service brand.

As per FSSAI, "General hygienic and sanitary practices to be followed by food business operators applying for a license- Manufacturing/ processing/ packaging/storage/distribution".

It also states that "arrangement shall be made to get the food handlers/employees of the establishment medically examined once in a year to ensure that they are free from any infectious, contagious and other communicable diseases. A record of these examinations signed by a registered medical prractitioner shall be maintained for inspection purpose".

Therefore, it is mandatory for companies to provide a preventie health care plan for the beeerment of employees and consumers.

# 9.2.3 Health and Safety Audits

To analyse an organization's Workplace Health and Safety (WHS) performance, audits are essenntial But they are not always taken this way. If the word 'audit' raises a montage of clipboards, inspections, and interrogations, one would have terrible experiences or expect the worst.

Safety audits should never be a policing activit. They are crucial to find out where the safety performance is and where it needs to be as per the specified parameters. So, these should be taken as a positi e learning opportunity to improve the safety of the employees.

Health and safety auditors can be an organization's internal employees or someone from outside. It depends on the organization's preference. Some choose to conduct their audits in-house, as they know the areas they want to emphasize, while others might prefer to hire someone externally to develop a fresh set of eyes and perception. Some organization even choose both and conduct an internal audit as a predecessor to the external audit.

## Importance of Health and Safety Audits

The task of the audit is to compare what's happening on the ground with what is writen in the safety management system or the prescribed rules and regulations. Apart from identitying the gaps, health and safety audits are crucial to challenge the benchmarks set out in the safety management system.

They are really beneficial for coming up with actionabl steps to be taken to improve the safety of the business and can be used to:

Document that thesafety management system complies with legislation

Test if the safety management system is achieving its objecti es Determine if thesafety management system is maintaining the performance criteria and the auditing ystem is efffecte

Assess whether the organisation has ompleted any previous modification compliance audits, when necessary

Constantly improve the safety and performance of the organisation

Fig 9.11 Importance of Health and Safety Audits

Workplace Health and Safety Audit Process

Generally, the following steps are followed to conduct a workplace health and safety audit.

Identify Aeas Decide How Conduct the Document the Report the to Audit Ofen to Audit Audit Results Findings

Fig 9.12 Steps of Health and Safety Audits

## **STEP 1: Identiy Areas to Audit**

A note of each part of the business that should be audited should be made first. Some may have simple processes, while others may have more complex ones. It is imperatie to understand that an internal audit should not try to do everything at once. Whatever the focus area, a 'systematicand disciplined approach to work' should be used according to the relevant norms. Benchmarks and standards should also be set, and it should be made sure that everybody agrees on them before the audit is conducted.

## STEP 2: Decide How Ofen to Audit

The size of the business decides how ofen the audit should take place. However, some timing are already chosen, for example, HACCP audits must be completed every quarter. It is possible that some areas of the business might need auditingmore frequently than others as they carry greater health and safety risks.

The organizationalsafety management system should clearly outline how oen it is required to audit different areas. Stillthe frequency might be changed, like from quarterly to monthly or monthly to weekly – depending on the risk factors. Once the frequency of the audit of each area is decided, it should be put on the calendar. It is prettycommon that the months roll past and internal audits do not happen, so these should be scheduled for the year ahead. A copy of the calendar should be sent out so an upcoming audit never comes as a surprise to the employees.

### **STEP 3: Conduct the Audit**

The audit process will differ depending on the organizaatioand the area to be audited.

- 1. **Kick-o ffmeeeting**The audit should start with a kick-o ffmeeetingIt is a decent opportunity to introduce the team that will conduct the audit and the key participa ts, describe the audit's purpose and approach, and determine the required communication protocol.
- 2. In-field observaationand interviews: Post the kick-o ffmeeeti , observavatioand interviews should be carried out. In-field observaationsurely do not mean hiding behind some equipment with the camera to snap somebody being non-compliant. A casual and inclusive approach should be taken to understand how the processes work in actuality. Similarly, interviews should not seem like interrogations. They should be conducted in the field among people who are really familiar with the processes.
- 3. **Collect evidence:** This is very important as it facilitates demonstratingthe outcome of the audit and can help improve the system for the future or celebrate the success of the standards achieved. Evidence can be completed documents, interview statements or photos, etc.
- 4. **Result Documentation:** Notes should be taken throughout the audit process, which further helps write the report. The collected documents and notes should be reviewed, and the findings should be writen comprehensively. Any gaps in compliance should be documented to ensure they appear in the report.
- 5. **Report the Findings:** The findings should be reported in a tabular format with graphs, diagrams, and photos to make the informationmore straighhorward to find and understand. All the positi e notes about things that are going well should be covered. Lessons should be learned from the findings and applied to gaps in other business areas. Determining the reason and discussing the best actions to be taken with management can lead to the best outcome. The report is crucial to highlight how to improve the safety of the business.

# 9.2.4 Reviewing SOPs

A Standard OperatingProcedure (commonly known as an SOP) is basically a wrien plan of a process that assesses potential haards and explains how they have been eliminated or minimized. The SOP is prepared to assure maximum safety at work. As a writen document, the SOP permits the management to review and approve a somewhat detailed plan of a process based on the assessment of the associated risks. It also enables Hazards Control Division specialists to review the plan and suggest modification control possible health and safety hazards beter.

SOPs are developed as a measure for controlling risks:

- if suggested from the conclusions of a risk assessment which is carried out in agreement with the procedure to manage workplace health and safety risks
- when new work practices are introduced
- when new technology is introduced
- when SOP development is recommended following some incident investigation

SOPs must be writen in detail to make sure that anybody with limited understanding or knowledge of the procedure can efffectely carry out the procedure in a safe manner even when unsupervised. They should be writen in a logical, easy-to-read, step-by-step, and concise format.

SOPs should be reviewed periodically, for example, every two years, depending on the risk level, to make sure that the procedure remains current and appropriate. The next review date should be mentioned in each SOP reviewed. If an SOP explains a process that is no longer required to be followed, it should be withdrawn and archived immediately.

The health and safety system of an organizationshould never sleep. In fact, it should evolve and keep changing as per the legislation, mar et requirements, new products, machinery, and other internal as well as external factors. All this can impact the quality, personnel, health and safety, and other business systems.

The health and safety processes can change even daily, and any change can impact the process descriptions, for example, implemental machinery.

The following parameters should be checked while reviewing the SOPs:

- 1. Hazard and risk assessment on the equipment
- 2. Development and implementation of hazard plan
- 3. Development of safe work method for the equipment or process
- 4. Training of the employees using the SOP or safe work method
- 5. Records of training
- 6. Establishment date to understand if the SOP was efffecte and to decide if tweaking is required

The health and safety document should be particularly reviewed when:

- 1. An employee has reported an idea for continuousimprovement
- 2. An accident or near-miss report is filed, and as part of the incident, corrrecte e actions
- 3. Non-conformance of any product or service

Document management and reviews generally do not happen and are sometimesnot even considered. But, these documents are ofen the keystone to a business, especially if any evidence of compliance in a WorkSafe investi aatioor prprosecutiis to be be sub ed. Therefore, the organizanizatmust ensure that the SOPs are stillrelevant and updated with the business operations.

# 9.2.5 Documentation and ecord Management

Any procedure or system in an organization has docume taationequirements because if something is not documented, then there is no evidence that it was done. Documentationnot only provides proof that the system is in place but the review and understanding of the documentation also acilitates the continualimprovement of the system.

To ensure proper documentation and record management, the following shall be well documented in any organization:

- i. Policy: The policy statement must be writen and kept current.
- ii. Regulations:A review of the legal applicability of regulaationshould be documented.

- iii. Structure and Responsibilities:RResponsibilitieand Authority for managing the overall program for the organization and any individual area programs, procedures, or work instructionshould be documented.
- iv. Objecti es and Goals: Meaningful and aaainable goals should be set for the safety management system and should be documented.
- v. Activities The measurements are taken, including baseline data, should be well documented. It assists in determining (i.e., evidence) if there is progress toward achieving the goal or not
- vi. Data and Measurements: Audits, inspectionresults, and findings should be documented for safety and health management.
- vii. Changes and Correcti e ActionsChanges to equipment and procedures should be documented, including the reasons for change.
- viii.Procedures and Records: Instructionsor procedures outlining the specific steps that must be taken by the employees should be documented to assure that their tasks or activitie—remain compliant with the regulations.Records to be documented include training records, established safety and health goals, results of measurements (ventlaaon readings, noise readings, air quality measurements, etc.), audit and inspectionresults, corrrecte e actio—taken, communicaicat with authorities(OSHA, etc.), injury logs and/or incident rreportindata should be maintained.
- ix. Emergency Response Information: Emergency Evacuaatio and Response procedures should be clearly writen and communicated to employees.

# Summary |



- Infectionand sources of inffectiospread
- Types of infections and their treatment
- InfectionControl Methods
- Cleaning and sanitiaatioprocess
- Appropriate methods of storing the sanitizingmaterial
- Responsibility for self in case of any illness
- Importance of health audits
- SOPs and their review process
- Document and Record Management

# - Exercise



Answer the	following	questions:
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	What do you understand by the term "Infection"?
2.	What are the various sources of infectiontransmission?
3.	Explain the procedure to clean, sanitie and disinfect the workplace.
4.	What precautionsshall be taken to prevent the spread of inffection?
5.	What steps should you follow if you feel ill at the workplace?
6.	What do you understand by preventie health check-ups?
7.	Explain the process of conductinga health and safety audit?
3.	What records should be maintained for a process in an organization?

- 9. State True/False:
  - i. Alcohol-based hand rub is the preferred method of hand hygiene. (True)
  - ii. Allow hands to dry before applying gloves to ensure the full antisepteffect. (True)
  - iii. It is not necessary to wash your hands afer removing gloves because the gloves protect your hands. (False)
  - iv. Removing all the soap from your wrists and hands is essential, keeping your hands up and your elbows down to rinse away the micro-organisms. (False)

10. Fill	in the blanks:
i.	is the first step while cconductinan audit.
ii.	FSSAI stands for
iii.	,, are the basic and mandatory health-checks every organizationshould organize for their employees
iv.	A writen plan of a process that assesses its potenntiahazards and explains how the hazards have been eliminated or minimized is called









# 10. Working Effectively in an Organization

Unit 10.1 - Organizational Policies

Unit 10.2 - Legislations, standard, policies, and procedures

Unit 10.3 - Reporting Structure

Unit 10.4 - Inter-Dependent Functions

Unit 10.5 - Harassment and Discrimination

Unit 10.6 - Prioritising Tasks

Unit 10.7 - Communication Skills

Unit 10.8 - Teamwork

Unit 10.9 - Ethics and Discipline

Unit 10.10 - Grievances Solution

Unit 10.11 - Interpersonal Conflicts

Unit 10.12 - Disabilities and Challenges

Unit 10.13 - Gender Sensitivity and Discrimination

Unit 10.14 - Applicable Legislation, Grievance Redressal Mechanisms

Unit 10.15 - Transacting With Others without Personal Bias



# - Key Learning Outcomes 🙄



## At the end of this unit, the trainee 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 10.1: Organizational Policies**

# - Unit Objectives



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

1. Categorize the organizational policies

# **10.1.1** 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 10.2: Legislations, Standard, Policies, and Procedures**

# **Unit Objectives**



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

1. Catalogue the Legislations, standards, policies, and procedures

# 10.2.1 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:

## **POLICY**

The formal guidance needed to coordinate and execute activity throughout the district. When effectively deployed, policy statements help focus attention and resources on high priority issues - aligning and merging efforts to achieve the district's vision Policy provides the operational framework within which the district functions.

- Widespread application
- Changes less frequently
- Usually expressed in broad terms
- States "what" and/or "why"
- Answers operational issues

### **PROCEDURE**

The operational processes required to implement district policy. Operating practices can be formal or informal, specific to a department or building or applicable across the entire district. If policy is "what the district does operationally, then its procedures are "how" it intends to carry out those operating policy expressions.

- Narrow application
- Prone to change
- Often stated in detail
- States "how", "when", and/or "who"
- Describes process

Fig. 10.1: Difference between Policy and Procedure

Notes 🗏			

# **UNIT 10.3: Reporting Structure**

# - Unit Objectives



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

1. Analyse the reporting structure

# **10.3.1** 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.

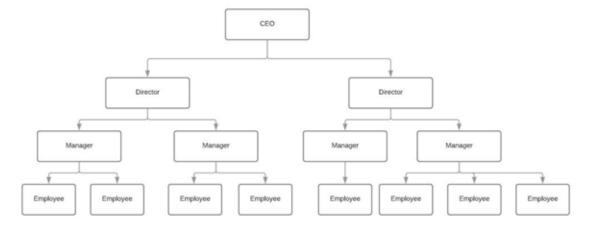


Fig. 10.2: Company's Reporting Structure

# **UNIT 10.4: Inter-Dependent Functions**

# - Unit Objectives



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

1. List the inter-dependent functions

# 10.4.1 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.

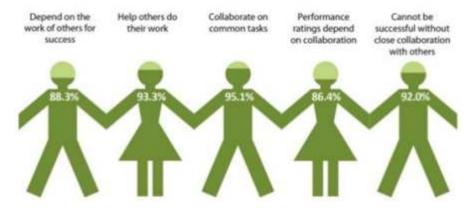


Fig. 10.3: Process of the concept of Inter-dependence

## **UNIT 10.5: Harassment and Discrimination**

# - Unit Objectives



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

1. Discuss the impact of harassment and discrimination

# 10.5.1 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.10.4: Types of Workplace Harassment

Notes 🗒			

# **UNIT 10.6: Prioritising Tasks**

# - Unit Objectives



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

1. Monitor the ways of prioritising the task

# 10.6.1 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

Notes 🗏	]			

#### **UNIT 10.7: Communication Skills**

## **Unit Objectives**



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

1. Record the types of communication skills

## **10.7.1** 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.

- 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 atwoway 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.
- 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

LISTENING **Essential Communication Skills for Your Career** the balance

Fig. 10.5: Essential Communication Skills



Fig. 10.6: 7 Key Active Listening Skills

- 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.

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#### **UNIT 10.8: Teamwork**

## **Unit Objectives**



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

1. Evaluate the ways of carrying out a teamwork

## **10.8.1** 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 10.9: Ethics and Discipline**

## Unit Objectives



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

1. Highlight the ethics and discipline

## 10.9.1 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

Notes 🗐			

#### **UNIT 10.10: Grievances Solution**

## - Unit Objectives



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

1. Illustration of the grievance's solution

#### 10.10.1 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 10.11: Interpersonal Conflicts**

## Unit Objectives



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

1. Recognize the interpersonal conflicts

## 10.11.1 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

Notes 🗐 -			

## **UNIT 10.12: Disabilities and Challenges**

## - Unit Objectives



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

1. Identify the disabilities and challenges

#### 10.12.1 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 authorize them 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 10.13: Gender Sensitivity and Discrimination**

## - Unit Objectives 🏻 🏻



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

1. Identify the disabilities and challenges

#### 10.13.1 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 genderfluid 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 10.14: Applicable Legislation, Grievance Redressal Mechanisms

## **Unit Objectives**



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

1. Discuss the applicable legislations, grievance redressal mechanisms

## **10.14.1** 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 10.15: Transacting With Others Without Personal Bias**

## **Unit Objectives**



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

1. To administer with others without personal bias

#### 10.15.1 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 giving 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 by choosing the correct option
--

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 quit	e harmful if not dealt in time.			
	A. Actions	B. Grievance			
4.	4. The employment barriers might include:				
A.	Communication barriers	B. Disciplinary barriers			
5	requires employers to par	y equal remuneration to the workers.			
A.	Equal Remuneration Act, 1976	B. Republic Act No. 9710			
B. Answer the following questions briefly.					

- 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?









## 11. Material Conservation

Unit 11.1 - Material Handling

Unit 11.2 - Workstation Layout, Electrical and Thermal Equipment

Unit 11.3 - Organisational Procedures for Minimising Waste

Unit 11.4 - Practices of Efficient and Inefficient Management

Unit 11.5 - Material and Water Usage



## – Key Learning Outcomes 🙄



#### At the end of this unit, the trainee 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 11.1: Material Handling**

## **Unit Objectives**



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

1. Identify the ways to handle materials

## 11.1.1 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.

## 11.1.2 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 11.2: Workstation Layout, Electrical and Thermal Equipment

## - Unit Objectives



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

1. Categorize the workstation layouts, electrical and thermal equipment

## 11.2.1 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 Is 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 11.3: Organisational Procedures for Minimising Waste**

## - Unit Objectives



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

1. List the organizational procedures for minimising waste

## 11.3.1 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. 11.1: 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

Notes 🔳			

#### **UNIT 11.4: Practices of Efficient and Inefficient Management**

## - Unit Objectives



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

1. Analyse the practices of efficient and inefficient management

## 11.4.1 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 11.5: Material and Water Usage**

## Unit Objectives



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

1. Discuss the material and water usage.

#### 11.5.1 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.

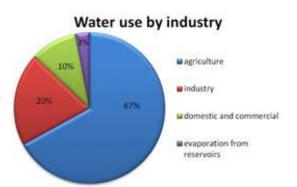


Fig. 11.2: Industry-wise water consumption

#### Industrial usage of water:

Deionised or Ultra Pure water

Water as coolent

Usage of water in oil and gas

Usage of water in pulps and paper mills

Fig. 11.3: 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 2 —			
A. Answer the following	ng questions by	choosing the co	rrect option:
<ol> <li>What is the manufa</li> </ol>			·
A. 20- 23%	B. 20- 25%		D. 20- 35%
2. What stands to be t	the full form of /	AGV?	
A. Automated Guided \	/ehicle		
B. Activated Guided Vel	hicle		
C. Accurately Guided Ve	ehicle		
D. Action Guided Vehic	le		
		•	facturing semiconductors and chips, which are us other electronic goods.
A. Nitrogen	B. Silicon	C. Hydrogen	D. Lithium
4d	irectly affects th	e efficiency of th	e workers
A. Proper lighting	-	•	D. Machine design
5. The appropriate ten Celsius.	nperature at the	e workplace usua	Illy requires being at degrees
A. 22			
B. 30			
C. 18			
D. 16			









# 12. Energy and Electricity Conservation

Unit 12.1 - Define Electricity

Unit 12.2 - Basics of electricity

Unit 12.3 - Energy efficient devices

Unit 12.4 - Standard Practices for Conserving Electricity



## – Key Learning Outcomes 🙄



#### At the end of this unit, the trainee 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 12.1: Define Electricity**

## Unit Objectives



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

1. Define electricity

## **12.1.1** 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:

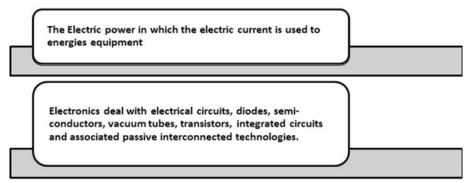


Fig. 12.1: Electricity utilization

## **UNIT 12.2: Basics of Electricity**

## - Unit Objectives 🏻



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

1. State the basics of electricity

## 12.2.1 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.

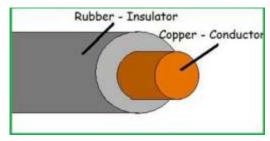


Fig. 12.2: Conductor of Electricity

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 12.3: Energy Efficient Devices**

## - Unit Objectives 🏻 🏻



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

1. Identify the energy-efficient devices

## 12.3.1 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. 12.3: 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.

## **12.3.2 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 individuals 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 12.4: Standard Practices for Conserving Electricity**

## Unit Objectives



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

1. Explain the standard practices for conserving electricity

## 12.4.1 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 🔯

L							
A.	A. Answer the following questions by choosing the correct option:						
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.	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					

Energy is broader in comparison decrease energy consumption.	on to energy efficiency in including active efforts to			
A. Release	B. Emission			
C. Conservation	D. Deletion			
5. Modern energy efficiency refrigerators use models did in 2001.	less energy than their conventional			
a. 50%	b. 40%			
c. 60%	d. 90%			
B. Answer the following questions briefly.				
1. What are the classifications for the materials of	of electricity?			
What are the three primary electrical paramet	ers?			
What are the components of electrical equipment?				
4. What are the categories of appliances?				
—Notes 🗒				









# 13. Waste Management and Recycling

Unit 13.1 - Types of waste

Unit 13.2 - Waste Management and Disposal Solutions

Unit 13.3 - Pollution and Remedies



## – Key Learning Outcomes 🙄



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

- 1. List the types of wastes
- 2. Describe waste management and disposal solutions
- 3. Explain pollution and its remedies

## **UNIT 13.1: Types of Waste**

## – Unit Objectives 🏻 🏻



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

1. List the different types of waste

## **13.1.1** 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
<ol> <li>Concrete</li> <li>Steel</li> <li>Aluminium</li> <li>Plastic (PET)</li> <li>Newspapers</li> <li>Corrugated Cardboard</li> <li>Plastics (HDPE)</li> <li>Glass</li> <li>Mixed Papers</li> <li>Used Motor Oil</li> <li>Used oil from food industry</li> </ol>	<ol> <li>Garbage. Mixture of different of garbage makes it hard to recycle.</li> <li>Food-tainted items (such as: used paper plates or boxes, paper towels, or paper napkins)</li> <li>Ceramics and kitchenware.</li> <li>Windows and mirrors.</li> <li>Plastic wrap.</li> <li>Packing peanuts and bubble wrap.</li> <li>Wax boxes.</li> <li>Photographs</li> <li>Medical waste</li> <li>Polystyrene or Styrofoam</li> <li>Hazardous chemicals and chemical containers</li> <li>Plastic toys or sporting goods equipment</li> <li>Foam egg cartons</li> <li>Wood</li> <li>Light bulbs</li> <li>Yard waste or garden tools</li> </ol>

Table 13.1: 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. 13.1: 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)

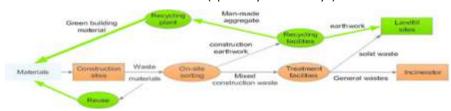


Fig. 13.2: Ways to process industrial and biomedical wastes

#### **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					
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					
3	M/s Earth Sense Recycle Pvt. Ltd., Plot No:37, TSIIC Industrial Park, Mankhal, Maheshwaram Mandal, Rangareddy Dist., Telangana-501359					
4	M/s EPR Compliance Pvt. Ltd., 422, The Summit Business Bay, Andheri Kurla Road, Near WEH Metro Station, Andheri (East), Mumbai-93					
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					
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. 13.3: Examples of waste collecting vendors

## **UNIT 13.2: Waste Management and Disposal Solutions**

## – Unit Objectives 🏻



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

1. Describe waste management and disposal solutions

## 13.2.1 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. 13.4: 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. 13.5: 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 13.3: Pollution and Remedies**

## - Unit Objectives



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

1. Explain pollution and its remedies

## 13.3.1 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 **E**



- '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 remains 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 released into the environment.

## - Exercise 🔯



### A. Answer the following questions by choosing the correct option:

- 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
- \_\_\_\_, reusing, recycling and mitigating helps in pollution reduction.
  - A. Reducing
  - B. Reinstalling
  - C. Redeeming
  - D. Reinvolving

	The Latin term for pollution is
	A. pollueme
	B. polluese
	C. polluere
	D. polluete
_	waste comes from medical facilities.
	A. Municipal
	B. Biomedical
	C. Industrial
	D. Commercial
	What are two general types of wastes?
	What are two general types of wastes?  What stand to be the significance of the different colored dustbins?

## Scan the QR Code to watch the related video





https://www.youtube.com/watch?v=Qyu-fZ8BOnl

Waste Management

https://www.youtube.com/watch?v=abuousxwRe4

Conservation - Reduce, Reuse & Recycle









# 14. Employability Skills30 hours



Scan this QR code for chapter Visit











# 15. Annexures

Annexure I : QR Codes



## 

Serial No.	Module No.	Unit Number	Topic Name	Page No.	URL	QR Code
1.	Introduction to the program and Overview of the Food Processing Industry (FIC/N9301)	Unit 1.1 - Introduction to the Training Programme	Scope of food processing in India with National and International perspective	9	https://ww w.youtube.c om/watch?v =5VIYw38hC xU	
2.	Introduction to the program and Overview of the Food Processing Industry (FIC/N9301)	Unit 1.2 - Introduction to the Food Processing Industry	Overview of Food Processing Industry		https://ww w.youtube.c om/watch?v =J- 2EiMVNtpM	
3.	Recipe formulation and scale up process guidelines for product development (FIC/N9301)	Unit 2.3 Develop new guidelines	Developing A New Food Product	68	https://ww w.youtube.c om/watch?v =xOXnrKy17 s0	
4.	Guidelines and benchmarking for new product development	Unit 3.1 Follow FSSAI regulations	FSSAI regulations	97	https://ww w.youtube.c om/watch?v =q8nE0rRnJ OY	
5.	Regulations for packed food product (FIC/N9302)	Unit 5.1 FSSAI Regulations for Packed Food Products	Food Packaging	152	https://ww w.youtube.c om/watch?v =osA74cAq MLc	

# 

Serial No.	Module No.	Unit Number	Topic Name	Page No.	URL	QR Code
6.	Regulations for packed food product (FIC/N9302)	Unit 5.1 FSSAI Regulations for Packed Food Products	Labelling Of Food Products In India	152	https://ww w.youtube.c om/watch?v =oFCMk1Dj0 pM	
7.	Basic Food Safety Standards (FIC/N9904)	Unit 6.1 Food Hazards and Contaminatio n- Causes and Prevention	Personal Hygiene		https://ww w.youtube.c om/watch?v =6WXc6cH_ gil&t=1s	
8.	Basic Food Safety Standards (FIC/N9904)	Unit 6.1 Food Hazards and Contaminatio n- Causes and Prevention	General Requirement on Hygiene and sanitation	191	https://ww w.youtube.c om/watch?v =d5kn5ns0z WM	
9.	Basic Food Safety Standards (FIC/N9904)	Unit 6.2 Food Safety – Standard Operating Procedures	Food Safety		https://ww w.youtube.c om/watch?v =KBvU4Bmu 500	
10.	Manage Workplace Emergencies (FIC/N9903)	Unit 8.1 Workplace Emergency	Emergency Procedures	247	https://ww w.youtube.c om/watch?v =DaYwcH1G MEg	

# – Annexure I - QR Code –

Serial No.	Module No.	Unit Number	Topic Name	Page No.	URL	QR Code
11.	Manage Workplace Emergencies (FIC/N9903)	Unit 8.3 Health, Safety and security breaches	Waste Management	323	https://ww w.youtube.c om/watch?v =Qyu- fZ8BOnI	
12.	Manage Workplace Emergencies (FIC/N9903)	Unit 8.3 Health, Safety and security breaches	Conservation - Reduce, Reuse & Recycle		https://ww w.youtube.c om/watch?v =abuousxwR e4	
13.	Employability Skills				https://eskill india.org/Ne wEmployabil ity	









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