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GOVERNMENT OF INDIA
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FICSI
Food Industry Capacity and Skill Initiative

Participant Handbook

Sector
Food Processing

Sub-Sector
Packaged Foods

Occupation
Packaged Foods

Reference ID: **FIC/Q8502, Version-4.0**
NSQF Level: 3

Spice Processing Technician

This book is sponsored by

Food Industry Capacity and Skill Initiative (FICSI)

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

Shri Narendra Modi
Prime Minister of India

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE

for the

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Spice Processing Technician**' QP No. **'FIC/Q8502 NSQF LEVEL 3**

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Authorized Signatory
(Food Industry Capacity and Skill Initiative)

Acknowledgement

FICSI (Sector Skill Council for Food Processing Industries) is thankful to all organizations and individuals who have helped us prepare this participant handbook

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

The preparation of this participant Handbook would not have been possible without the support of the Food Processing Industries. The Industry feedback has been highly encouraging from inception to conclusion & it is with their input we have tried to bridge the skill gaps existing today in the Industry. This participant handbook is dedicated to all aspiring youth who desire to achieve special skills which would be a lifelong asset for their future endeavours 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 the

Food safety team leader with Reference ID: FIC/Q7604 published by Food Industry Capacity Industry and Skill Iniave (FICSI).

This course encompasses all National Occupational Standards (NOS) of the Qualification Pack, Spice Processing Technician, Reference ID: FIC/Q8502. Each NOS is covered across one unit/s. This book is designed to upgrade the knowledge and skills for working as a 'Spice Processing Technician' in the Food Processing Industry. This book will provide the necessary knowledge and skill inputs for a Spice Processing Technician to work in an organized and 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:

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

1. FIC/N9026: Prepare for production
2. FIC/N8515: Produce Spice and Seasoning
3. FIC/N9901: Implement health and safety practices at the workplace
4. FIC/N9902: Work effectively in an organisation
5. SGJ/N1702: Optimize resource utilization at workplace
6. DGT/VSQ/N0101: Employability Skills

Symbols Used


Key Learning Outcomes


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1. Overview of Food Processing Industry

Unit 1.1 Introduction to Food Processing Industry
Unit 1.2 Future Trends and Career growth Opportunities Available to the Spice Processing Technician.
Unit 1.3 Roles and Responsibilities of Spice Processing Technician
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Unit 1.6 Importance of Planning Before Star

(FIC/N8515)

Key Learning Outcomes

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

1. State the importance of the training program for a Spice Processing Technician
2. Discuss the food processing industry and generic sub-sector in brief
3. Discuss the career opportunities available to a Spice Processing Technician in the food processing industry
4. Explain the terminologies used while conducting audits in the food processing facility
5. Elaborate on standard business etiquette in the food processing industry
6. Discuss the workflow and departmental organisation in the quality analysis and assurance sector

UNIT 1.1: Introduction to Food Processing Industry

Unit Objectives

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

1. Discuss the size and scope of the food processing industry in brief
2. Discuss the role and responsibilities of the Spice Processing Technician.

1.1.1 Food Processing

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

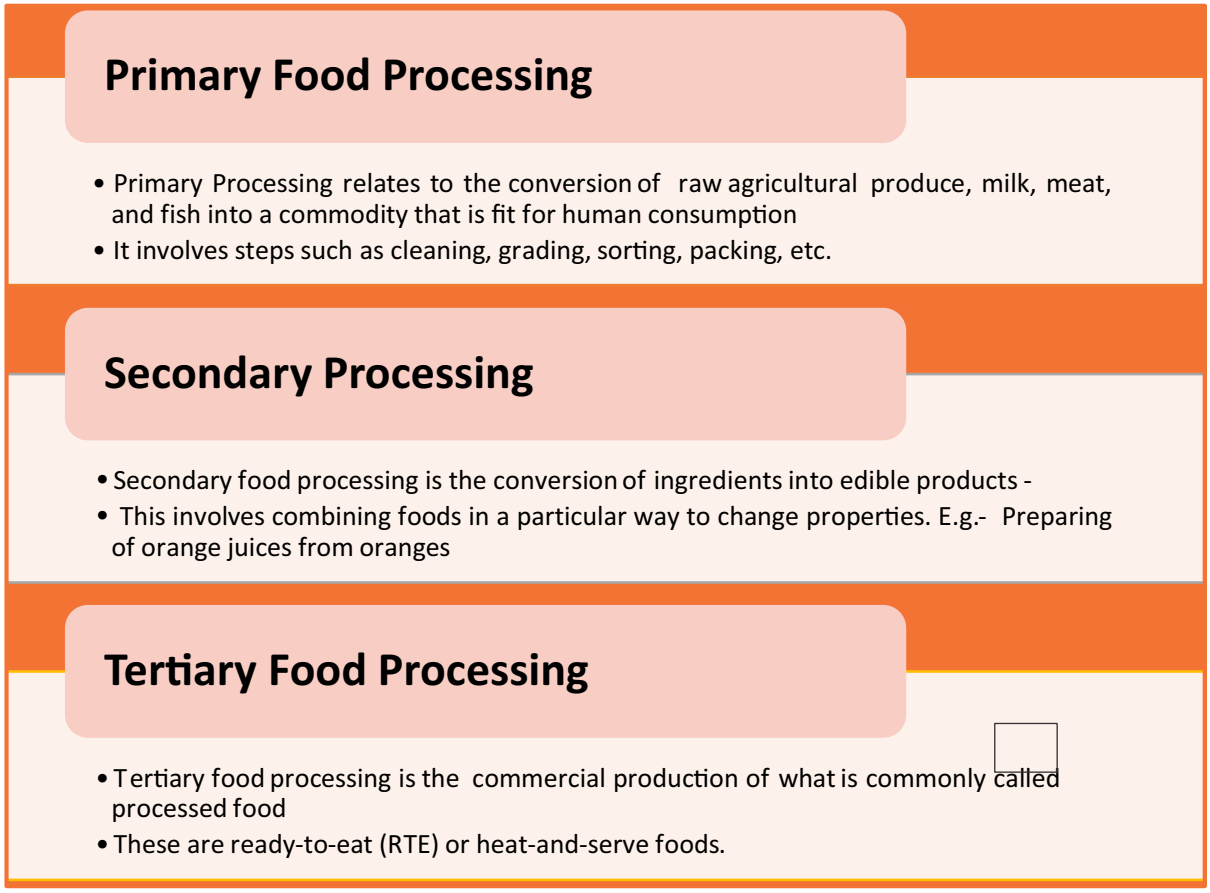

Fig 1.1.1 Level of Food Processing

1.1.2 Journey of food from Harvest to Consumer

The flowchart below explainshow food material becomes a final, consumable product for various customers.

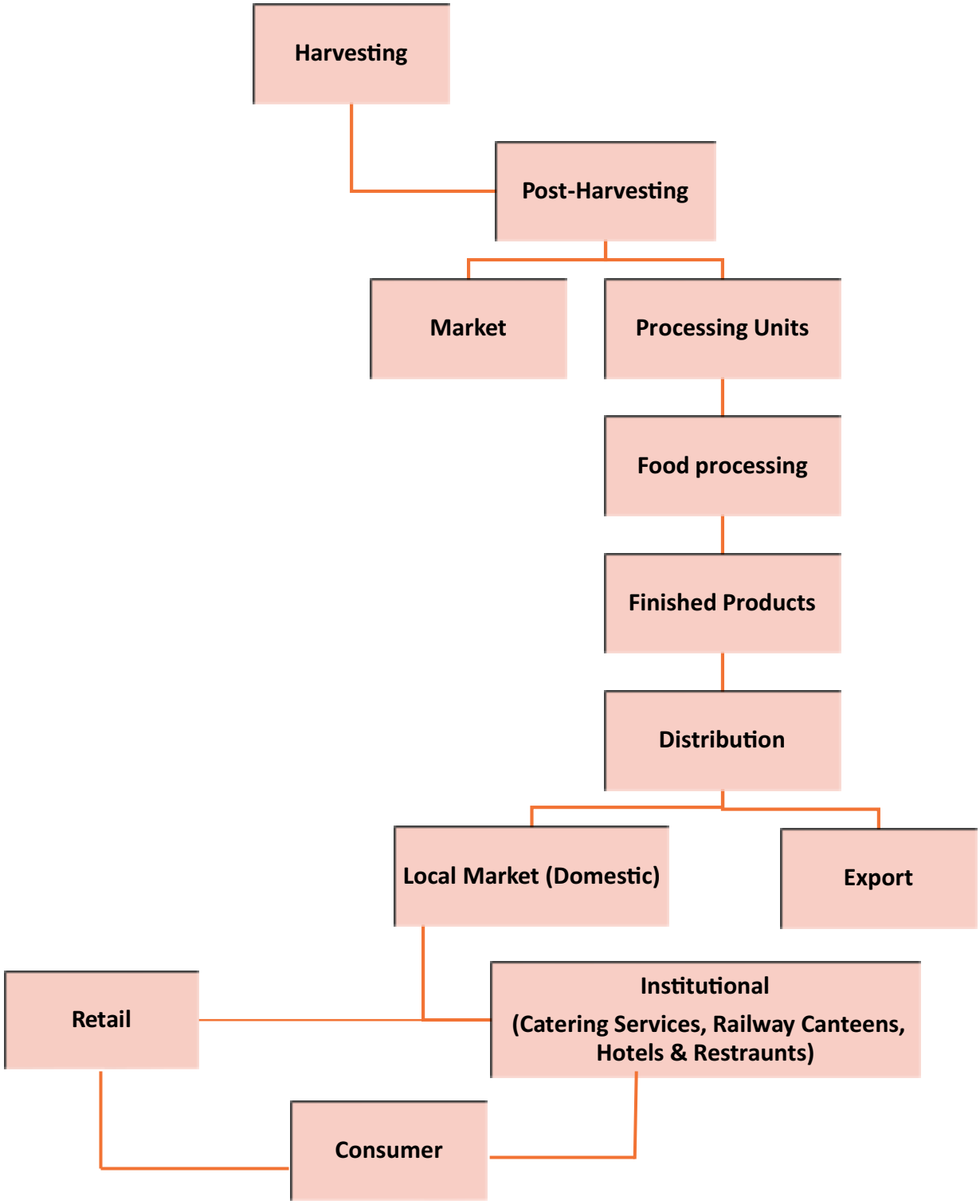

Fig.1.1.2 Journey of Foods from Farm to Consumer

1.1.3 India's Food Processing Industry

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

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

Fig.1.1.3 Sub-Sectors of the Food Processing Industry

1.1.4 Overview of the Spice Production Sector

India, known as the Spice Kingdom, has a long history of trading with ancient civilizations such as Rome and China. Given their exquisite aroma, texture, taste, and medicinal value, Indian spices are now the most sought-after in the world. India has the world's largest domestic spice market. Traditionally, spices in India were grown on small plots of land, with organic farming gaining popularity in recent years. India is the world's leading producer, consumer, and exporter of spices, producing approximately 75 of the 109 varieties listed by the International Organization for Standardization (ISO) and accounting for half of the global spice trade.

India is the world's leading chilli, turmeric, and ginger producer. Rajasthan produced over 980 thousand metric tonnes of spices in 2019-20, making it India's largest spice producer. Gujarat came in second with 760.5 thousand metric tonnes, and Andhra Pradesh came in third with 747.45

thousand metric tonnes. India's production volume has increased due to various end-user industries such as bakeries, cosmetics, pharmaceuticals, and, most notably, the food and beverage industry.

The domestic spice market in India is worth INR 750 billion per year. The market is largely unorganised, with the branded segment accounting for approximately 15% of the total. Cooking time has been reduced due to increased urbanisation and the number of working women. Homemakers have begun to demand readymade spice mixes, increasing industry revenues because spice mixes and branded spices have higher profit margins than unbranded spices.

As perImarc Spice market analysis market

- India's spices market will exhibit a CAGR of 11.15% from 2022-2027.
- The India spices market was valued at INR 142,569.3 Crores in 2021.

Market Potential and Future trends of the Spice Industry

Spices refer to food additives primarily used for flavouring, colouring, or preserving food items. They are usually manufactured by processing various aromatic seeds, dried fruits or vegetables, roots, barks, etc. Spices offer exquisite aroma, texture, and taste to food without adding any extra fat or calories. India currently represents one of the largest producers of spices in the world. Some common spices widely available in the country include chilli, turmeric, coriander, tamarind, cumin, mustard, fenugreek, etc.

Segmented by Product type

Pure spices:

- Chilli
- Turmeric
- Coriander
- Cumin
- Pepper
- Tamarind
- Asafoetida
- Bay Leaf
- Clove
- Cardamom
- Cinnamon
- Tulsi Leaf
- Others

Blended spices:

- Garam Masala
- Non-Veg Masala
- Kitchen King and Sabzi Masala
- Chole and Channa Masala
- Chat Masala
- Sambhar and Rasham Masala

- Paneer and Curry Masala
- PavBhaji Masala
- Jaljeera Masala
- Others

Segmented by the application

Based on the application, the India spices market has been segmented into veg curries, meat and poultry products, snacks and convenience foods, soups, sauces and dressings, bakery and confectionery, frozen foods, beverages, and others. Among these, veg curries represent the largest market share.

Strength:

1. India represents around 30% of the world's pepper production, 35% of the world's ginger production and 90% of turmeric production
2. The best suitable environment for the production of spices

Weakness:

1. Rejection of Export Materials
2. Insufficient Mechanization of Spice Production and Processing
3. Insufficient Quantities of Quality Spices
4. Poor Post-reap Handling

Opportunities:

1. India has the better capability of expanding the production of seed spices yields, and prospects of their export are many
2. India is customarily developing spices naturally
3. The seed spices can be developed effectively under saline/antacid water, corrosive soils, disintegrated lands, bringing down ripe soils, constrained soil dampness conditions and metal-contaminated soil

1.2 Future Trends and Career growth Opportunities Available to the Spice Processing Technician.

India is the world's largest spice producer. It is also the largest consumer and exporter of spices. Different spices have been growing rapidly over the last few years. Production in 2021-22 stood at 10.88 million tonnes. During 2020- 21, the export of spices reached an all-time high in value and volume by registering a growth of 17% in US$ value terms and 30% in volume terms. During 2021-22, the single largest spice exported from India was chilli, followed by products, cumin and turmeric. India produces about 75 of the 109 varieties listed by the International Organization for Standardization (ISO). The most produced and exported spices are pepper, cardamom, chilli, ginger, turmeric, coriander, cumin, celery, fennel, fenugreek, garlic, nutmeg & mace, curry powder, spice oils and oleoresins. Of these spices, chilli, cumin, turmeric, ginger, and coriander make up about 76% of the total production.

The largest spices-producing states in India are Madhya Pradesh, Rajasthan, Gujarat, Andhra Pradesh, Telangana, Karnataka, Maharashtra, Assam, Orissa, Uttar Pradesh, West Bengal, Tamil Nadu and Kerala. India is the largest exporter of spice and spice items. For 2021-22, the country exported spices worth US$ 4,102.29 million. In September 2022, the exports of spices from India increased by 6.62% to US$ 330.46 million. In 2021-22, During 2020-21, the export of chilli, ginger, cardamom (small & large), coriander, turmeric, celery, cumin, fennel, fenugreek, other seeds such as ajwain seed, mustard, aniseed, nutmeg & mace; other spices such as asafoetida, tamarind, etc., expanded both in value and volume as compared to 2019- 20. Even the export of value-added products such as spice oils & oleoresins grew both in value and volume; the export of curry powder/paste increased in value, and the export of mint products increased in terms of volume.

India exported spices and spice products to 180 destinations worldwide in 2020-21. The top destinations were China, the USA, Bangladesh, Thailand, the UAE, Sri Lanka, Malaysia, the UK, Indonesia, and Germany. These nine destinations comprised more than 70 per cent of the total export earnings in 2020-21. Spices worth Rs. 6,27,155.48 lakhs (US$ 791.5 million) were exported to China in 2020-21, constituting 23% of the overall value exported. USA imported spices worth Rs. 4,65,000.00 lakhs (US$ 586.8 million) in 2020-21, constituting 17% of the total exported value from India. Bangladesh imported spices worth Rs. 2,51,280.47 lakhs (US$ 317.1 million) from the country during the above period. It comprised 9% of the total exported value from India. UAE exported spices worth Rs. 1,65,298.53 lakhs (US$ 208.6 million) from India in 2020-21, which is 6% of the total value exported. Chilli was the most exported spice from India. During 2021- 22, China imported Rs. 3,144 crores (US$ 396.9 million) of chilli in 2020-21. During the same period, China imported cumin worth Rs. 1,397.4 crores (US$ 176.4 crores). Mind products imported by China during the same period (US$ 227.2 million). The main products imported by the USA are celery, cumin, curry powder, fennel, fenugreek, garlic, chilli, and mint products.

1.3 Role and Responsibilities of Spice Processing Technician

Roles and responsibilities

¿ Handle raw material from the time of receipt till it reaches the process line
- Check the raw material for quality
- Ensure minimum loss of raw material

¿ Record-keeping and documentation
- Document and maintain records of raw materials, production schedule, and process
- Document and maintain records of finished products

¿ Hygiene and sanitation maintenance
- Adopt safety and sanitation-related measures

- Follow food safety norms and practices

¿ Operate processing equipment and machinery
- Optimize the use of machinery
- Ensure smooth operation of machinery to complete the production line. Inspect machines and troubleshoot issues
- Ensure smooth operation of machinery to complete the production line
- Optimize the use of machinery
- Attend to minor repairs of tools and machinery when required
- Ensure that safety rules and regulations are observed
- Prevent accidents
- Escalate issues to the supervisor

¿ Plan and execute the production process
- Examine products at different stages of production
- Adhere to Good Manufacturing Practices (GMP)
- Inspect intermediate as well as finished products
- Ensure conformance of quality as per organizational standards

¿ Follow storage and packaging norms
- Ensure safe and proper storage of raw material, packaging material, and finished goods

¿ Professional Skills
- Planning and organizing the work order according to situations
- Utilize the time properly at the work place
- Use common sense and make judgments on day to day basis
- Support the supervisor in scheduling tasks for the helper
- Identify the problem and handle issues
- Complete the assigned tasks with minimum supervision

1.4 Terminology Used in the Spice Processing Industry

- **Aril:** An accessory appendage of certain seeds (example: mace around the nutmeg seed)
- **Bite:** The heat factor in a spice. The tongue and flavour experience bite through the nose.
- **Capsule:** A dry fruit that splits open at maturity (example: sesame).
- **Condiment:** A substance used to give relish to food; a seasoning.
- **Custom Blend:** A unique blend produced for a food manufacturer's formula or needs.
- **Decorticated:** To remove the outer husk (example: cardamom).
- **Dehydrated:** Process by which fresh produce is dried and converted to various forms for easy handling and final use.
- **Distillation:** A purification process in which a liquid is converted to vapour by the external application of heat. The vapour is condensed to the purified liquid by some means of cooling.
- **Dry Solubles:** Spice extractives plated on a dry soluble carrier.
- **Essential Oils:** A spice's volatile oils produce most of its flavour.
- **Extractives:** Volatile and non-volatile components which produce a spice's full flavour.
- **Freeze Drying:** A drying technique that produces an end product which is dry, not frozen. The term comes from the material to be dried being frozen and remaining that way during the complete drying process.

- **Hull:** The outer covering/husk of some fruits or seeds.
- **Oleoresins:** Viscous, resinous materials extracted from spices contain volatile and nonvolatile portions.
- **Pigment:** Any of various colouring matters found in the cells and tissues of plants and animals.
- **Piperine:** A colourless, crystalline alkaloid found in black and white peppers.
- **Pungency:** A slightly sharp sensation registered by the tongue and olfactory senses.
- **Rhizome:** A creeping, underground rootlike, often fleshy stem (example: ginger).
- **Seed:** The ripened or matured ovule, consisting of two coats, an embryo, and reserve food.
- **Volatile Oils:** Naturally occurring oils found in various plants, especially flowers and leaves, give spices their characteristic flavour and odour.

1.5 Policies to be Followed on the Delivery, Health, Safety and Hazard Handling Standards, Integrity, Dress Code, etc.

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

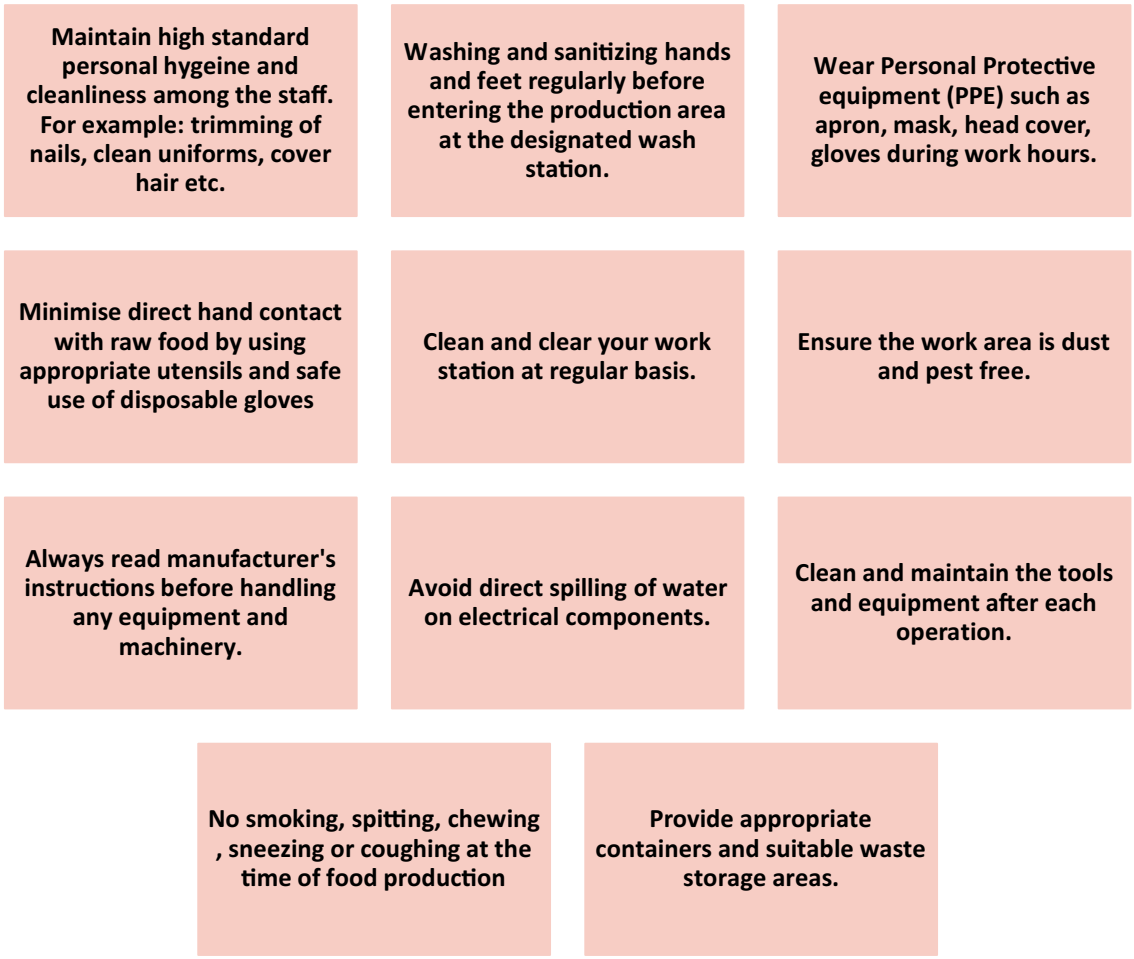

Fig.1.1.3 Organisational guidelines to be followed during work

1.6 Importance of Planning Before Starting Work

1. Planning helps you set appropriate goals
2. Planning breaks a problem or goal into smaller pieces
3. Planning reveals weaknesses (and strengths)
4. Planning increases certainty and confidence
5. Planning increases efficiency
6. Planning reduces risk
7. Planning increases your credibility
8. Planning encourages creativity
9. Planning improves decision-making
10. Planning equals more peace of mind

Exercise

1. List the type of spices with examples.
2. What does Decorticated mean?
3. Write short note on the spice production sector
4. Mention various responsibilities of spice processing technician.

Notes

Scan the QR Codes to Watch the related Videos

Overview of Food Processing Industry | FICSI Food SSC

Roles and Responsibilities

Orientation Video

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2. Prepare for Spice Production

Unit 2.1 - Planning for spice production
Unit 2.2 - Clean and maintain the work area, machinery & tools
Unit 2.3 - Organize for production

FIC/N9026

Key Learning Outcomes

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

1. Describe the process of production planning.
2. Discuss the significance of various process diagrams, product flow diagrams, and other diagrams.
3. Describe the process of resource management.
4. Describe how to calculate the workforce, raw materials, packaging materials and capacity.
5. Please list the different types of equipment and how they areused during the process.
6. Discuss the organisation's rules and procedures for cleaning and maintaining production equipment.
7. Write out the fundamentals of food safety and sanitation.
8. Procedures for waste management at the workplace.
9. Make a list of inspection methods for tools, equipment, and machinery.
10. Discuss how to assign work or responsibilities to the team.

UNIT 2.1: Planning for Spice Production

Unit Objectives

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

1. Explain the production planning process in spice processing.
2. Interpret process diagram, product flow diagram etc.
3. Outline best practices to be followed for spice processing.
4. Understand the management of resources and required equipment.
5. Understand how to maintaintools and equipment used in spice production.

2.1.1 - Introduction to Spice Processing Industry

India produces and exports about 75 varieties of spices, making it the world's top producer and exporter of the 109 varieties classified by the International Organization for Standardization (ISO). The scent, texture, and flavour of Indian spices are well-known worldwide. Pepper, chilli, turmeric, ginger, cardamom, coriander, cumin, fennel, fenugreek, celery, nutmeg and mace, garlic, tamarind, and vanilla are the main exports from India. Spice oils and oleoresins, mint products, curry powder, spice powders, mixes, and seasonings are among the processed spices exported. India has a 45 per cent share in the global spice trade in terms of volume and value.

Spices are the most valuable commodity in the commodities market. India and China are the world's top spice exporters, with the United States and Europe as the leading consumer markets. Pepper, cardamom, ginger, turmeric, chilli, cinnamon, nutmeg/mace, cloves, pimento, and vanilla are the most important tropical spices c. At the same time,cumin, coriander, sesame seeds, mustard, sage, bay, oregano, thyme, and mint are the most important non -tropical spice crops.

Spices from India areutilised in both whole and processedforms . Furthermore, the global demand for spices poseseveral obstacles to the country's spice business, particularly regarding food sustainability, traceability, and safety requirements. Modern processing technologies and good hygiene and manufacturing procedures can help to ensure food safety.

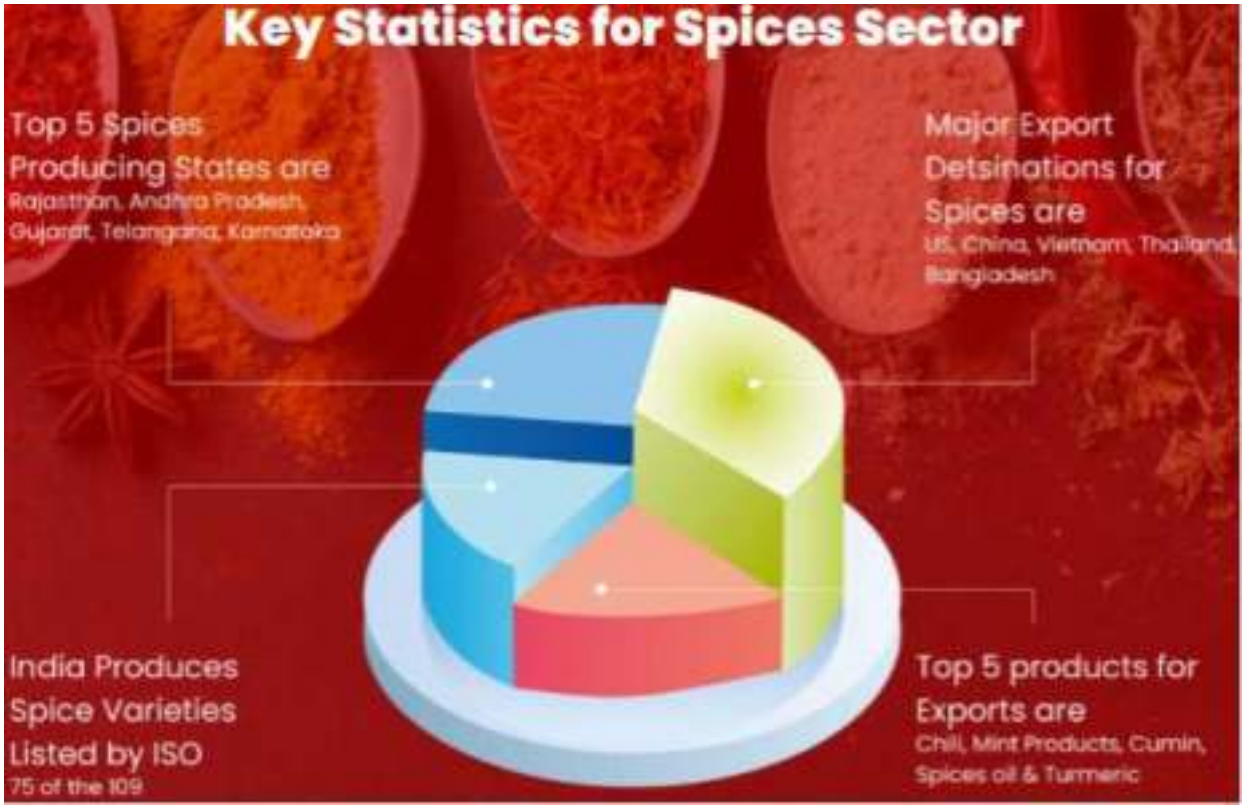

Fig 1.1.1 Key statistics for the spices sector

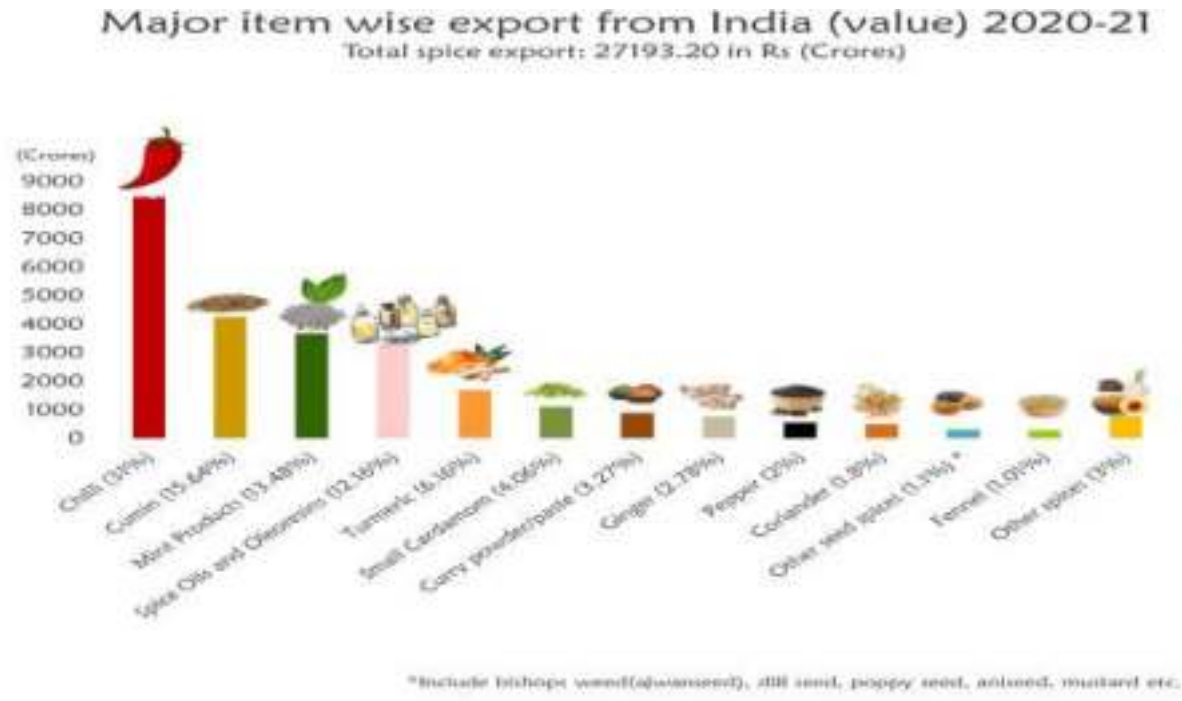

Fig 2.1.2 Major spices export from India -2021

2.1.2 Obtaining instructions for spice production

Spice Processing Techniciansare responsible for processing variousspices and spice products.Under the supervision of a supervisor, he performs activities after reading and comprehending the supervisor's instructions, assists the supervisor in planning production sequences, refers to the process chart, production flow chart and formulation chart for products to be produced, and ensures the proper operation and performance of required machinery and tools. In brief, ample time for Spice Processing Technician is spent receiving instructions from the supervisor regarding various functions in planning for the spice production. It becomes imperative to be thoughtful while receiving instructions from the supervisor to make the production process effective and flawless.

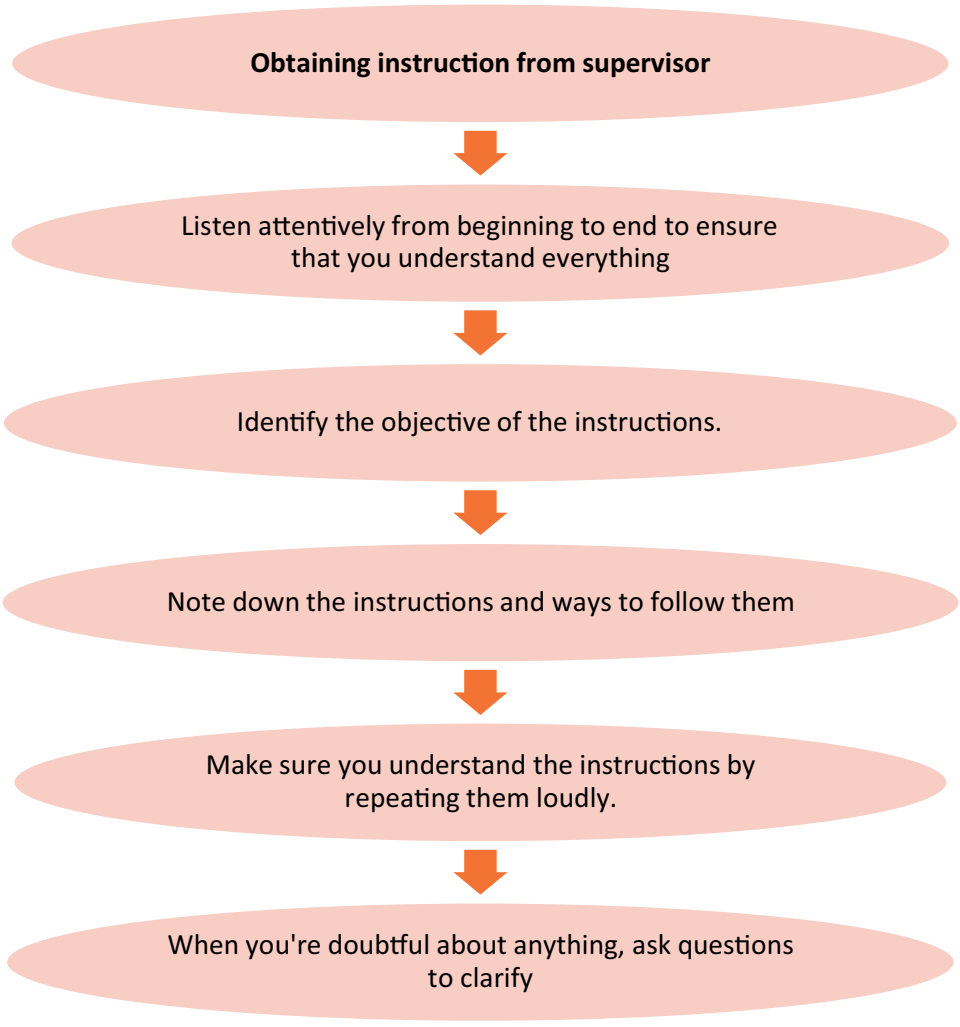

Fig 2.1.1. An effective way of obtaining instruction

The importance of process charts, product flow charts and formulation chart

Process flow chart

A flowchart is a diagram that depicts the actions and decisions required to perform a process. A diagram shape represents each step in the sequence, and connecting lines and directional arrows connect the steps. It allows anyone to look at the flowchart and follow the procedure from start to finish. It is an effective tool that properly and efficiently illustrates a process's actions.

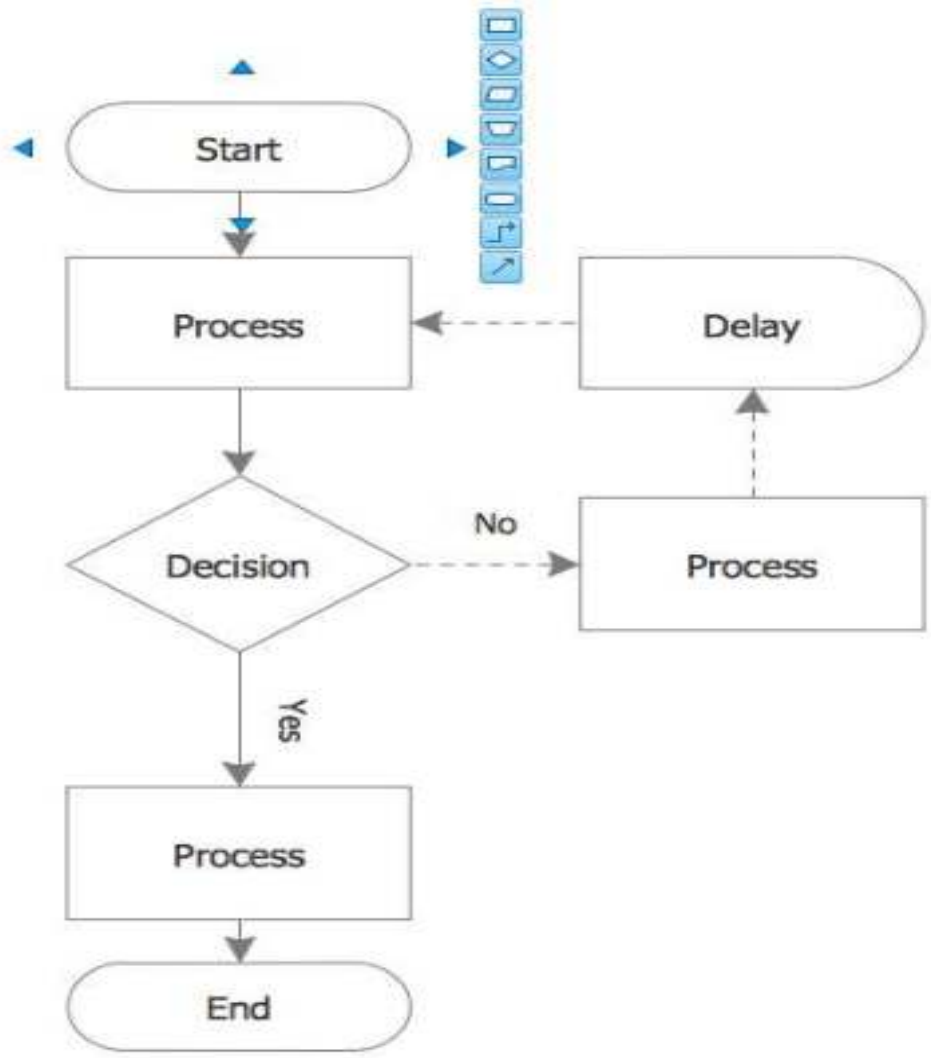

Fig 2.1.2.Basic Flowchart

Terminator	This shape is called Terminator, which denotes the beginning or end of a process in the process flow diagram.
Process	This shape denotes any processing function in the process flow diagram.
Decision	This shape denotes a decision point between two or more paths in the process flow diagram.
Delay	This shape is used to denote delay in the process.

Fig. 2.1.3 Basic shapes of process flow chart

Product flow chart

A product flow diagram is a tool for outlining the sequence of actions while manufacturinga product. The goal is to identify each step in the process in a logical order so that they can verify that the current process is running as efficiently as feasible.

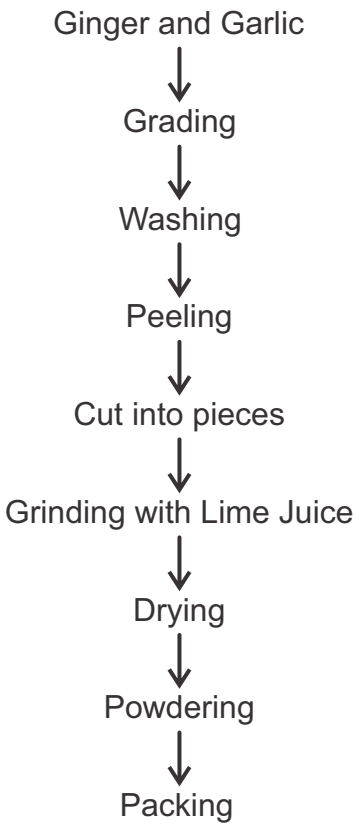

Fig 2.1.4 Preparation of Ginger Garlic powder

Spice Manufacturing Process (Product Flow Diagram of Powdered Spices)

Fig 2.1.5 Product flow chart of powdered spices manufacturing

Cleaning

Dust, dirt, chemicals, insects, animal hair and droppings, and various bacteria frequently infect spice crops. Before processing, the crop must be cleaned.It is the first step in the spice-making process, in which unground spices are cleaned manually using a winnowing basket or machines to remove impurities such as stone, dust, and dirt.The crop should be washed in clean, potable water after winnowing. Washing should be done quickly to avoid soaking the spice in water, which degrades its quality. The washing water must be changed regularly to prevent the recontamination of herbs by dirty water.

Fig 2.1.6 Winnowing basket for cleaning spices

Drying

This is perhaps the most critical step in ensuring high-quality spices.The quality of the spice powder will be determined by how well-dried the herbs are. If adequate cleansing and washing are not done, bacteria will proliferate and poison the food. Herbs contain volatile oils, which are seriously harmed by high temperatures. As a result, the drying temperature must be carefully monitored to ensure a high-quality dried product. The majority of small-scale processors dry the product in the sun.It may result in a chance for the crop to be contaminated. All attempts should dry the products in a clean environment, away from mals, insects, and birds.

Fig 2.1.7 Winnowing machine for cleaning spices

Roasting

After the spices have been dried, they are roasted. Roasting the spices is important since it contributes to the spice powder's scent, colour, and flavour.

Grinding

Grinding machines such as crushers, mincers, mills, cutters, shredders, and other similar devices are used to pulverise spices into powder.Many mechanical forces operate on the material during the grinding process, causing finer particles to form. The size of the particles in the finished products will be finer if the force used is greater. Grinding is a time-consuming and energy-intensive process. Around 1% of the given energy is useful in breaking bonds between the particles. The remaining energy is converted to heat, raising the powdered product's temperature. Temperatures rise to 42 to 93°C during standard or conventional grinding, causing the evaporation of volatile oils of the spices. It results in the loss of medicinal and nutritional components of processed herbs.

Fig 2.1.8 Industrial Spice Grinding Machine

Grading

Grading is a process that determines the amount and proportion of spices mixed with the raw material used and the type of spices (flavour), their size, shape, density, and colour.

Sieving

The powdered spices are sieved to ensure that the mesh size of all the spices is uniform.

Packaging of Spice

Seasonings and spices offer many
flavours to your favourite foods, but they must be fresh to function.
Therefore, proper packing is essential.After going through thestages mentioned above , the spices are then sent to be packaged. Spices are weighed and packed according to the quantity required.Spice packaging protects yourherbs from moisture, puncture, odour, and other problems. As a result, you may rest assured that your seasonings and spices will make it safely from the warehouse to the taste buds of your consumers.

2.1.3 Good Manufacturing Practices to be followed for spice processing

The farmer faces numerous challenges from the beginning of production until the product reaches the consumer. Pests, microorganisms that infest farmland, foreign matter that may or may not be dangerous, poisonous substances or impurities that get into products from materials used in processing, microorganisms and dirt introduced into the product through unhygienic practices of those who handle the produce, and loss of quality caused by storage flaws are just a few of these.Below are some of the industry's recommended good manufacturing practices (GMPs).

GMP's

- Appropriate facility design and maintenance.
- Well-designed and well-maintained equipments.
- Documentation of procedures, forms and manuals.
- Validation of process.
- Remedial action.
- Control of non-conforming products
- Incident and product recall management
- Sanitation and hygiene
- Waste disposal
- Physical and chemical product contamination control
- Dispatch and transportation
- Managing allergens etc.

Resource planning

"Resources" are the materials required to produce deliverables and complete a project. Each industry will necessitate its own set of resources. However, the majority of enterprises will need the below resources to achieve their organisational goal;

- Workforce such as employees, workers etc.
- Material such as office supplies, raw materials etc.
- Equipment and machinery

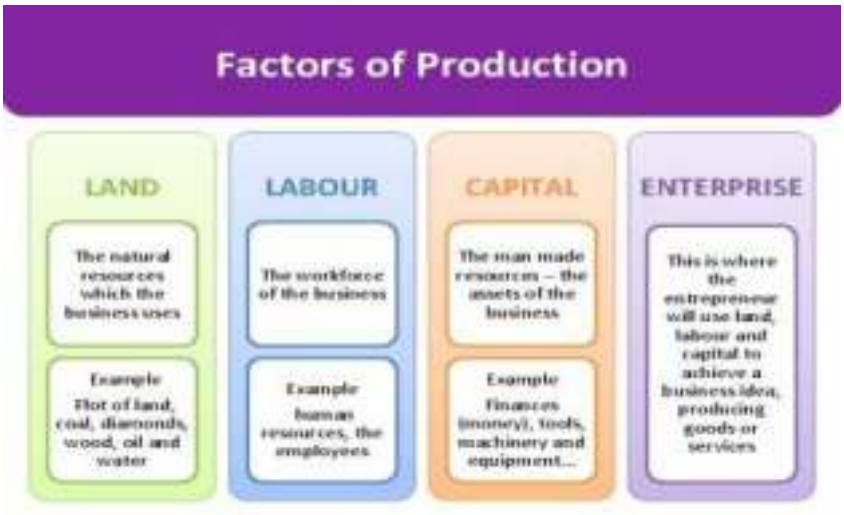

Fig. 2.1.9 Resource (Factor) of production

Resource Management Process

Managingan organisation's resources effectively is known as resource management. Planning, scheduling, and allocating finances, inventory, personnel, technology, and other resources as efficiently as possible are all part of resource management.T he approach enables optimal efficiency by effectively using the company's resources.

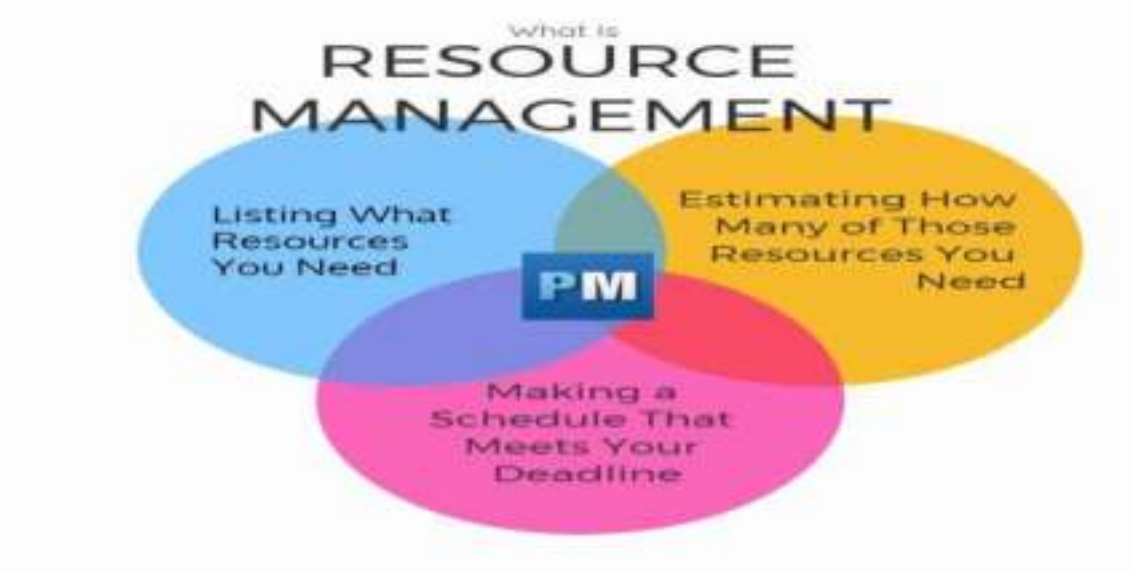

Fig 2.1.10 Resource Management

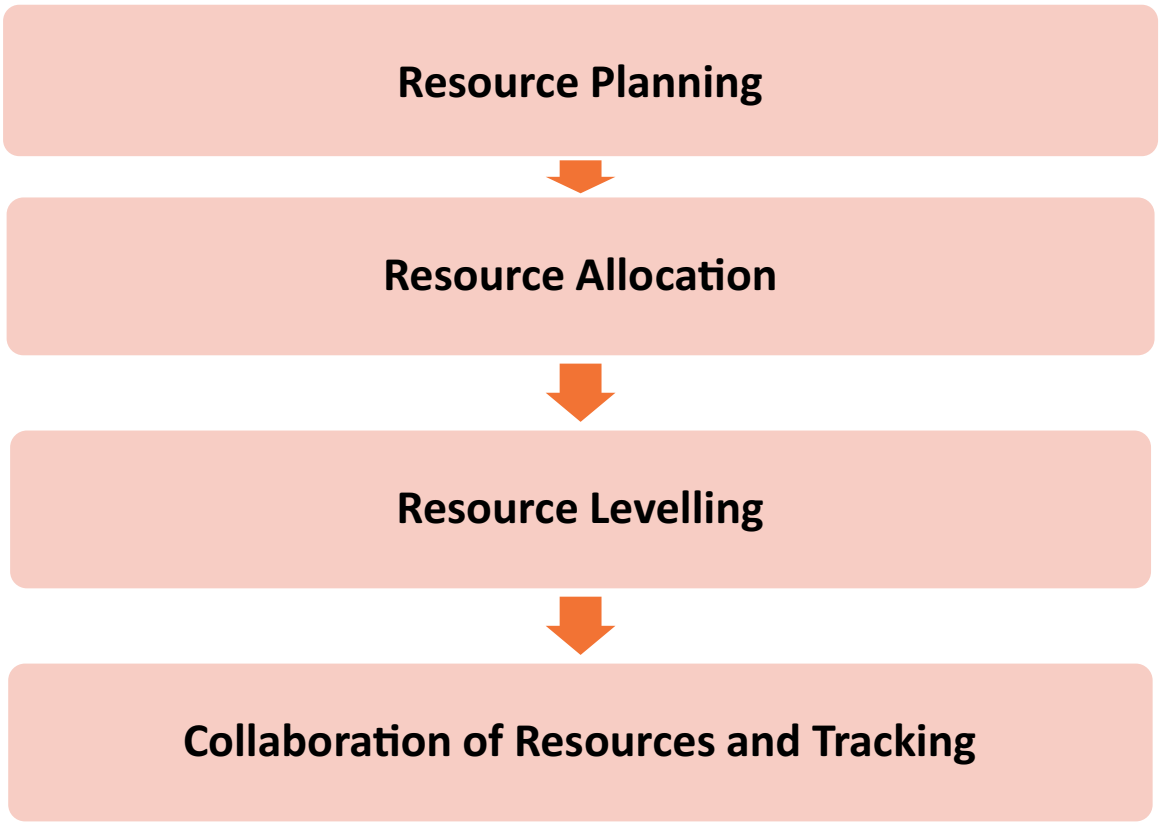

Fig 2.1.11 Elements of the resource management process

Resource Planning

"Resource planning" refers to identifying and allocating resources to certain projects or tasks. The technique necessitates a deeper understanding of allocating the appropriate skills to perform the work within the time and budget constraints.This strategylists all the resources you'll require and when you'll require them. It's crucial to account for lead time orits time to obtain a resource. This is related to change management since unexpected events can occur, and you may need to revise your resource strategy.

Resource Allocation

It would help if you first assigned your team members. You must answer the following questions: Who is available, and when are they accessible? When and where will they be required to work? What will their responsibilities be? You'll have to question materials and equipment similarly, such as when and where you'll need them.

Resource Levelling

This method seeks to findunde rutilised or inefficiently utilised resources within the company and use them to your benefit.A Spice Processing Technician with knowledge of waste disposal management assists the team by taking on small jobs concerning waste disposal that require waste disposal techniques. Thisis an example of resource levelling. If a team member's waste disposal management talents can be flexed, the team won't need to recruit a freelancer if they are suddenly inundated with waste disposal requests.

Collaboration of resources & Tracking

Resource management has an impact on many aspects of an organisation. Because the budget is limited, you must constantly weigh the relevance of each resource and determine which projects require which resources most urgently. As a result, you must ensure that all of your resources communicate with one another and collaborate to achieve a shared goal, i.e. the effective completion of the project.It would help if you also tracked what resources are being used and how much of it is used in the case of material You must compare the actual usage to the anticipated usage. Because neither under-utilisation nor over-utilisationis desirable, you should use this information to improve future resource estimations.

Equipment required

Unground spices are mechanically cleaned to remove contaminants before being washed. They are pulverised in a grinder after drying to turn them into powder. Turmeric is solid and must be disintegrated before being pressed, or turmeric powder can be obtained in a single grinding using a modern screen-less impact pulveriser. The powdered spices are then sieved to achieve a consistent mesh size. Finally, the items are packed in bags and sealed. A grinding machine is a vital piece of equipment in the spice business, depending on the industry's size. Impact pulverisers are used in large-scale enterprises, while double-stage pulverisers are used in small scale industries. Spice grinders, weighing scales, packaging machines, compressors, and rosters are all necessaryequipmentto process spices. Some of the majorequipment used to processherbs are illustrated below.

Washing and cleaning equipment

They are usually washed when fresh herbs are delivered to the processing unit. Spices are rarely cleaned, except nutmeg, dipped in water to remove unsound nuts or "floaters," and cardamom, which may be soaked in sodium bicarbonate to maintain its green colour.It is critical to wash herbs as soon as possible after receiving them to remove 'field heat' and inhibit the growth of microorganisms. Large volumes of pure chlorinated water are required, with chlorine levels higher than those found in tap water.

Fig 2.1.12 Turmeric Washer

Small-scale washing can be done in big shallow tanks with operators moving the produce freely through the water. If concrete tanks are used, they should be tiled as much as possible. Soil and other foreign matter are rinsed off the raw materials, necessitating regular water changes. Continuously circulating water through a filter is a better way. Ideally, several tanks should be utilised, with the first used to remove heavy soiling and the others used for final washing.

Continuous washers are more appropriate on a larger scale. A moving conveyor collects the herbs and transports them under intense water sprays. Recirculation through a filter is a common way to save water.

Winnowing

Stones, trash, dust, broken seeds, and other impurities are removed from dry spices via winnowing. This can be done with a winnowing basket (shown above)and letting the wind blow away light stuff like dust or trash. Hand removal of stones is required. Simple procedures are only suitable for extremely modest amounts of raw material. Manual cleaning is necessary for leafy herbs, removing any unsound material or foreign materials.Small businesses typically employ electric winnowers with a variable-speed fan and adjustable baffles to separate stones from sound and light materials.

Fig 2.1.13 Electric powered winnower

Drying equipment

Various dryers process herbs and spices, from basic sun drying to gas dryers.The type of dryer used and how it is operated may considerably impact the quality of the finished product.

During the dry season, sun drying the produce is generally sufficient. The simplest and cheapest option is to lay the produce on mats in the sun. However, there are certain crop, and sudden rainstorms can rehydrate it. These issues are avoided by using a solar dryer. The solar cabinet dryer is the most basic spices.

Fig 2.1.14 Cabinet solar dryer

An 'Excel Solar Dryer' could be utilised for larger units. However, because the construction expenses are higher, a thorough financial analysis should be conducted to guarantee that the increased revenue from higher-quality spices can justify the additional cost.

A solar dryer or sun drying cannot be utilised effectively during the wet season or times of high humidity, which typically corresponds with the harvest of spices. An artificial drier with a low-cost energy source is required. A variety of drying machines are used to dry different kinds of spices.

Fig 2.1.15 Excel solar dryer

The spice drying machine uses a closed hot air circulation system with an automatic temperature control system for maximum thermal efficiencyS uitable for chilli, pepper, herb, ginger, and other spices.

Spice roasting machine

Coriander, Fenugreek seeds, Fennel, Bay leaf/Cinnamonleaf, Cumin, Sesame, and other spices are roasted using the Spices Roasting Machine. The Products are roasted to remove moisture content, inhibiting bacterial growth and extendingtheir shelf life. Because the heating is done indirectly , there is less scent loss.Oil-immersed electrical heaters provide heat in the Spice Roaster Machine.

The spice roaster machines are batch machines that come as a full kit that includes the process chamber, heating system, drive unit, and pre-wired control panel. Due to their three dimensional motion, specifically designed spiral ribbons produce the best roasting results. As a result, every particle has an equal chance of coming into touch with the heating zone and being roasted.

Pulverising/Grinding Equipment:

The process of applying an external force to a solid material of a specific size to reduce it into smaller bits than the original size is known apulverisation .Grinding can bring value, but it must be done with caution due to the complications. It is easier to assess the quality of a whole, intact product than to determine the quality of a ground product. Ground spices face market opposition due to concerns about adulteration- or the use of low-quality spices. This can only be solved by constantly creating high-quality products and establishing client confidence.Spices are sometimes marketed ground or combined into a mix, such as curry powder. A hammer mill or a disc millis commonly used for grinding. Put ground spice through a fine sieve to geta product witha uniform particle size. Because finely crushed herbs absorb water considerably faster than whole spices.

Fig.2.1.15 Hot air circulation spices drying machine

Hammer mill/impact pulverizer

Spices and other food products, such as pulses, herbs etc., are the best ground in hammer mills in large batches. The grinding chamber has a toothed ratchet liner on top and a classification screen at the bottom. The manual hopper transports the feed material through the grinding chamber. Asmall amount of air is generated during the grinding process; to remove this air, a Polyester dust bag is attached below the through, and the other end of the bag is hung at the top, acting as a dust collector. Spice pulveriser machines grind small amounts of spices, particularly high-value condiments such as cinnamon, cloves, cardamom, nutmeg, pulses, and sugar. Additionally, these machines can grind wet and pulpy materials such as green/red chilli sauce, fresh ginger garlic paste, and other damp food products per hour.

Fig.2.1.16Pulverising/Grinding Equipment

Grading machine

While grading spices, size, density, colour, form, and flavourare considered.

This Blow Type Specific Gravity Cleaning Machine generates proportion segregation of graininess material under aerodynamic and vibration friction stress. By modifying wind pressure, amplitude, and other factors, a bigger proportion of material will sink and move from bottom to top under vibration friction stress; a smaller proportion of material will travel from top to bottom. This machine removes blighted seeds, blossoming seeds, insect-damaged seeds, rotting seeds, deteriorated seeds, mouldy seeds, non-viable seeds, seeds with black powder sickness etc. An angle on the right of the vibration surface allows the stone to be separated.

Fig . 2.1.18 Black Pepper Grading Machine

Sieving machine

Chili, turmeric, cinnamon, coriander, pepper, and various spices are mixed. These spices are blended and sold as garam masala, mixed masala, chicken masala, or mutton masala on the market. Kicks are delivered whole to the factory and thoroughly cleaned. These spices are washed and dried before being pounded into powder. Individual and mixed spices are produced - by a spice manufacturer. However, each herb must be sieved before use. There are numerous advantages to using a sieving machine at this point, such as - Spices may contain huge fragments of material that was not properly ground after grinding, and the product held at the factory may form lumps. Humidity causes lumps or agglomerates to form etc. If these impurities or undesirable contaminants are not eliminated before packaging, the product's quality will suffer.

Fig. 2.1.19 Sieving machine for mixed spice manufacturing

Packaging Equipment:

The type of packaging required for herbs and spices is determined by the product, the target market, and the climate in which the food will be kept. A herb or spice sold in a cool, dry environment may require minimal packaging, such as paper. The identical product marketed in a hot, humid environment requires further moisture protection. As a result, producers may need to use alternative packaging for different markets. Packaging demands a lot of care and consideration because it is the product's last line of defence before it reaches the client.

Fig. 2.1.20 Automatic spice powder packing machines

UNIT 2.2: Clean and Maintain Work Area, Machinery & Tools

Unit Objectives

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

1. State cleaning and maintenance of work area, machines and tools per organisational standards.
2. State waste management process.
3. State techniques of tool, equipmentand machinery inspection.

2.2.1 - Cleaning and maintenance of the work area

Keeping your food processing facilities clean is more critical than the product itself.Since cleaning and sanitising are likely to be the most significant components of a sanitation programme, enough time should be allocated to laying out correct methods and parameters. All food-contact surfaces must have detailed procedures developed, and non-product charactersinclude non-product portions of equipment, overhead structures, shields, walls, ceilings, lighting devices, refrigeration units, heating, ventilation, air conditioning systems,and anything else that could affect food safety.

Workplace hygiene is vital because it contibutes to a healthy workforce and a healthy workforce is more productive and happier.A robust workplace hygiene policy is the best method to ensure that staff keep the workplace clean.

Maintenance of workplace Hygiene:

Personal hygiene, work area cleanliness, clean restroom facilities, and a clean kitchen are the 4 elements of basic workplace hygiene.

Fig. 2.2.1 Maintaining workplace hygiene

Personal hygiene

Employees' cleanliness, look, and habits are personal hygiene. Employee personal hygiene can be a sensitive issue for business owners.

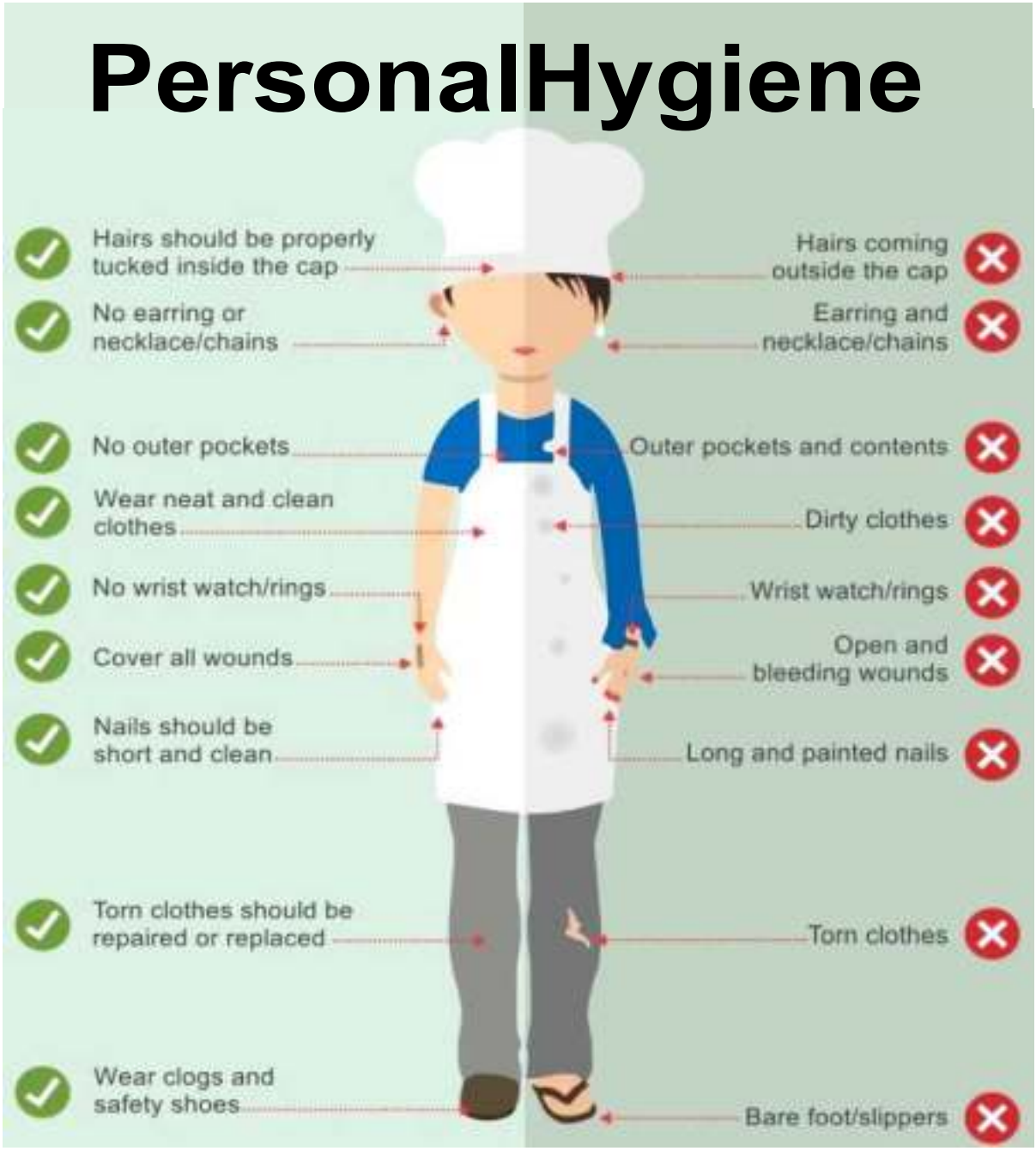

Fig 2.2.2 Maintaining personal hygiene

Restroom Hygiene

Hand soap, toilet paper, and hand-drying clothes or equipment should be provided in the restrooms. Encourage your employees to wash their hands after using the facilities. Depending on how much traffic your bathroom receives,you should conduct these duties at least once a day/week or deep cleaning as needed.

Daily Cleaning Activities	Weekly Cleaning Activities	Deep Cleaning
• Examine the toilet paper dispenser. If you're out, restock. • Examine the paper towel dispense. If you're out, restock. • Clean the counters. • Bins should be emptied. If necessary, replace the pail liner. • Examine the soap dispensers. If your supply is running low, refill it. • Toilet and urinal must be clean. Remember to flush the toilet. • Clean the floor. • Clean the floors on the spot, including any wet patches. • Look into vending machines. If you're running low on supplies, restock.	• Vents should be dusted. • Using a disinfecting cleaner, wipe down all flat surfaces. • Sweep the floor and remove any debris. • Toilet and urinal must be cleaned. Don't forget about the outside. • Clean the mirrors. • Scrub the sink and the counter. • Clean and polish faucets and other shiny surfaces. • Remove water stains and other markings from the walls. • Clean the floors. Remember to display your Wet Floor Sign. • Carpeted areas should be vacuumed.	• Sinks need to be cleaned. • Toilet bowls must be cleaned of stains. • All grout must be cleaned. • Wash all surfaces thoroughly. Remember to check behind the fixtures for walls. • Partitions between stalls should be cleaned. • Calcium deposits on the fixtures should be removed. • Drains must be kept clean. Keep in mind that floor drains are frequently overlooked.

Maintaining appropriate hygiene in the kitchen is critical because it is a shared space. Workplace hygiene strategy should include regular cleaning and upkeep of utensils and equipment.

Fig.2.2.3 Maintaining workplace kitchen hygiene

2.2.2Cleaning and sanitisation of tools and equipment used in spice production

The ultimate purpose of cleaning and sanitising equipment is to eliminate any particles that could contaminate your food items. The workers clean to physically remove dirt and particles from the kit, remove residues from equipment that you can't see but can smell, and eliminate bacteria and germs. Cleaning is a method of physically removing soil or dirt from the surface; it may include detergent and water concentration, a vacuum cleaner or any other way. Whereas sanitising is treating a cleaned surface to destroy microorganisms effectively.

Fig 2.2.4 Cleaning V/s Sanitizing(Disinfecting)

Food businesses must keep their premises, fixtures, fittings, equipment and food transport vehicles clean and sanitised.A typical cleaning plan in the food industry consists of the following steps.

Fig. 2.2.5 Cleaning plan in a food processing industry

Step 1- Clean the food contact surface of any visible dirt and debris

- Removal dust from equipment, furniture or any surface mostly involves dry cleaning, using dampened (wet but tightly squeezed) micro-fibre cloth.
- It is important to determine that the cloth used for dusting doesn't cause any scratches on the cleaned surface. Choosing the right cloth material for dusting is important to ensure this.
- Preferably, a microfibre cloth is used for dusting, but there can be another category of materials as well:
- Remove any visible dirt or debris from the food contact surface first. This can be done with a brush, air, or water, depending on the type of debris. The appropriate amount of pressure is crucial.
- Avoid using high-pressure washers or air compressors to clean since germs and other debris could be distributed over a vast area.
- Soil and debris may not be adequately removed from surfaces when water or air pressure is too low.

- Remove the debris with just enough pressure.
- Tools should be kept in a designated place. This can be accomplished by using colour labelling. For example, black handles could be used only on floors, whereas blue handles on food contact surface like conveyor belts.

Image	Cleaning Cloth Type
	**Scrim:**Because of its great absorbency and lint-free character, this loosely woven linen cloth is frequently substituted for chamois leather when cleaning mirrors and windows.
	**Glass Cloths:** These are used to clean mirrors and drinking glasses because they leave no lint.
	**Floorcloths are bigger, thicker,** and coarser cotton material than all purpose swabs. They are used to wipe WC pedestals, clean tiles and pure marble or granitefloors, remove spills, etc.

	**Swabs:** These are all-purpose cloths made of soft, absorbent material. They are used for wet cleaning and damp dustingon all surfaces above floor level. They can also be used for cleaning sanitary fittings such as bathtubs and washbasins.
	Duster:These are meant for dusting and buffing. Afine mist of water or dusting solution is sprayed on them for damp dusting.

	Chamois leather is the skin of a chamois goat (antelope)used to clean windows and mirrors when dry and polish silver and other metals.
	**Rags:** These clothes are used for applying polish and, when dirty,are thrown away.

Step 2 - Removal of Rust

Any food processing unit has a lot of equipment, furniture and metallic fixtures. Mainly these are made of stainless steel, iron or chromium oxide quoted. When wet or in moisture, these metals react with oxygen and develop rust over time. Rust is brown and orange (iron oxide) consumed and extremely dangerous. Rust can lead to the contamination of food and other ingredients. Thus, rust is fatal in a food processing unit. Rust can easily be removed using chemicals like acids and abrasive agents. But, it can also be removed using easily available materials such as vinegar and salt. In the coming section, we will discuss easy ways to clean rust from furniture, fixtures and cooking surfaces.

Fig 2.2.6 Rust Stain in metal

Method	Process for Removal of Rust
Use Of Acidic Solutions	**Soaking in vinegar** • Soak the rusty item in vinegar overnight • Scrape away the rust the next morning. • Instead of white vinegar, apple cider vinegar is preferable • White vinegar may be useful, but it isn't as effective as apple cider vinegar **Use of lemon/Lime juice** • Sprinkle the salt over the rusted area • Soak it in lemon or lime juice • Scrape the surface with a scrubber
Use of Paste Solution	**Baking Soda Paste** • Blend sufficient baking soda and water to make a paste that is somewhat thicker than toothpaste • Use more baking soda than water to make it thicker • Apply the paste to the rusty item and work it in with an abrasive object and then wipe it off **Cream of tartar with hydrogen peroxide** • Blend cream of tartar with hydrogen peroxide and make a thicker paste; use slightly more cream of tartar than hydrogen peroxide • Apply the paste tothe rusted surface • Scrape with an abrasive and then wipe off
Use of Chemical Rust Remover	**Commercial Rust Remover** • Toto removes light rust; soak your rusted item for 1 to 3 hours ina chemical solution such as WD-40, Acid magic etc. • To remove heavy rust, rusted itemsmust be soaked in the solution overnight. • Do not use components with protective oxide paints, as the coating will be removed. • Always wear PPE while handling commercial rust remover

Step 3 - Apply the cleaning compound.

Soaking

- Small pieces of equipment, fittings, and valves can be immersed in cleaning solutions in a sink, while bigger vessels like vats and tanks can be partially filled with a pre-dissolved cleaning solution.
- The cleaning solution should be hot (50°C/125°F), and the equipment should soak for a few minutes before being washed manually or mechanically.
- Ultrasonic cleaning tanks are a relatively new approach. Equipment is immersed in a cleaning solution and cleaned by the scrubbing action of small bubbles created by high-frequency vibrations.

Spray Method

- Cleaning solutions can be sprayed on equipment surfaces with either hot water or steam.
- Fixed or portable spraying machines can be used for spraying cleaning compounds.
- These methods are widely used in cleaning equipment/plants and tools in the food processing sector.

C.I.P (Clean-in-place system) & C.O.P (Clean-out-place system)

- C.I.P technology involves using an automated cleaning system with permanently welded pipeline systems.
- Fluid turbulence in pipelines is the primaryenergy source for soil removal and other foreign matter in C.I.P. cleaning.
- In the C.O.P. system, a recirculating parts washer is ideal for washing many small components.
- These systems are similar to sanitary pipe washers in that they use a clean tank with a recirculating pump and distribution headers to agitate the cleaning solution thoroughly.
- In some circumstances, the parts washer can also function as a recirculating unit for CIP cleaning.

Foaming

- This method employs a concentrated chemical blend to be introduced to full alkaline or acid-cleaning solutions.
- When used with a foam generator, it produces a stable, plentiful foam.
- The foam sticks to the surface to be cleaned, extending the liquid's contact time with the filth and preventing rapid drying and runoff of the liquid cleaner, resulting in better cleaning.

Gelling

- A concentrated powdered gelling ingredient is dissolved in hot water to generate a thick gel in this process
- The cleaning product of choice is dissolved in the hot gel, and the resulting acid or alkaline detergent is sprayed over the surface to be cleaned.
- The gelled cleaner will leave a thin film on the surface for 30 minutes or more to attack the soil or other filth.
- Then, a pressure-warm water rinse removes the soil and gel.

Cleaning with High-Pressure

- Exterior portions of equipment, floors, and different building surfaces are regularly cleaned with hydraulic cleaning systems
- Cleaning compounds are atomised using a high-pressure spray nozzle in high-pressure cleaning.
- Steam injection systems and pressure-fed tanks typically have nozzle pressures between psi, whereas air and motor-driven high-pressure pumps may have nozzle pressures from psi.
- The cleaning solution's force against the surface, controlled by the nozzle design, is a major factor in cleaning performance.

Step 4 - Rinse the surface well with clean water to eliminate all detergent compounds and soil.

- Remove all detergent and soil from the area by rinsing it with water.
- Avoid using high-pressure washers to rinse since infections can spread over a vast area, decontaminating regions already cleaned.
- Use high-volume, low-spray water to minimise splashing orto aerosolise to prevent contamination from spreading from one surface to another.

Step 5 – Usesanitiser, rinse if needed and let the surface air dry.

- The fundamental goal of using effective sanitising processes is to eliminate disease organisms that may be present on equipment or utensils after cleaning to a safe level, as determined by public health standards, and thereby avoid transmission of those organisms to the final consumer.
- Sanitizing may also help to avoid food deterioration.
- Use asanitiser that has been approved for use on food contact surfaces. Make sure the product is in the right concentration according to the label.
- Use sanitisers as directed on the label.
- Leave the surface to air dry.
- A potable water rinse may be performed in organic operations after applying a sanitiser.

2.2.3 Waste Management

A waste management system isan approach for disposing, reducing, reusing, and preventing trash. Recycling, composting, incineration, landfills, bioremediation, waste to energy, and waste minimisation are the methods of possible waste disposal. In other words,actions required to handle garbage from its inception to its final disposal are referred to as waste control or waste disposal. Storage, transportation, management, waste recycling, and control and enforcement are all part of this.

Fig 2.2.7 Waste Management

Type of waste

Majorly there are two types of debris, namely:

Biodegradable waste

Waste that microorganisms can decompose is known as biodegradable waste, as; domestic sewage, newspapers, and vegetable waste, for example, are biodegradable and undergo the rotting process.

Fig 2.2.8 Biodegradable waste

Non-biodegradable Waste:

Waste that cannot be decomposed is called non-biodegradable waste. These wastes do not undergo the process of rotting. Polythene bags, plastics, glass, aluminium cans and iron nails are a few examples of such waste.

Fig 2.2.9 Non- Biodegradablewaste

Waste Management Hierarchy

Using a waste management hierarchy, organisations may maximise the value of their products and services while reducing waste output.The waste management hierarchy is a systematicpproach for guiding and ranking waste management decisions individually and collectively. Here waste prevention comes first, followed by re-use, recycling, recovery, and eventually disposal.

Fig. 2.2.10 Waste Management Hierarchy

Reduce

The waste management hierarchy prioritises decreasing or preventing waste generation to the greatest extent possible. This stage encourages businesses, communities, and governments to utilise less virgin raw materials in their manufacturing processes.The idea is to maximise efficiency and prevent the unnecessary consumption of resources. It can be achieved bypurchasing raw materials with the least amount of packaging or that require the least amount of resources to refine, avoiding single-use or disposable itemspurchasing recycled or recyclable p roducts that can be recycled, repaired, or reused, and Inventory optimisation to prevent perishable commodities from going to waste.

Reuse

The second best technique to waste management is to prepare items for reuse in their original state. Reusing business trash reduces your landfill impact and saves money by avoiding purchasing new goods or virgin materials and paying someone to dispose of your garbage. Office-based enterprises can reuse toner and printer cartridges by refilling them Instead of buying a new ones.Instead of disposable items, use sturdy glasses, mugs, cups, plates, and cutlery.

Recycle

Recycling converts items that might otherwise end up in landfills into new goods. The additional energy and resources required to create a new productare the third step in the waste management hierarchy. Scrap paper, for example, can be recycled, but it takes to water and electricity to turn it into a usable form.Recycling contributes significantly to environmental protection. Recycling is a kind of waste management that prevents garbage from being disposed of in landfills or water sources by converting waste into usable litter components. Manyorganisations and towns have made it easier to recycle things by adding labelling that indicates if the material is recyclable.

Energy Recovery

Businesses can recover energy or materials fromthe garbage when further recycling is not viable or possible. This waste management method includes the disposal of waste items by burning them. This disposal procedure is also known as thermal treatment. You can dispose of a wide range of waste products through incineration on a commercial or human scale. In most places with limited land, incineration is a viable option. Using the power generated by burning waste items, you can generate heat, energy, or steam.

Disposal

If all else fails, materials that cannot be reused, recycled, or recovered for energy will be landfilled and burned without energy recovery. This is an unsustainable waste management strategy because waste that lingers in landfills might continue to harm the environment.

2.2.4 Inspection procedures of tools, equipment, and machinery

Modern food processing and production technology are more complex than ever before, but it entails more complications when something breaks down or goes wrong.A proper inspection and preventative maintenance approach will help ensure that your equipment continues functioning properly, reducing the chance of premature breakdown. Some of the best industry practices are outlined for equipment and machinery inspections.

- Pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends should all be avoided on equipment.
- When possible, hollow portions of the equipment and cracks and fissures should be eradicated or permanently sealed.
- The danger of equipment contamination should be identified and managed. Forklifts, utensils, and maintenance tools used in the finished product and packing facilities should be distinct from those used in the "raw" material section.
- Equipment and containers that come into touch with food and are used for handling, storage, processing, and packing must be made of corrosion-resistant materials that do not contaminate the food
- Waste, by-products, and inedible or dangerous substance equipment and containers must be clearly labelled and manufactured properly.
- Inspectingequipment and machinery should bedone by referringto the manufacturer's manual to make it more effective.
- While inspecting theequipment, it must be ensured that the user of the equipment has been given adequate training for using it correctly, the risk associated with it and precautions.
- It is to be inspected whether the equipment is being used per the manufacturer's instructions.
- While inspecting, it must be ensured thatthe equipment is being used in an appropriate environment, such as; ventilation and moist and explosive conditions.
- There should bea clear warning for handling equipment, such as wearing PPE,restrictions on the use and a list of authorised users.
- Equipment must be made stable wherever appropriate by clamping, bolting, tying, etc.
- Potentially hazardous portions of the machineryshould beprotected , and all guards should be well-constructed, strong, and well-maintained.
- All the control machinery should be operated safely and easily.

Preventive Maintenance

Preventive maintenance entails resolving minor issues before they become major ones. Preventative maintenance plans aim to extend the useful life of an asset and avoid unplanned downtime.A preventative maintenance programme that includes all equipment inside the facility and prescribes the frequency at which preventive maintenance must be available should be documented and checked by an authorised person.

Fig 2.2.11 Preventive Maintenance

- Regularly examine all equipment for hygiene and damage. A line startup check is recommended, with quick corrective or preventive steps done if necessary.
- Beforereleasing the equipment for production, the supervisor must confirm that all tools and other items have been removed and returned to their proper positions as the equipment is cleaned.
- A structured food safety management system should be in place if outside contractors are needed for preventative maintenance or equipment repair. Contractors will be expected to follow the guidelines, and the area should be inspected and cleaned once the preventive maintenance is completed.
- Equipment repairs and maintenance must be performed by trained workers, approved contractors, or the equipment manufacturer. Properly trained persons should perform instrument calibration.
- Leaks and excess lubricant must be found and removed. Where there is a risk of direct or indirect contact with the product, oils, heat transfer fluids, or any other similar material employed must be of food grade.
- An organisation should strive for preventive maintenance instead of reactive maintenance.

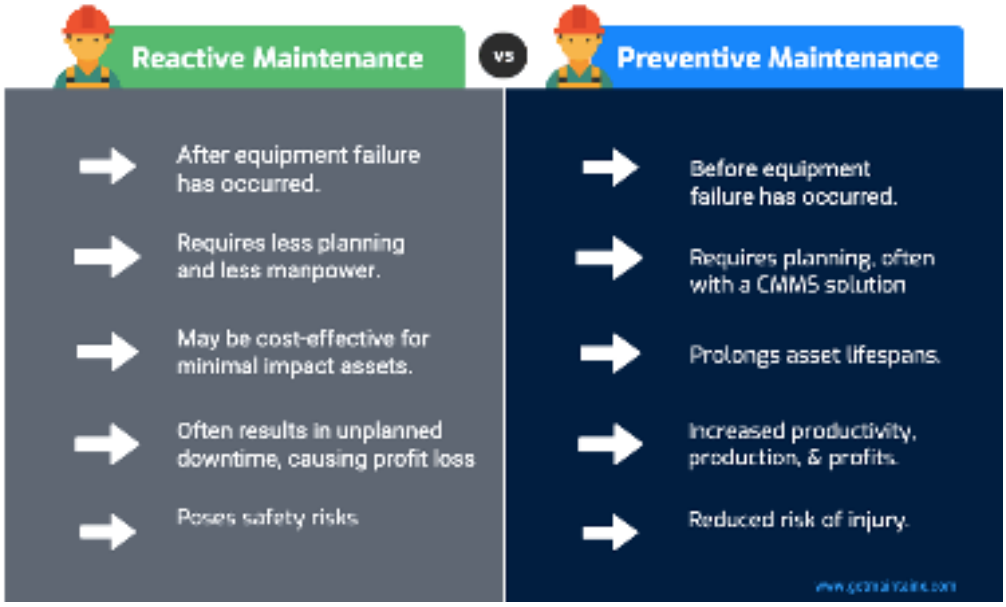

Fig 2.2.12 Preventive V/s Reactive Maintenance

UNIT 2.3: Organizing for Spice Production

Unit Objectives

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

1. Explain how to organise tools and equipment used in spice production.
2. Explain the process of receiving and organising production materials.
3. Explain how to allocate work and responsibilities among team members.

2.3.1 Organizing of tools and equipment

It's crucial to look through what's already in the facility and eliminate any duplicates or objects that aren't useful. This can be accomplished by using red tags; Red tags will help identify any items that can be removed from the workplace. The red tag will indicate whether the object must be relocated, disposed of, recycled, etc.One can use personalised tool foam, pegboards, a magnetic tool board, or vinyl shadow board tape to make it easier for workers to find them. There are numerous ways of organising tools and equipment; some methods are discussed below.

1-Developing different tool zones

The primary thing in organising tools and equipment is to inventory everything you have. Sort the tools into categories after a broad notion of what you have. All power tools, small hand tools, and similar items should be grouped. Create zones and utilise cabinets to group like objects. For instance, creating a zone for repair and maintenance tools used in preventive maintenance equipment and machinery.

Fig 2.3.1 Repair and maintenance tool zone

2- Creating a Pegboard Tool Cabinet

Customising storage pieces to match the space is the best management tool approach. For example, buying a workbench isn't nearly as efficient as designing one with designated storage areas for your devices.Building a tool cabinet is an excellent method to make the most of any available vertical space. Use pegboard as support and on the cabinet doors to maximise the surface area open for hanging tools.

3- Vertical storage of tools and equipment

Having adequate vertical storage space is one of the most effective methods of cleaning a work area Tools tucked away in toolboxes and cabinets might easily be forgotten or misplaced. So the more visible space you have on the walls.Slat boards and pegboards are two options for hanging tools on a wall. Vertical stripes with anchor hooks on the strip are another common alternative. Consider a magnetic strip for smaller devices and equipment.

Fig 2.3.2 Vertical storage of tools

2.3.2 Obtaining and organizing production material

There should be a process flow separation to facilitate hygienic operations according to the one–way flow direction, without backtracking from the arrival of the raw materials at the premises to the finished product, and should provide appropriate temperatures condition for the process and the product.A few points should be kept in mind to receive and organise production material to minimise the chance of contamination while managing spice production.

- Spice processing facilities and rooms should be physically separated from wet processing areas and designed to be cleaned regularly with minimal water.
- The production facility should include the following:
- Separate areas for receiving raw materials
- Different storage rooms for raw materials and ingredients, packaging materials, processing chemicals, and cleaning and sanitisation chemicals
- Particulate area for storing finished goods and dispatching final products
- Openings for material transfer must be designed to prevent the entry of foreign items and pests.

Receiving and Storage of raw materials for spiceproduction

- All raw materials should be purchased from an approved vendor per the current requirements.
- An organisation should accept no raw material or ingredient if it is known to contain parasites, unwanted microorganisms, pesticides, drugs, or poisonous, decomposing, or extraneous chemicals that would not be reduced to an acceptable level by routine sorting and processing.
- Beforeacceptance, all raw materials, packing, containers/trucks should be inspected, and raw materials or ingredients should be inspected and sorted as needed. Laboratory tests

must be done when necessary to determine fitness for use. Only high-quality, appropriate raw materials or ingredients should be used.

- Stored raw material should be kept under conditions that prevent spoilage ; it should be protected from pests, physical, chemical, or biological contamination , Microbial dangers and other toxic compoundsand safeguarded against harmful temperatureand physical changes such as Crushing, abrasion, and vibration may cause characteristics to change , it should be processed or used until contamination, spoilage, and pests have been inspected.
- Raw materials and ingredient stock rotation should be practised to ensure first in, first out.
- Cleaning and washing of raw materials must be done suitably.
- Environmental conditions such as temperature and humidity must be controlled, monitored, and documented to ensure raw material safety and wholesomeness.
- Raw materialscan have the potential to contaminate other substances. This is especially critical for items that are considered allergens. Therefore,products must be separated with care.Thus, effective measures must be implemented at various processing steps to prevent cross-contamination of food.
- Storage areas must be carefully planned to prevent damage and cross-contamination so that Pallets must not become a source of contamination.
- Effective steps must be made to prevent raw orsemi -processed materials from coming into contact with the finished product and contaminating it.
- Pathogens can be passed from one food to the next by direct touch or by food handlers, contact surfaces, or the air. With effective intermediate cleaning or disinfection, raw, unprocessed foods must be fully separated from finished or ready-to-eat foods, physically or over time.

2.3.3 Assigning Tasksand Responsibilities

One of the most important responsibilities of a team leader or supervisor is assigning tasks to each member. This necessitates deciding who is competent in doing specific jobs to attain goals.The team leader must decide on major jobs undertaken to make proper decisions. Humanresources in the department can complete the desired task effectively and identify the greatest fit to meet project objectives.

What exactly is the role?

A team member's position is referred to as a role. Each member of the team should be assigned to a specific project role.Functions are defined by the amount of effort required from the team to achieve the objectives. The next stage is identifying the best candidates based on their skills, expertise, and experience. Defining roles aids in finding the correct individuals for the job and determining the quality and amount of effort needed to complete the project.

What Do Responsibilities Entail?

The tasks and activities that a person in a specific role is required to perform responsibilities. Employees are held accountable for their roles-specific obligations. Individual employees who

perform better in their roles contribute to the team's endeavour and, as a result, assist the team in achieving its objectives.

Steps involved in the assignment of roles and responsibilities

Roles and responsibilities help a team understand and agree on what each member will do. A team like this is more likely to be well functioning and synchronised. Working well together and excelling as a team requires ensuring that your team values each individual's contribution and understands their assigned tasks.

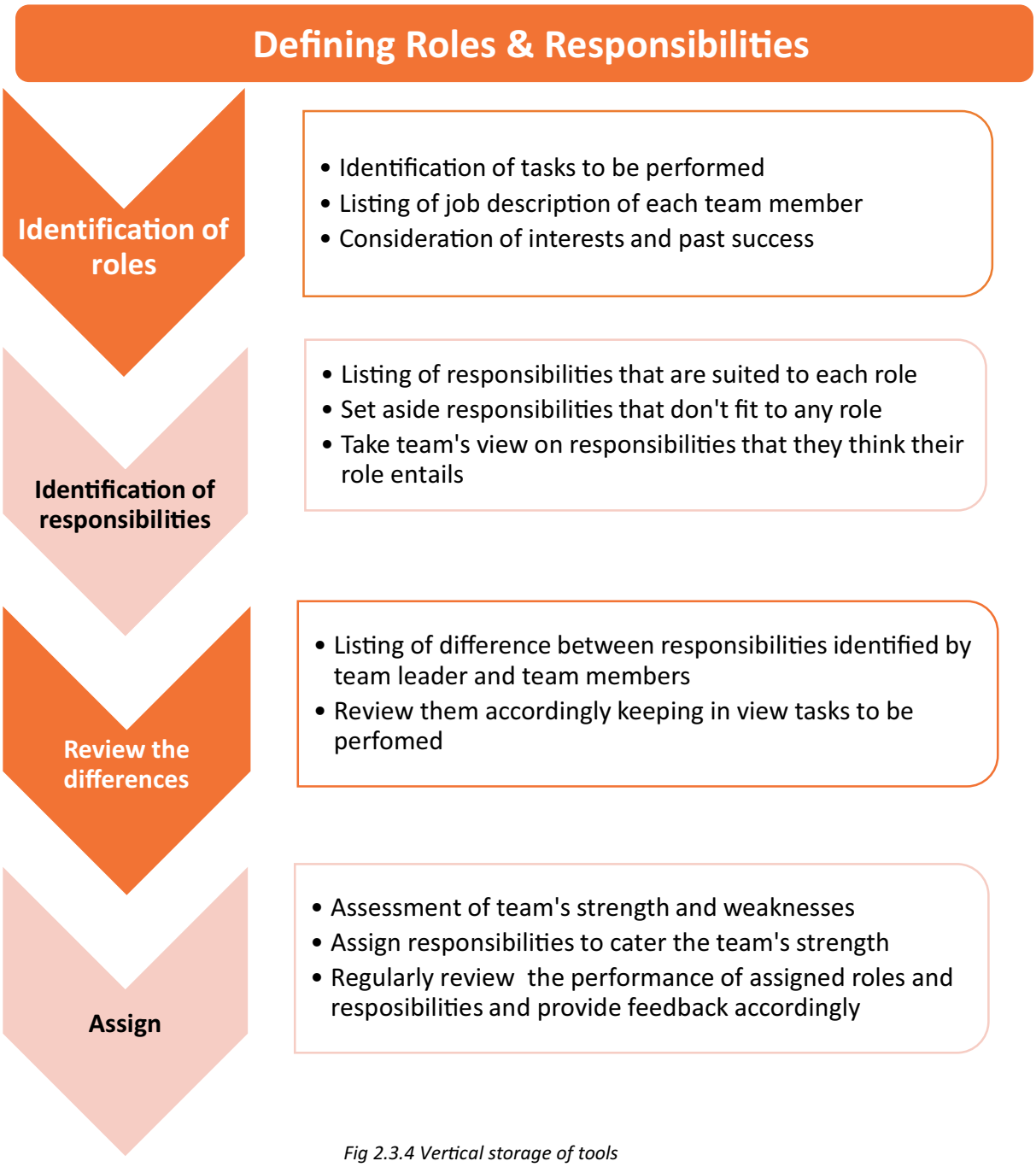

Fig 2.3.4 Vertical storage of tools

Exercise

1. Which among the given option is not a part of the spice processing process?
   a) Grinding
   b) Grading
   c) Roasting
   d) Cleaning of tools

2. What is the step performed after drying spices?
   a) Colouring
   b) Packing
   c) Roasting
   d) Sieving

3. A waste management system is an approach for disposing, reducing, reusing, and preventing trash.
   a) True
   b) False

4. The spices are ---------- before being pounded into powder.
   a) washed and dried
   b) Peeled and dried
   c) Fried in oil
   d) Soaked in water

5. Which among the given option should be provided in the restrooms?
   a) Hand soap
   b) Toilet paper
   c) Hand drying cloths
   d) All

6. What does implementing a proper inspection and preventative maintenance approach ensure?
   a) Ensure that your equipment continues to function properly, reducing the chance of premature breakdown.
   b) Ensure that equipment is purchased on time.
   c) Only 1
   d) Option 1 and 2

7. Hammer Mill/Impact Pulverizer is used for grinding ----------.
   a) Large batches of pulses and herbs
   b) Flour
   c) Chilli
   d) Turmeric

8. A ---------- is used as support and on the cabinet doors to maximise the surface area open for hanging tools.
   a) Pegboard
   b) a magnetic tool boards
   c) vinyl shadow board tape
   d) Cello tape
9. Spice processing facilities and rooms should be physically separated from wet processing areas and designed to be cleaned regularly with minimal water.
   a) True
   b) False
10. What does C.O.P mean?
    a) Clean-out-place system
    b) Conference of the parties
    c) Clean-one-piece
    d) Clean on point

- Practical 1Using the resources showcasesthe proper way to dispose of the different sorts of waste

Practical 2

With the help of fellow teammates, show how to receive the equipment and assemble it for production.

Notes

Notes

Scan the QR Codes to Watch the related Videos

Machinery used in Spice processing

Spice processing Method

NCVET
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Food Industry Capacity and Skill Initiative

3. Product Spice and Seasonings

Unit 3.1: Basics of Spice Processing
Unit 3.2: Process for Preparing Different Spices and Seasonings
Unit 3.3: Packaging and Labelling of Various Spice Products
Unit 3.4: Post-production Cleaning and Regular Maintenance of Equipment

FIC/N8515

Key Learning Outcomes

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

1. Identify common spices
2. Describe the basics of spice processing.
3. Discuss the process for preparing different whole spices, seasonings, spice powder and curry powder.
4. Demonstrate the standard work practices followed to produce whole spices, seasonings, spice powder and curry powder.
5. Explain the procedure of wrapping and labelling products and post-production cleaning and maintenance of equipment.
6. Demonstrate the technique to package the finished products.

UNIT 3.1: Basics of Spice Processing

Unit Objectives:

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

1. Understanding the use and role of raw ingredients in the process of producing spice and seasonings
2. Quality control during the spice manufacturing process
3. FSSAI regulations to be followed for manufacturing of spice and seasonings

3.1.1 Introduction to Basics of Spice Processing

India is known as 'The Land of Spices' throughout the world. South Asian countries, especially India, the world's largest producer, consumer, and exporter of spices, rely heavily on spice crops to sustain their agricultural economies. Spices are essential additives that enhance colourfoods' flavour, smell, and colour. Farmers generally grow them as cash crops since they are low-high-value high-value commodities. Moreover, spices are a great source of essential oils and aromatic constituents. Hence, they are in high demand in the pharmaceutical and cosmetic industries. Standard ISO 676:1995 of the International Organization for Standardization (ISO) defines spices and condiments as "vegetable products or mixture free from extraneous matter, used for flavouring, seasoning and imparting aroma in foods". The term applies equally to the product in the completeor ground form".

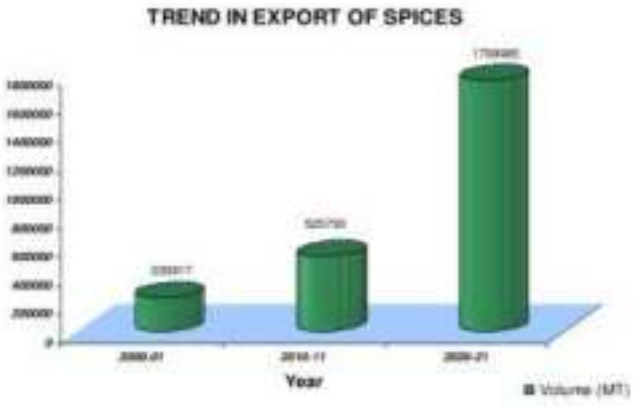


Fig 2.1.1Major trend in export of Indian spices

The Trade Information Services (TIS) division of the Spices Board of India gathers information about the export of spices from various sources, such as exporters' returns that are filed to the Spices Board, DGCI&S Kolkata, and DLE from Customs. Major export trends have been highlighted in the below image.

S No.	Spices Images	Spices Name	S No.	Spices Images	Spices Name
1		Turmeric	9		Clove
2		Saffron	10		Poppyseed
3		Garlic	11		Caraway
4		Cinnamon stick	12		Mustard seed
5		Tamarind	13		Menthapiperita
6		Cardamom	14		Curry tree
7		Peppercorns	15		Cumin seed
8		Malabar leaf/bay leaf	16		Asafoetida

S No.	Spices Images	Spices Name	S No.	Spices Images	Spices Name
17		Coriander	25		Fennel
18		Ginger	26		Carom seed
19		Nutmeg	27		Black Cardamom
20		Black Pepper	28		cubeb pepper
21		coriander powder	29		dry coconut
22		Poppyseed	30		dry gooseberry
23		Star Anise	31		Fennel seeds
24		Turmeric powder	32		Fenugreek seeds

S No.	Spices Images	Spices Name	S No.	Spices Images	Spices Name
33		Sichuan peppercorn	37		Liquorice
34		Red chilli powder	38		Nigella seeds
35		White Pepper	39		Oregano
36		Red chilli	40		Pine nuts

Table 3.1.1 Major spice processing ingredients

3.1.2 Nature and Deteriorative Characteristics of Spices and Spice Products

'Spices are products derived from various plant parts, including bark, bud, flower, fruit, root, seed, or secretion. The FDA defines spices as "any aromatic vegetable substance in whole, broken, or ground form used primarily to season food rather than to contribute nutrients." Aroma, flavour, and colour are the supreme quality contributing factors that climate and storage affect. They are influenced by factors such as high temperature and humidity, oxygen, respiration, and heating, as well as insects, pests, microorganisms, rodents, and birds, all of which work together to cause the following deteriorations:

3.1.2.1 Loss of Aroma and Flavour

The loss of aroma and flavour is caused by the loss of volatile oil content due to evaporation, seepage, and oozing out through packaging material oxidation of some aroma components. Temperature variations accelerate this process.

3.1.2.2 Bleaching of Colour

Natural pigments in spices such as green and bell pepper, green cardamom, turmeric, red chillies, paprika, and saffron cause colour bleaching. This deterioration is caused by oxygen, hastened by light, humidity, and temperature, and is aided by oxygen.

Fig 3 1 2Infestation

2.1.2.3Loss of Free-flowing nature

Due to moisture ingress from the surroundings through the package, the spice powders become soggy and lose their free -flowing nature.Caking and lumping do not occur in whole spices; however, a musty odour does develop at higher RH.

2.1.2.4 Microbial spoilage

Microbial spoilage in spices occurs due to moisture sorption at and above 70% RH.Although the microorganisms found in raw spices are not harmful, they can cause problems when used in food preparation. As a result, it is they must be ked.

3.1.2.5 Insect infestation

The problem of insect infestation in spices is quite severe.As many as 55 insects, including the drug store, cigarette beetle, and coffee bean weevil, attack spices and spice powders. These insects require a stable environment to live in. Thetropical climate is ideal for their activities, resulting in both qualitative and quantitative losses. Warehouses that are not adequately protected against rodents also cause significant spoilage.

3.1.3 Key Quality Control Points in ~~Preparing Spices~~

Spices can come from the following plant parts: roots, rhizomes, stems, leaves, bark, flowers, fruits, and seeds or the entire plant tops. Spices are often dried and used in a processed but complete state. Another way is by distillng wet or dry raw materials to prepare extracts such as essential oils or using solvents to extractoil and resin. Small-scale processors need to be aware of some key quality control points to produce quality spices, such as:

3.1.3 1 Correct Harvesting Time

A high-quality spice cannot be produced from soft low-quality error material. Harvesting spices at the correct point of maturity is essential for product making quality products. Farmers harvest spices when immature and before their flavour and aroma compounds fully develop. This results in spices with a bad aroma. For good quality spices, avoiding early harvesting and waiting until that is fully mature is good.

Fig 3.1.3 Harvesting crop

3.1.3.2 Cleaning

Spice crops must be cleaned before processing. Unfortunately, these crops are often contaminated by dust, dirt, pesticides, insects, animal hair and droppings and a range of microbes.During the first cleaning stage, dustand dirt are removed using a winnowing basket made locally from bamboo, palm or other leaves. Small machines are also available for cleaning, butthey are rarely cost-effective.

After the crop has been winnowed, it should be washed in water safe for human consumption. It is essential to move quickly while washing the spice so that it does not become soaked in water, lowering its quality.T o avoid recontaminating the spices with dirty water, the washing water must be changed consistently. Because spices are not subjected to heat treatment at a later stage in the processing, pure water is required. More bacteria, which cause food poisoning, are introduced when water is dirty.

3.1.3.3 Drying

This is the necessary processing to ensure good quality spices. Inadequately dried spice produce will lead to mould growth in the spices. The sale value of mouldy spices can be less than 50% of the average value. In addition, the growth of food poisoning bacteria on some spices is realif proper washing and drying are not carried out.

Fig 3.1.4 Drying machine

2.1.3.4 Grading

Food is graded according to its quality, freshness, legal compliance, and market value after being inspected, evaluated andsorted. Foods are evaluated and sorted during food grading, which is frequently done manually.For example, spices can be graded by size, density, colour, shape and flavour. Larger- scale production units make use of machines for this process. It is necessary to obtain the required uniformity of the raw material for further processing.

Fig 3.1.5 Grading machine

Spices Grader

The 100% rotating action of the Spices Grader creates stratification and dispersion of the material to be filtered. On the surface of the Vibrio screen, feed material continuously flows horizontally along a loop pattern. As a result, Vibrio screens offer the best screening and guarantee the highest feed rate and efficiency.

A unique kind of vertically mounted motor with an eccentric at the upper and lower ends of the shaft is used to drive Vibrio screens. While the rotation of the lower weight creates tilt and vibrations in the vertical plane, the rotation of the upper, unbalanced weight causes vibration in the horizontal plane.

3.1.3.5 Grinding

Spices can be sold as whole or ground into powder. Grinding adds value to the product, but it also diminishes the quality of the product. Many consumers are wary of ground spices as grounded spices are often contaminated or adulterated, and it is difficult to determine whether they are pure or have been adulterated. Generally, ground spices are made by grinding inferior and broken spices. Also, ground spices have a much shorter shelf life than whole spices. Once it is grounded, the flavour and aroma of spice soon deteriorate. Therefore, it is always better for a small-scale processor to sell whole spices. This also removes the need for moisture-proof packaging materials and sealing machines.

Figure 3.1.6 Grinding machine

3.1.3.6 Packaging and Storage

After drying, the material should be packed quickly into clean heavy gauge polypropylene sacks to avoid picking up moisture. The spices must be cooled before they are packed into the sacks and stored out of direct sunlight to prevent condensation from forming inside the sack. Workers should not directly handle the spices but should use clean gloves and scoops. Sacks should be labelled and dated.

Fig 3.1.7Packaging and Storage

3.1.4 FSSAI Regulations to be Followed for Manufacturing of Spice and Seasonings

Spice consumption in India is the largest in the world. India has 65 of the 109 spices listed by the International Organization for Standardization. As a result, spices from India are highly sought after worldwide. As spices are in such high demand worldwide, multiple challenges are associated with them, including food sustainability, traceability, and safety standards.

Food safety regulations for spices and herbs intended for export focus primarily on safety and quality, particularly concerning contamination. Considering that Europe and the United States are among the biggest consumers of spices from India, the concept of Corporate Social Responsibility (CSR) and Sustainability is influenced by the concept of ethical and responsible consumption.

To control and maintain the quality of Spices, FSSAI has codified some protocols for 30 spices and condiments, including Cardamom, Chillies, Cinnamon, Cassia, Cloves, Coriander, Cumin, etc. In addition, powdered spices and condiments in the loose form are prohibited by FSSAI.

3.1.4.1 Regulatory standards for Spices laid down by FSSAI

Spice	Description	It shall conform to the following standards:
Cinnamon (Whole)	• Cinnamon (Dalchini) whole means the inner bark of trunks or branches of CinnamomumZeylanicum Blume. It shall have a characteristic odour and flavour and be free from foreign flavour and mustiness. It shall be free from mould, living and dead insects, insect fragments, and rodent contamination. The product shall be free from added colouring, foreign vegetable matter and other harmful substances.	• Extraneous matter not more than 1.0 % of the weight • Moisture not more than 12.0 % by weight • Total ash on a dry basis is not more than 7.0 per cent by weight • Hydrochloric acid insoluble ash on a dry basis not more than 2.0% by weight • Volatile oil content on a dry basis is not less than 0.7 % by volume and weight • Insect-damaged matter not more than 1.0 % by weight
Cinnamon (Dalchini) (Powder)	• Cinnamon (Dalchini) powder is the powder obtained by grinding the inner bark of the trunk or branches of CinnamomumZeylanicum Blume. The powder must be yellowish to reddish-brown with characteristic odour and	• Moisture not more than 12.0 % by weight • Total ash on a dry basis is not more than 7.0 % by weight • Ash insoluble in dilute HCl on a dry basis of not more than 2.0 % by weight

	flavour and shall be free from mustiness and off-flavour. It must be free from moulds, living and dead insects, insect fragments, and rodent contamination. The product must be free from foreign vegetable matter, added colouring matter, and other harmful substances.	• Volatile oil content on a dry basis is not less than 0.5 % by weight
Ginger (South, Adrak)	• Ginger (South, Adrak) whole means the dried rhizome of Zingiberofficialese Roscoe in pieces irregular in shape and size, pale brown with peel not entirely removed and washed and dried in the sun. It can be bleached with lime. It must have the characteristic taste and be flavour-free from musty odour, bitter taste, or rancid taste. It shall be free from mould, living and dead insects, insect fragments, and rodent contamination. The product shall be free from added colouring matter and contamination.	• Extraneous matter not more than 1.0 % by weight • Moisture not more than 12.0 % by weight • Total ash on a dry basis a) Unbleached not more than 8.0 % by weight b) Bleached not more than 12.0 % by weight • Calcium as Calcium oxide on a dry basis a) Unbleached not more than 1.1 % by weight b) Bleached not more than 2.5 % by weight • Volatile oil content on a dry basis is not less than 1.5 % by volume or weight • Insect-damaged matter not more than 1.0 % by weight
Turmeric (Haldi)	a) Turmeric (Haldi) whole means the primary or secondary rhizomes commercially called bulbs or fingers of Curcuma Longa L. The rhizomes shall be cured by soaking them in boiling water and then drying them to avoid regeneration. The rhizome shall be in the natural state or machine polished. The product shall have a characteristic odour and flavour and be free from mustiness or foreign flavours. It shall be free from mould, living and dead insects, insect fragments, and rodent contamination. In addition, it must be free from lead chromate, added starch, and other extraneous colouring matter.	• Extraneous matter not more than 1.0 % by weight • Defective Rhizomes not more than 5.0 % by weight • Moisture not more than 12.0 % by weight • Insect-damaged matter not more than 1.0 % by weight • Test for lead chromate negative

Cardamom seeds	• It should have a characteristic odour and be free of any rancidity and other odour but its characteristic odour.	
Chilly	• It is one of the most significant commodities exported. FSSAI has prescribed that it should not have an edible oil maximum limit of 2% by weight. Therefore, t he product level should specify the quantity and the nature of the oil used.	
Mustard	• It should be free from mould, living and dead insects, insect fragments, and rodent contamination. In addition, the powder shall be free from any added colouring matter.	
Whole Pepper Black	• PepperBlack is the dried form of Piper nigrum L. berries. It is widely used as a spice/condiment in Indian cooking. The berries are generally picked before complete ripening and may be brown, grey or black. It is known for its various nutritional benefits, as well as its flavour enhancing properties in food products.	• Light Berries – Not more than 5.0 per cent by weight • Pinheads or broken berries Not more than 4.0 per cent by weight • Bulk Density (gm/litre) – Not less than 490 gm/litre by weight • Moisture – Not more than 13.0 per cent by weight • Total ash on a dry basis– Not more than 6.0 per cent by weight • Non-volatile ether extract on a dry basis – Not less than 6.0 per cent by weight • Volatile oil content on a dry basis– Not less than 2.0 per cent by v/w • Peperine Content on a dry basis – Not less than 4.0 per cent by weight • Insect damaged matter (per cent by weight) – Not more than 1.0 per cent by weight
Pepper Black powder	• Pepper Black powder is obtained by grinding dried berries without adding other matter. The powder shall have a characteristic aromatic flavour, free from foreign odour, mustiness or rancidity.	• Moisture Not more than – 12.5 per cent by weight • Total ash on a dry basis– Not more than 6.0 per cent by weight • Ash insoluble in dilute Not more than 1.2 per centHCl on a dry basis by weight • Crude fibre on dry– Not more than 17.5 per cent basis by weight

		• Non-volatile ether – Not less than 6.0 per cent by extract on a dry basis weight • Volatile oil content on – Not less than 1.75 per cent dry basis by v/w • Peperine Content on – Not less than 4.0 per cent by dry basis weight

Table 3.1.2 Regulatory standards for Spices laid down by FSSAI

3.1.4.2 Quality Assurance in Spice Processing

Assuring the quality of spices is directly related to getting the best prices and ensuring steady growth in sales, exports, and trade for the spice industry.Therefore, q uality control is a consideration from spice procurement through processing and packaging. Quality standards are established following specifications at every stage of the supply chain, from sourcing through final production.

Spices are valuable commodities that must pass inspection for several quality factors, including flavour, texture, and safety, before consumption. The above specifications are a pproved by spice quality testing and analysis, as are any additions used. It also controls the 3Ps—purchasing, processing, and packaging—and checks for the usage of any dangerous substances.Due to the restricted growth of microorganisms, dried foods typically pose a low risk of contamination. Therefore, most food items are heated, sun-dried, or chilled to prevent moisture from growing. However, spices come with their own unique set of problems. Spices must undergo quality testing at an accredited spice testing laboratory service to keep their colour, texture, and flavour because they cannot be heated and dried like other herbs. Additionally, spice testing ensures that no one ever experiences health risks from food poisoning because of pollutants or contaminants.2.1.4.2.1 Product Parameters to be Achieved in the Spices to be Produced

The four primary stages of quality assurance in the spice sector are as follows:

- By managing the planting and harvesting operations
- Strictly inspecting the quality of the spices being purchased
- Strictly observing the production unit's processing procedures
- Ensuring proper testing during packaging and storage of Spices processes.

Importance of Spice quality testing and analysis

Spice quality testing and analysis areessential for a business in India due to the following reasons, to mention:

- Maintain benchmark standard of spices
- Gain a competitive edge in business
- Gain and maintain a recognised position in the national/international market
- Ensure Continuous process improvements
- Ensure 100% retention of customers

A) The ingredients utilised in the spice sector are:

Some spices include chilli powder, turmeric powder, chaat masala, mustard powder, coriander powder, cumin, fennel seeds, mixed powder, pepper, and poppy.

B) Microbial contamination of spices and herbs

The demand for more delicious foods that are also low in sodium and fat and the popularity of highly spiced cuisine has led to a continued interest in using spices and herbs in food items. Although these condiments are typically added to food goods for their aesthetic qualities, they can frequently be a significant cause of microbial contamination.Therefore, we review studiesexamining bacterial and fungal contamination of spices and herbs.T o prevent food spoilage and food-borne illnesses caused by contaminated spices and herbs, better control in all aspects of the production, processing, and usage of these products is needed. This is because many of the studies we reviewed reported high levels of microbial contamination in spices and herbs.

C) Importance of sensory evaluation of different spices

People decide what meals to eat based on cost, preference, past experiences, and what is healthy. However, probably more crucially, they also consider information from their senses, including look, texture, taste, and smell. These sensory elements may contribute to a food product's appeal, demonstrate its appeal and quality, or satisfy the preferences and needs of essential groups. Therefore, manufacturers may benefit from understanding the sensory components of food goods for product development, marketing, and other claims.

Sensory analysis, also known as organoleptic evaluation, is a scientific technique that offers unbiased information on how consumers perceive things. It can be used to evaluate food and drink beyond regulatory requirements.

Using the senses and statistical analysis to record insights can evaluate food and beverage beyond regulatory standards or general safety and quality issues. With this testing technique, food products' appearance, scent, taste, and texture are all evaluated objectively and systematically.

Quality control, shelf life estimation, product readiness, product success evaluation, flavour profiling, and pinpointing the factors influencing consumer preferences can all be done using sensory analysis. It can be used to make decisions regarding storage or packing conditions, expiration or "best by" dates, product optimisation, and decisions concerning raw materials, components, or additives.

- When evaluating spices using sensory analysis, essential data and insights are obtained that can be used to:
- Ensure that you meet or exceed customer expectations.
- Respond to crucial inquiries regarding your goods that directly impact sales and market performance.
- To inform judgments about present products and product development, consider consumer insights.
- Investigate issues
- Obtain a competitive advantage by evaluating other brands

Grading parameters for some spices		
Spice	**Grades**	**Criteria for grading**
Chillies	Special Good Fair Ordinary	Based on refractions
Cardomom	Special General Fair	On size and weight
Pepper	Special Grade 1 Grade 2	Based on the extraneous matter and light berries
Ginger powder	Single grade	General characteristics
Saffron	Special standard	On extraneous matter, stalks, leaves and colour

Table 3.1.3: Grading parameters for some spices

Sr. No.	Name of Spices	Quality standards (as per AGMARK guidelines)
1	Black Pepper (Whole)	1. Extraneous matternot greater than 3.0% 2. The proportion by weight of light berries and pinheads shall not exceed 10% and 4.0%, respectively 3. The amount of insect-damaged matter shall not exceed 5% by weight
2	Black Pepper (Powder)	1. Moisture: not more than 12.5% by weight 2. Total Ash: not more than 8% by weight 3. Ash insoluble in dilute HCl: not more than 1.3% by weight 4. Crude Fibre: not more than 18.0% by weight 5. Free from any added colouring matter
3	Cardamom (whole)	1. Dried and nearly ripe fruit: percentage of extraneous should not exceed 5.0% by weight 2. The cardamom seeds obtained from the capsules should contain not less than 3.0% of volatile oil 3. The amount of insect-damaged matter should not exceed 5% by weight 4. Free from any added colouring matter
4	Cardamom (small) seeds	1. Seeds obtained by separating from the capsules of fruit - a percentage of extraneous matter in the seeds should not exceed 2.0% by weight 2. The seeds should contain not less than 3.0% of volatile oil 3. The amount of insect-damaged matter should not exceed 5% by weight 4. Free from any added colouring matter

Sr. No.	Name of Spices	Quality standards (as per AGMARK guidelines)
5	Chillies (whole)	1. Dried ripe fruits or pod -the proportion of extraneous matter, including loose tops, dirt, lumps of earth, and stones, should not exceed 5.0% by weight 2. Pods shall be free from extraneous colouring matter, coating of numeral oil and other harmful substances 3. The amount of insect-damaged matter should not exceed 5% by weight
6	Chilli powder	1. Moisture content not more than 12% by weight 2. Total ash not more than 8% by weight 3. Ash insoluble in dilute HCl not more than 1.3% by weight 4. Non-volatile oil extract not less than 12% by weight 5. Condi flour not more than 30% by weight
7	Ginger (whole)	1. In pieces, irregular in shape and size with peels not entirely removed, washed and dried in the sun 2. The proportion of extraneous matter should not exceed 2% by weight 3. On a dry basis should contain not less than 4% of volatile oil 4. If ginger is limed, content shall not exceed 4% by weight on a dry basis 5. The amount of insect-damaged matter shall not exceed 5% by weight 6. Free from any colouring matter.
8	Ginger powder	1. Moisture not more than 12% by weight 2. Total ash not more than 8% by weight 3. Ash insoluble in dilute HCl not more than 1% by weight 4. Water soluble ash not less than 1.7% by weight 5. Cold water soluble extract not less than 10% by weight 6. Calcium not more than 4% by weight 7. Alcohol soluble extract not less than 4.5% by weight 8. Free from any added colouring matter.

Table 3.1.4 Types of spices

Practical

Precautions:

- Ensure that the received raw material meets the standards set by the organisation.
- Record the received spices in the system/ register before sending them for storage.

Observation:

Write your observation here.

Sr no	Name of the spices	Weight of received spices	Stack card updated (yes/no)
1			
2			
3			
4			
5			
6			

Table 3.1.5 Observation

Conclusion:

Write your conclusion here.

Sr no	
1	
2	
3	
4	
5	
6	
7	

Table 3.1.6 Observation

UNIT3.2: Process for Preparing Different Spices and Seasonings

Unit Objectives:

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

1. Discuss the spice manufacturing process for whole spices, curry powders and seasoning

3.2.1 Whole Spices Manufacturing Process:

Spices grown on Indian farms are known for their rich aroma and tasteSo, t he quality control exercise begins at the farms (at the producing centres), where the teams of experts select the best new crop.

Fig 3.2.1. Red chili

Whole spices provide aroma and, most importantly, texture and visual appeal. Basil, Kari leaf, ginger, and Mints, for example, have a strong aroma when fresh due to their highly volatile (essential) oils. Spices lose their essential oils quickly at high temperatures, mainly when processed in an aqueous system. However, they can also be lost at room temperature or cut or bruised. As a result, the flavour of a whole spice is more slowly released than ground spices, especially when subjected to preparation techniques such as frying or roasting, during which the whole spice slightly cracks.

Spices are often used in their dried forms because they are not subject to seasonal availability, are easier to process, havea longer shelf life, and have a lower cost. Therefore, these dried forms are most frequently used for processed products or wholesale usage.

Fig 3.2.2 Flowchartfor whole spicesmanufacturing

Drying:

The drying process is an essential step in producingdelicate quality spices. The quality of the spices during the drying process greatly influences the results of the subsequent steps in production. An improper drying process can result in a loss of aroma and flavour. Drying should be done with the utmost care. It is best to dry the materials in the sunlight.

Fig 3.2.3 Drying of Whole spices

To ensure specified moisture content, the material is roasted whenever necessary.

Drying During the Dry Season	Drying During the Wet Season
Sun drying is usually sufficient to dry produce during the dry season.	During the wet season or periods of high humidity, which often coincide with the harvest of spices, sun drying or solar drying cannot be used effectively. Therefore, a cheap energy source is needed to dry the spices artificially.
It is simplest and cheapest to lay the produce on mats in the sun.	An example is a block of wood or husk burning dryer or a wood burning and solar dryer.
This method has some drawbacks. Dirt and dust are blown onto the crop, and unexpected rainstorms can re-wet it.	It is essential to monitor the temperature and time of drying.
Drying in direct sunlight can adversely affect the colour of some more sensitive spices.	At higher temperatures, volatile compounds responsible for the flavour and aroma are compromised.
Using a solar dryer can solve the contamination and spoilage caused by rain.	

Table 3.2.1 Drying of whole spices

Cleaning:

The most desired quality in any food product is purity. Therefore, scientific methods are used to remove all organic and inorganic impurities. This ensures that the spices will be 100% pure for further processing.

Observation:
Write your observation here.

Sr no	Name of spices	Cleaning is done (Yes/no)	Washing is done (yes/no)
1			
2			
3			
4			
5			
6			

Table3.2.1Observation

Grading

Spices aregraded by size, density, colour, shape and flavour before packaging for distribution. Forlarge -scale units, machines are available for grading the spices.

Fig 3.2.4 Grading Process

Packaging

The packaging should be carried out to preserve the clean, dried spices from contamination and the entry of water or excess moisture In hum id tropical areas, reabsorption of ambient moisture must be avoided. Contamination from mineral oils used in producing natural fibre bags must be avoided whenever possible by using liners. Before reuse, reusable containers must be thoroughly cleaned and disinfected.

3.2.2 Curry Powder Manufacturing Process

Curry powders can contain different spices in varying amounts, making each blend unique. Curry Powder is one of many spice mixtures used in Indian cooking and is specifically used to make curry dishes. Curry powder includes turmeric, hot pepper powder, ground coriander, ground cumin, ginger, and pepper. It can be mild, medium, or hot.Spice mixtures such as Garam Masala, Rasam powder, and Sambar powder are also available. Although they may look similar, t hey should not be confused with each other as they all are different.

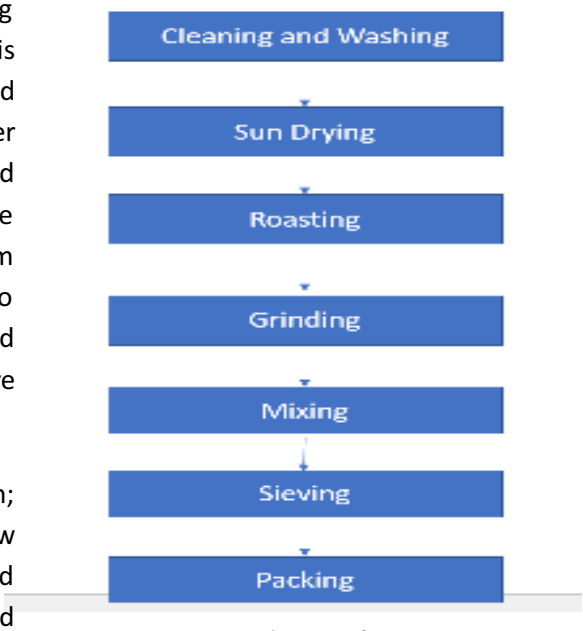


Fig 3.2.5: Curry Powder Manufacturing Process

After cleaning and washing, dry the spices in the sun; the quality of the spice powder will depend on how well-dried the spices are. If proper cleaning and washing are not carried out, bacteria will grow and poison the food.

Roasting

Once the spices have been dried, they are roasted. Roasting the spices is essential because it contributes to the aroma, colour, and flavour of the spice powder.

Grinding:

The correct grinding procedure determines the colour and flavour of spices. During conventional grinding, the volatile oils most essential to maintaining the flavour and taste of spices are destroyed, and the natural colour is faded due to excessive heat generation. For crushing a sm al number of herbs or spices, a mortar and pestare quick to use, and you can control the grind's coarseness. On the other hand, a spice mill or a grinder is convenient and quick for large batches of herbs and spices. In a sizeable industrial set-up, a multi-stage grinding process with a controlled temperature system can

Fig 3.2.6. Various spices

preserve spices in their natural flavour, taste, and colours.Horizontal and vertical hammand roller mills are used for crushing spices to the necessary size.

Following the grinding process, coarse and fine particle materials are pneumatically handled and transferred to the mixing process, where all ingredients are combined according to specifications.

Mixing:

Spice powders can be compressed and mixed to customer specifications by pneumatically connecting grinding equipment to mixers. This can be fully automated in large set-ups and requires no operator interaction. Even when mixing is a batch process, the entire processing system is designed to run continuously. The finished commodities are emptied into the tiny hopper when the mixing cycle is completed. Then, the material is pneumatically carried into the intermediate storage silo/tank.

Sieving:

Sieving spices is a common problem to encounter to get the quality or performance needed. A sieve is used to sift the powder to remove lumps and achieve the desired mesh size. Ground spices need to be sieved since ground spices can retain lumps and granules of varying sizes. The spices can be sieved in various grades, and the impurities can be taken out. The packing and final use of this tiny powder.The measurement of particle size via sieving, an ancient discipline founded on straightforward principles, is a typical practic e in materials testing labs. Since the method relies on each particle being a perfect sphere, the precision of particle sizing by sieving has never been completely clear. Types of Mesh Uses and Material of Mesh

Woven Wire Mesh - Metal wirecreatesa woven-wire mesh invarious weave patterns on huge industrial looms. The wire mesh is sized, soldered, or attached to the frames with high-toughness epoxy adhesives. The life of the sieve is extended by proper tensioning, which guarantees regular apertures, and stops finer wire cloth meshes from sagging and stretching during usage.

Because it is malleable and used to be less expensive, brass wire mesh has traditionally been preferred for sieves. Some hazardous compounds are nevertheless occasionally preferred because of their sparkresistance.The specified holes of stainless-steel mesh are better maintained and significantly more resistant to contamination during processing. Modern tooling makes it simpler to weave, mould, and mount, and it is also less expensive than brass these days.

Non-Metallic Mesh- For special purposes or as a disposable cloth for use in two-part sieve frames, non-metallic mesh woven from polyester or nylon thread is available. This synthetic mesh is practical for uses where the metal mesh is prohibited or could become contaminated.

Electroformed Mesh - The best option for situations where the exact size of fine materials is essential is this pricey and occasionally brittle sieve media. Nickel is electrodeposited on a flat stainless steel grid surface before being used to create the electroformed mesh.

3.2.3 Seasoning Manufacturing Process

Seasonings include herbs and spices, frequently referred to as "to season and flavour are not the same thing", insisting that seasoning includes a large or small amount of salt being added to a preparation. Salt may draw out water or magnify a food's natural flavour, making it richer or more delicate, depending on the dish. This type of procedure is akin to curing. For instance, sea salt (a coarser-grained salt) is rubbed into chicken, lamb, and beef to tenderise the meat and improve flavour. Other seasonings like black pepper and basil transfer some of their flavo urs to the food. A well-designed dish may combine seasonings that complement each other.

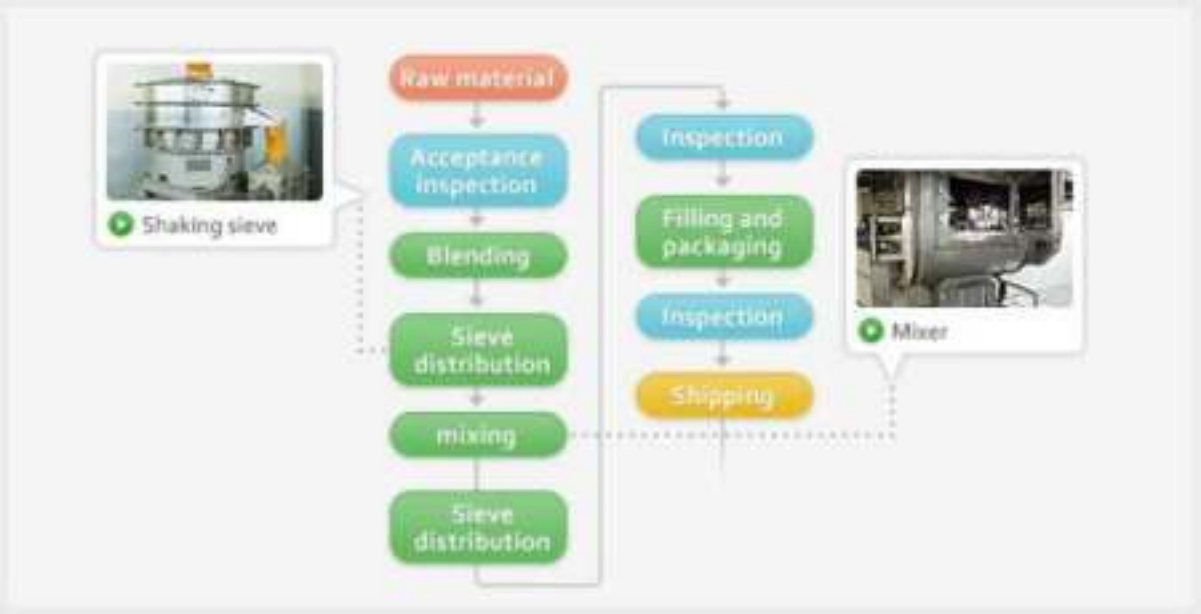


Fig 3.2.7: Seasoning Manufacturing Process

Aside from the herbs and seasonings used, the timing of when flavours are added impacts the food being cooked or otherwise prepared.

In some cultures, meat is seasoned by pouring seasoning sauce over the dish at the table. Seasoning techniques vary by culture. Seasoning means bringing out or intensifying the natural flavour of the food without changing it. Seasonings are usually added near the end of the cooking process. The most common seasonings are salt, pepper, and acids (such as lemon juice). When seasonings are used correctly, they cannot be tasted; their job is to enhance the flavours of the original ingredients.

Fig 3.2.8 Herbs

Oil infusion

Seasoning can also be done with infused oils. Infusions can be done in two ways: hot or cold. Although olive oil is a good infusion base for some herbs, it goes rancid faster than other oils. Therefore, infused oils should be stored in the refrigerator. It is important to note that butter is not a seasoning.

3.2.4 Inspection of the samples for desired parameters

Spices are tested for quality according to several criteria, including physical and microbial parameters, residue levels, toxins, and metal screening.

The following parameters, to name a few, are tested:-

- Acid insoluble ash
- Moisture
- Non-volatile ether extract
- Cadmium
- Lead
- Arsenic
- Coal tar dyes
- Total ash
- Crude fibre
- Scoville index
- Extraneous matter

3.2.5 Basic Troubleshooting of Equipment during Production

Finding the source of a problem and determining the best course of action to restore the production equipment to its operation are the basic steps in the troubleshooting process. Troubleshooting is not only used for completely broken-down equipment. We also employ it when a machine merely fails to perform as expected. Effective troubleshooting is crucial to managing, diagnosing, and repairing equipment.

Regular maintenance and good operation reduce the likelihood of significant failures in production machinery. Nevertheless, there will always be some chance of failure. If you use equipment, it will eventually need to be repaired.

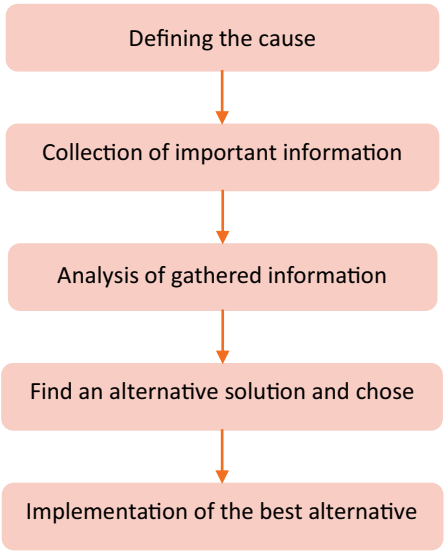


Fig3.2.9 Troubleshooting steps

3.2.4.1 Problems Occurring During Spice Processing and Their Troubleshooting

Troubleshooting of defects:Listed below are ways to remove defects occurring in spice production. Troubleshooting is needed to identify the symptoms. Determining the most likely cause is a process of eliminating potential causes of a problem. Clumping – occurs due to product exposure to moisture. To prevent clumping, store the product in dry airtight jars or use good quality packaging material on the industrial level. Polyester and BOPP-based laminates are most famous for spice packaging.

S No.	Description	Image
1	**Clumps:** The spices' flavour has probably been affected since they may have clumped due to heat or moisture exposure	
2	**Colour variation**: Through natural hues and the size of the seed, flake, or leaf, spices and herbs enhance the appearance of food. Spices and herbs must maintain their colour qualities to minimise food product discolouration. Furthermore, extractives have some heat and freezer stability compared to dried and fresh spices, which are affected by heat and freezing in terms of colour, texture, and flavour. Colour variation - commonly occurs due to soil condition, enzyme activity, moisture content, heat, oxidation and adulteration. It is prevented by adequately monitoring heat and moisture, controlling oxidation by not keeping the product at a high temperature, and checking adulteration by chemical and microbiological testing.	
3	**Particle size variation**: It can occur due to defects in sieving techniques.Particle size variation occurs due to the speed and time difference in the grinder. To prevent its quality assurance and quality checks on regular bases.	

4	**Texture change**: It can be avoided by roasting, which enhances the spices ' look, flavour, colour, texture, and general acceptability. During storage and extended processing, textures are lost. Before adding whole spices to processed meals, preliminary preparations are typically made, such as grinding, roasting, or flaking the spices. Texture change occurs due to the ageing of the product and indicates that they have lost flavour and freshness. It can prevent by proper storage and by increasing shelf life.	
5	**Flavour change**: Natural flavours, natural flavourings, and spice extracts are all used to describe spice extractives. Because of their uniform colour, quick taste release, consistency in flavour and scent, and stability in high-heat applications, food makers frequently employ extractives. In addition, extractives have some heat and freezer stability compared to dried and fresh spices, which are affected by heat and freezing in terms of colour, texture, and flavour. Flavour:- processing may change the spices' chemical compounds, and their proportions often give rise to different flavour profiles.	
6	**Product protection**: Spices must be kept in firmly sealed containers away from light, hot temperatures, and high humidity levels. They stay fresher for extended periods as a result. Product protection depends on the nature of the product. It required more rigid containers or packaging. The layering of packaging material should be good to prevent oxidation or any other chemical reaction between packaging material and product.	
7	**Freshness**: Freshness depends on the packaging of the product. Foil packaging or paper packaging can be used instead of plastic packaging.	

8	**Sustainability** - Sustainable productsbenefit society, the environment, and the economy over their life cycles, from the extraction of raw materials to final disposal, while safeguarding human health and the environment.	
9	**Lubrication**: One of the main reasons for equipment failure is a lack of lubrication. The best option is to have a regular lubrication schedule and possibly a lubrication chart for each machine that specifies the frequency, kind, and locations that need to be greased. For example, a high-speed bearing will need light oil, but a heavy-duty, low-speed bearing will need heavier oil. In addition, modern equipment asks for certain types of lubricants for specific bearings.	

Table 3.2.2 Defects Occurring in Spices and seasonings

UNIT 3.3: Packaging and Labelling of Various Spice Products

Unit Objectives:

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

1. Discuss the aspect of packaging spices and spice products.
2. Explain methods of packaging spices and materials used for packaging.
3. Explain FSSAI standards applicable for the labelling of spice products.

3.3.1 Aspects of Packaging Spices and Spice Products

Various types of packaging are:

1. **Primary Packaging -** Primary packaging, often known as consumer or retail packaging, is the packaging that directly touches the product itself. Therefore, the consumer is protected, preserved, contained, and informed as the major goals of primary packaging.

Fig 3.3.1 Types of Packaging

2. **Secondary Packaging -** The effective uses of secondary packaging are for logistical and branding purposes. The beverage, food, and cosmetic industries frequently employ grouped or display packaging to display primary packs on shelves and safeguard and collate individual units during storage. Retail ready Packaging (RRP), shelf ready Packaging (SRP), and counter-top display units are secondary packaging specifically designed to show multiple product units for sale to accelerate refilling from storeroom to shelf.Due to its crucial role in the marketing funnel, secondarypackaging is typically corrugated cardboard packaging that has been printed to a high degree.

3. **Tertiary Packaging -** To organise everything into unit loads for transit, secondary Packaging or tertiary Packaging makes it easier to protect, handle, and carry several sales units. However, unfortunately, the consumer hardly ever notices this kind of packaging.Knowing the elements influencing spice quality is crucial for choosing an appropriate packaging material for spices and spice products.

3.3.2 Various factors affecting the packaging of spices

- **Infestation of insects -** Due to insect infestation, spices are prone to spoiling, which can be hastened by excessive humidity, heat, and oxygen levels. The issue of the infestation of insects is very crucial.Spices and spice powders are attacked by different species of insects, including drug store beetles, cigarette beetles, and coffee bean weevils. These insects need a stable atmosphere to survive. The tropical environment makes it very easy for them to operate, which causes losses in both quality and quantity. If warehouses are not adequately protected against rodents, they also significantly increase the amount of deterioration.

- **Moisture content -** Spices, especially those in powder form, are hygroscopic by nature and absorb moisture from the air, resulting in sogginess and caking or lumping of the powder. The free-flowing quality of the spice powder is also lost when moisture is picked up.Whole spices do not cause lumping or caking issues. However, greater Relative humidity does cause the creation of a musty odour.

- **Microbial deterioration -** Moisture absorptionoc curs under high humidity conditions (65 per cent and above). Moisture content deterioration brought on by microbial growth begins to occur above a specific point.Although the microorganisms commonly foundi n raw spices may not be hazardous, they can cause issues when used to prepare food. Therefore, it is crucial to inspect them.

- **Loss of essence or aroma -** Spices contain volatile oils that give food its distinctive scent and flavour. Aroma and flavour are lost due to a decrease in volatile oil content or th e oxidation of specific aromatic components.

- **Colour bleaching -** Spices that include natural hues, such as green and bell pepper, green cardamom, turmeric, red chillies, paprika, and saffron, can fade in colour. Oxygen is responsible for this destruction, sped up by light, humidity, and temperature.

3.3.3 Methods of Packaging Spices and Packaging Material

Packaging spices for exports to other countries and domestic markets are diverse. However, the primary purpose of packaging spices is to preserve the very nature of spices during transportation, handling and distribution. Therefore, prevalent and basic packaging methods are discussed below.

The packaging material to be used must be carefully chosen, considering both functional and marketing requirements, to preserve the spices' quality during handling, shipping, storage, and distribution. Following is a list of packaging requirements for spices in general:

- Packaging material must be able to keep the contents from spoiling or spilling.
- Defence against physicochemical and microbiological spoilage caused by environmental factors such as humidity, temperature, light, and oxygen. This necessitates low water vapour and oxygen transmission rates and high light transmissivity.
- Apleasing aroma barrier preventsflavour substance loss from the product and the pickup of foreign odours.

- Excellent resistance to oil and fat.
- Have good machineability characteristics and the necessary mechanical strength properties. Good insect and mite resistance.
- Compatibility with the product packed in terms of tainting and migration, as well as compliance with the food laws of importing and exporting countries.
- Good appearance and printability to aid in sales through attractive graphics addition, it economical, readily available and disposable.
- Packaging Methods & Materials for Spices And Spice Products

3.3.3.1 Large-Size Packaging

Packaging Whole Spices

Fig3.3.2 Packaging spices

Spice Powder

Fig3.3.3Spices packaged in jute bags

Packaging

Fig3.3.4Powdered spices packaged in HDPE/PP woven

3.3.3.2 Unit Packaging

Packaging Whole Spices

Fig3.3.5Polypropylene& glass jar packaging of whole spices sacks

Fig3.3.6Spices Packed in Pouch-in-Carton

Fig3.3.7Spices Packed in tin containers

Spice Powder Packaging

Fig3.3.8Plastic packaging of powder spices

Fig3.3.9packaging of powder spices in glass jar

3.3.3.3 Packaging of Pastes and Dry Spice Blends

Different powdered spices are combined to create spice powders and masala mixtures. Dry spice blends are packaged in a manner that is quite similar to how powdered spices are packaged. In addition to spice powders, some masala mixes include substances like common salt,black salt, etc. This somewhat alters the packaging profile. The addition of salt makes the product more hygroscopic than 70 per cent relative humidity.

Furthermore, different masala pastes are appearing on the market. These pastes are packaged in glass/PET jars for the export market and blister packs with a limited shelf life for the domestic market. Spice powders should have a minimum amount of moisture and a maximum amount of volatile oil for longer shelf life.

The limiting factor for spices' flavour deterioration over light and oxidation is heat-related loss of aromatic flavour. So, more than any other aspect, cryogenic grinding of spices lengthens their shelf life.Many spice powders and mixtures are protected by micro-encapsulation of flavour. Encapsulation is a process whereby particles of a core material made up of chosen components are either uniformly distributed in a solid matrix by adsorption or covered with a continuous layer of a polymer. Micro-encapsulation is defined as when the particle size is smaller than 5,000 m. Many flavour components that are sensitive to light and oxidation benefit from their protection. An edible, non-toxic, inert substance is used as a wall material.

Fig3.3.10 Unit packs for dry spice mixes and paste

3.3.4 Sterilize Spice Produce

The treatment method to deactivate viable microorganisms from objects or products is sterilisation. However, bacterial loads are high on untreated spices, posing food safety and spoilage risks to fresh and processed prepared foods.Processing herbs and spices before use in food systems add value to food quality and safety, especially for ready-to-eat foods that do not receive additional processing. However, adding this extra food safety processing step can degrade herb and spice quality by altering volatile and flavour chemistry and colour.

Pathogens are routinely reduced using several microbial reduction procedures in the industry. Previously, the sterilisation of agricultural food products that were packaged and placed on shelves

without any significant cooking or preservatives relied on the application of chemicals to kill germs that had gathered and developed on or near the surface of the vegetable matter.

Fumigants (ethylene oxide and propylene oxide) and irradiation are two of these methods. The problem with the first of these methods is that the chemicals used typically leave an unpleasant residue or are potentially toxic to the environment when discarded. Ethylene oxide is one such chemical that has been widely used but suspected of being dangerous inspecific amounts.

Fumigation with ethylene oxide (EtO), irradiation, and vacuum-assisted steam are all methods of processing spices and herbs. While EtO fumigation has been shown to significantly reduce microbial populations on spices, some EtO-treated spices have changed in flavour and colour.

Benefits Of Steam Sterilization

- Steam is used in a natural and renewable process widely recognised as safe and healthy.
- Bacteria and pathogens are continuously decontaminated.
- High-temperature, short-time processing (htst) preserves the product's flavour, texture, and colour while minimising volatile oil loss
- Very gentle for leavy products

It is critical to verify that the treatment approach successfully inactivates the targeted pathogen to give a safe product to the user. While safety is crucial, the validated method must also produce a product of comparable quality and pricing.

3.3.5 FSSAI Labelling Requirement of Pre-packaged Species and Products

The Food Safety and Standards (Labelling and Display) Regulations, 2020, provide that specific labelling standards must be followed before distribution occurs. The following details ensure the safety of the consumer and are in their best interest.

3.3.5.1 General Requirement

- The mandatory label requirements specified in the above regulation must be provided to the consumer through appropriate means before the sale when a food product is sold through e-commerce or any other direct selling method, except batch number/lot number, best before, use by date, expiry date, and date of manufacturing/packing.
- Pre-packaged foods may not be described or presented as false, deceptive, misleading, or likely to give the wrong impression about their nature.
- The contents of the declaration that must be published on the labelfollowing these regulations must be written in either English or Hindi using the Devnagri alphabet. In addition to the

languages authorised by this regulation, nothing in this clause prohibits the use of any other language: Furthermore, the information provided in an other language must not conflict with the English or Hindi information on the label.

- Information on the label must be unambiguous, prominent, conspicuous, permanent, and easily readable by the user under typical purchase and usage circumstances.
- Labels on the Pre-packaged food must be applied to prevent separation from the packaging.

3.3.5.2 Labelling Requirement

Every product must have the following information on the label in addition to the general requirements stated above.

- **The Name of Food** - Every package shall carry the name of the food, which indicates the true nature of the food contained in the package, on the Front of the Pack.

Fig 3.3.11 Name of food

- **List of Ingredients** - Except for single-ingredient foods, a list of ingredients shall be declared on the label in the following manner.
  - The list of ingredients shall contain an appropriate title, such as the term Ingredients/List of Ingredients.
  - The ingredients used in the product shall be listed in descending order of their composition by weight or volume, as the case may be at the time of its manufacture.
  - A specific name shall be used for ingredients in the list of ingredients.

Fig 3.3.12 List of ingredients

- **Nutritional information.** - Information about the product's nutritional content (amounts of calories, proteins, trans fats, sugar, and other dietary elements) per 100 g shall be mentioned on the label.
- **Declaration regardingVeg or Non -veg.-** Every package of Non-Vegetarian Food containing ingredients including food additivesand processing aids of animal origin shall bear a declaration to this effect. The symbol shall consist of a brown triangle inside a square with a brown outline having sides not less than the minimum size specified in the regulation. Every package, In addition to vegetarian food, contains The symbol shall consist of a green colour-filled circle inside a square with a green outline having a diameter not less than the minimum size specified in the regulation.
- **Declaration regarding Food Additives.-**Functional classes for food additives shall be declared together with the specific name(s) or recognised International Numbering System (INS) as specified in Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011 in the list of the ingredients.

- **Declaration of name and complete address.-**The name and complete address of the brand owner, whether or not he is the manufacturer, marketer, packer or bottler, as the case may be, shall be declared on the label. Such name and address shall be preceded by the qualifying Version-I (23.09.2021) words "Manufactured by (Mfg by, Mfd by)" or "Marketed by (Mkt by)" or "Manufactured & Marketed by" or "Packed & Marketed by" as the case may be.

- **FSSAI logo and license number.-** The FSSAI logo and license number under the Act shall be displayed on the label of the food package in contrast colour to the background.

- **Net quantity, Retail Sale Price and Consumer Care details**.- Declaration and manner of declarationof Net quantity, Retail Sale Price and Consumer Care details shall be as provided on the label.

- **Lot/Code/Batch identification**.- A batch number, code number, or lot number shall be declared on the label.

- **Date Marking.-**"Date of manufacture or packaging" and "Expiry/Use by" shall be declared on the label. However, Best before" may be used as optional or additional information.

- **Labelling of Imported Foods.-** Labelling requirements for imported products shall be governed by the Food Safety and Standards (Import) Regulations, 2017,and the requirements mentioned in these regulations.

- **Country of Origin for Imported Foods-** The country of origin of the food shall be declared on the label of food imported into India.

- **Instructions for use.-**Instructions for use, including reconstitution, where applicable, shall be included on the label to ensure proper utilisation ofthe food or where such food requires directions for reasons for health and safety.

3.3.13 3 Specimen FSSAI Label of cumin seed

3.3.5.3 Record information on finished products

Food businesses are also required by law to keep records of the creation, processing, packing, distribution, receipt, holding, or importing of food items. Again, the objective is to aid in evaluating whether the food has undergone any changes that could make it dangerous (i.e.,contamin ated). In light of this, businesses must keep records, which government agencies may access.

The food industry also requires food firms to keep records that customers (maybe other food processors?) can access or rely on to confirm that the seller has taken all reasonable precautions to minimise the danger of a foodborne illness. Although the expectations imposed by statutory and regulatory law are the main focus of this website, it is crucial to understand that food buyers also place contractual obligations on food sellers, including the requirement that the seller maintains records that sufficiently demonstrate how the seller handled the product.

3.3.5.4 Need for Record-keeping

Food businesses keep thorough records for various reasons, including to prove that the food was not tampered with or misbranded while in their care by documenting how it was handled and labelled. Businesses that sell food also keep records of who supplied the food (primary source) and who purchased it (immediate subsequent recipient). The facilitation of traceability is the second reason for keeping records.

To help Food Safety Officers efficiently inspect Food Business Operators FBOs, the Food Safety & Standards Authority of India (FSSAI) has created an inspection checklist. The inspection checklists gauge how closely each regulation's requirements are being followed. These inspection checklists have been created for the following industries based on the updated Schedule 4 of the Food Safety & Standards (Licensing & Registration of Food Businesses) Regulation, 2011.

To maintain the record following proformas are recorded and maintained:

- Approved Supplier List
- Incoming Vehicle Inspection Record
- Incoming Material Inspection
- Outgoing Vehicle Inspection Record
- Pest Management Plan
- Pest monitoring record
- Monitoring of Personnel hygiene

Verification of Records

Verification of records is the process of examining their specifics. It involves checking the sufficiency and accuracy of any information that has been recorded.

Unit 3.4:Post-production Cleaning and Regular Maintenance of Equipment

Unit Objectives:

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

1. Understand the importance of cleaning and maintenance of equipment
2. Explain methods of post-production cleaning such as CIP & COP.
3. Explain the basic troubleshooting techniques of production machinery.

3.4.1 Cleaning of Equipment

A. Clean-In-Place (CIP)

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

Tipsfor conducting an effective CIP process

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

B. Clean-Out-Of-Place (COP)

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

Fig 3.4.1 COP

Tips for conducting an effective COP process:

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

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

- Fittings
- Gaskets
- Valves
- Tank vents
- Grinders

C. Sterilising-In-Place (SIP)

SIP is when baking equipment is sanitised after the CIP process. It helps to eliminate any residual microbiological contamination. SIP combines three processes: sterilisation, disinfestation, and sanitisation.

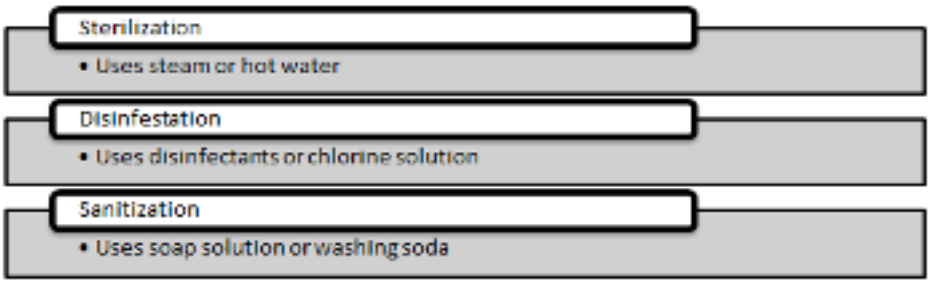


Fig. 3.4.2-SterilisingIn Place

D. Air-Pressure Cleaning

The baking industry follows the air-pressure cleaning method to ensure the cleanliness of regularly used equipment. Refer to the following image for using different novels for air cleaning.

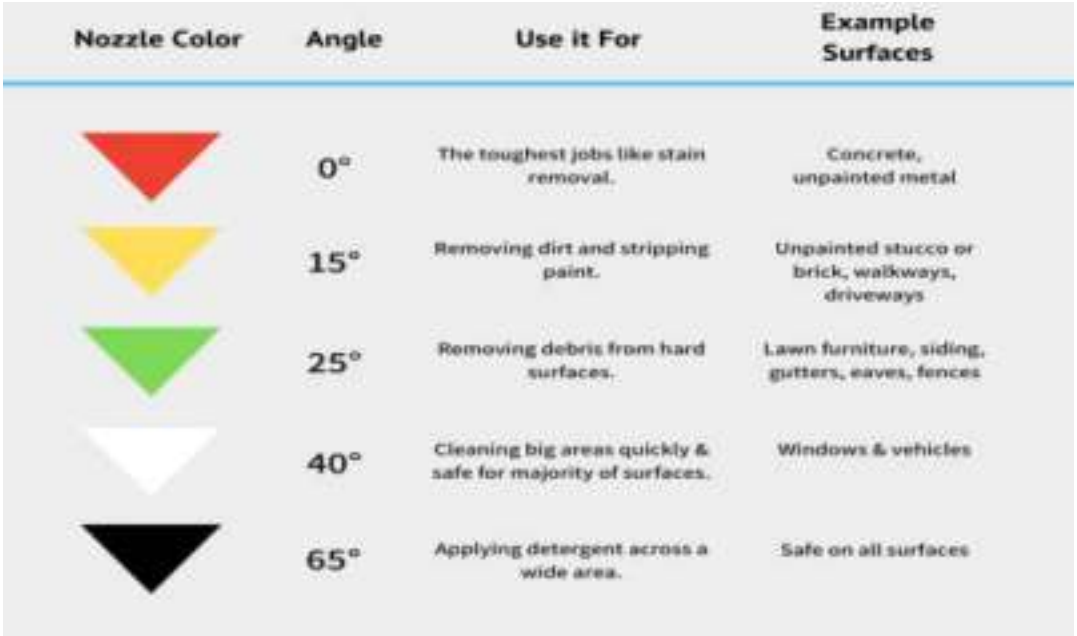


Fig.3.4.3 Air pressure Cleaning

E. Cleaning food residues and unwanted materials from the food processing area-

- It is advisable to remove/clean the food residues and unwanted materials from the unit area to avoid any contamination.
- It is generally done through the dry-cleaning method.
- Residues can be effectively cleaned using two methods:
  - **Manual cleaning**- using broom- dustpan, brushes, and a dusting cloth.
  - **Mechanical cleaning**- using vacuum cleaners, limited compress air, product flushes, and specialised application cleaning tools, e.g. belt scrapers, rotary brushes, and air knives.
- Suppose the residue is sticky, like an oil crust created during the frying processThe scrapping method using sharp scrapers can also be used in that case.
- It is advisable to clean the workspace floor thrice during the working day. In addition, some units also clean the residues every hour.

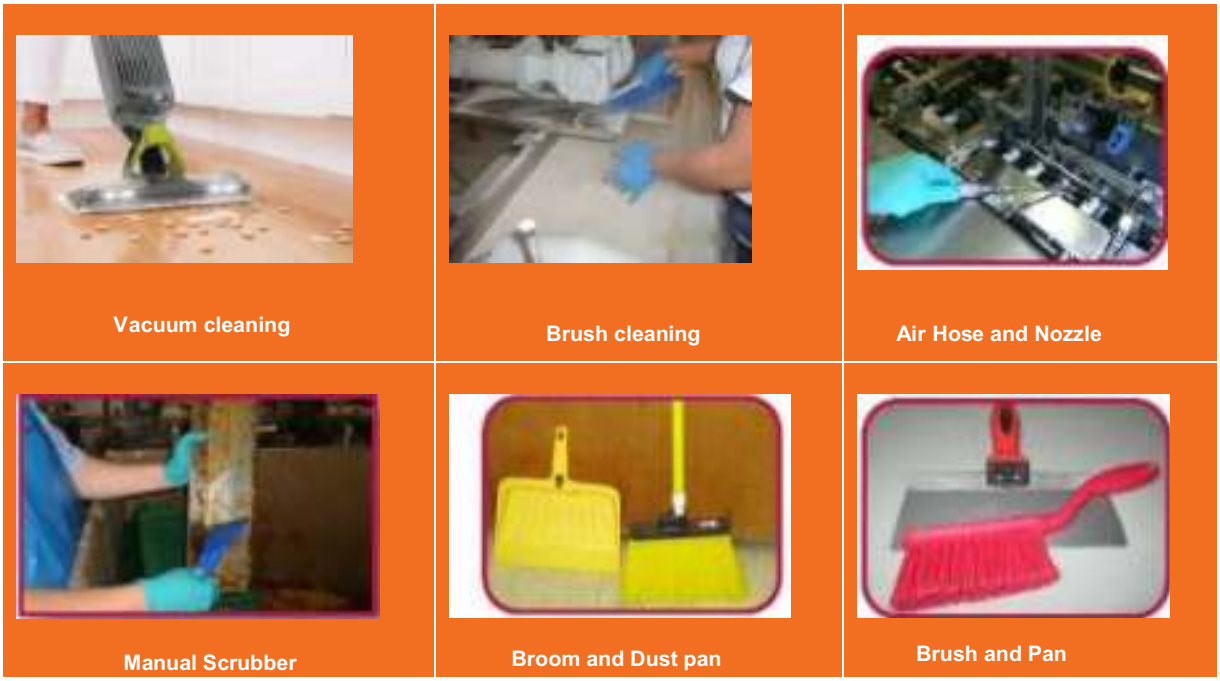


Fig. 3.4.4: Cleaning Equipment for food residue and waste material

F. Wiping Off the Water, Drying and Making Them Free from Moisture

- Airing the surface and equipment is recommended, but even cloth can be used for drying.
- Wiping cloth should preferably be soft (to save from scratches), lint-free, and one-time usable.
- Reusing the wiping cloth can lead to potential contamination and transfer of bacteria from one surface to another.
- Wiping cloth, if reused, should be washed thoroughly using soap or detergents and dried (air-dried, machine dryer or sun-dried) to ensure no bacteria or microorganisms grow on the cloth.
- No damp cloth from earlier cleaning should be reused for wiping at all.
- Wiping should be done gently, and the wiping direction should be up to down.
- Once wiping is done, remove all signboards put during cleaning or disinfecting.
- Wash your hands thoroughly after the job is done.
- The surface has become free from dirt and bacteria and is ready to be used again.

3.4.2 Importance Reporting equipment faults

An employee is in the best position to find equipment problems at work during the working day. Defective, poorly made, or missing equipment can pose risks.Always follow the facility's reporting guidelines so that the proper individuals can take action to address any hazards.

Regardless of the severity of the harm or destruction, every occurrence needs to be considered.

- The reporting system should provide a mechanism to alert the managers of various operations, such as safety, environment, human resources, production, scheduling, maintenance, purchasing, quality assurance, etc.
- Report dangers and occurrences to the immediate supervisor.
- Following the facility's emergency action plan for rescues, evacuations, and other reaction actions until the area is safe is crucial for everyone, including the incident inspection team.
- As soon as the situation is secure, an investigation should begin.
- A reported hazard that puts workers in immediate danger must be looked at immediately. Less severe risks still require attention, but a thorough study may be put off until later.
- The team can begin the investigation before the incident site is reachable by locating and speaking with witnesses.

A report must contain the following:

- Information on what happened, where and when the hazard or incident was reported, etc.
- A description of the possible consequences of a risk, the type of incident, the course of events, the degree of damage, etc.
- Examining the causes of the risk or incidence recommends short-term and long-term activities to eliminate the risk or stop an incident from happening again.
- The reports can be utilised to comply with OSHA's record keeping standards in the event of an illness or injury.

3.4.3 Maintenance of Equipment

Modern food processing and production technology are more complex than ever. However, it entails more significant complications when something breaks or goes wrong.Implementing an efficient preventative maintenance approach will help ensure that your equipment continues functioningcorrectly, reducing the risk of premature failure.

- **Determining the type of maintenance needed**

The plant's maintenance activities should all meetapp lication, efficacy, and profitability criteria. For example, an operation is practical if it can be carried out, efficient if it has a low failure rate, and profitable if it increases output.

- **Determining the need for maintenance**

The systematic execution of a set of predetermined processes is required to create maintenance policies for technological equipment. Therefore, determining maintenance requirements encompasses all of these steps (MRD).

The MRD (maintenance requirements determination) process includes Functional analysis, which serves as the foundation for detailed design and is based on the formulation of system operational requirements and the idea of system or equipment maintenance. MRD needs functional analysis results to discover failure modes, causes, and effects and associated criticality using failure modes, effect, and criticality analysis.

Determining the need for corrective and preventative maintenance requires knowledge of the failure modes and the effects of failure, which are utilised as inputs in the maintenance determination process.

Corrective/Break-down maintenance	**Preventive maintenance**	**Predictive maintenance**
Maintenance of equipment after equipment break down or malfunction is often the most Expensive	Maintenance performed with the intent of avoiding failures, safety violations, and unnecessary production losses and conserving original materials of fabrication	Advances in sensing and computing technology have given rise to "predictive maintenance.'
The worn-out equipment can damage other parts, lead to considerable damage, and increase repair/replacement costs.	The effectiveness of a preventive maintenance schedule depends on the Root Cause Analysis	It uses sensors to monitor key parameters within a machine or system. It uses this data in conjunction with analysed historical trends to continuously evaluate the system health and predict a breakdown before it happens, e.g., line monitoring of bowl speed, motor current, flow rate etc., during the operation of Clarifier / Cream separator / Bacteria removing clarifier.
Higher Machine downtime and Production loss	The maintained history sheet also helps detect problems early and increases equipment life.	The continuous temperature monitoring of bearings or internal motor/transformer windings would enable the operator to take appropriate action even before the equipment is due for preventive maintenance.

Table 3.4.1 Types of Maintaince

Exercise

Question 1. Demonstratethe process of grindingvarious whole spices together to manufacture curry powder.

Question 2. List the final product details on the label in compliancewith the Food Safety and Standards (Labelling and Display) Regulations, 2020.

Question 3. Demonstrate the process of Cleaning-out-of-place w.r.t. the grinder.

Multiple Choice Question

Question 1. Which of the following plant components is NOT used to make spices?

a) Bark
b) Leaf
c) Root
d) Cell

Question 2. Which of the following statements regarding turmeric is correct?

a) Green stems are heated in water until a bubble forms and white rises, producing a unique smell.
b) The curing conditions and technique determine the cooked rhizome's softnesstechnique style.
c) The turmeric hardens after drying.
d) All of the above

Question 3. _____ is the term used to describe the liquid high-aroma components found in spices.

a) Spice Oil
b) Spice Fat
c) Spice Gel
d) Spice Paste

Question 4. Which of the following is a world, new-world spice that has become a regular in Indian cooking?

a) Red pepper
b) Cardamom
c) Ginger
d) Black pepper

Question 5. A clove indicates a _____.

a) Terminal bud
b) Accessory bud
c) Flower bud
d) Vegetative bud

Question 6. Which country produces the most spices in the world?

a) India
b) Pakistan
c) Africa
d) Bhutan

Question 7. The material is _____ after the spices have been dried.

a) Grinding
b) Roasting
c) Packaging
d) Sieving

Question 8. With infused oils, seasoning can also be done in _____.

a) Only Hot
b) Only Cold
c) Hot and Cold
d) None of the above

Question 9. Machine internal cleaning is done using the _____ method.

a) Clean-In-Place (CIP)
b) Standard Isochronous Packet (CIP)
c) Clean-out-of-place (COP)
d) Crop Output Production (COP)

Question 10. The following items and units used in food preparation go through the COP process:

a) Fittings
b) Tank vents
c) Grinders
d) All of the above.

Practical 1

Pre-requisite knowledge:

- Execute the planning for the production of spice products.

Method:

1. Every organisation has a standard operating procedure (SOP) for production.

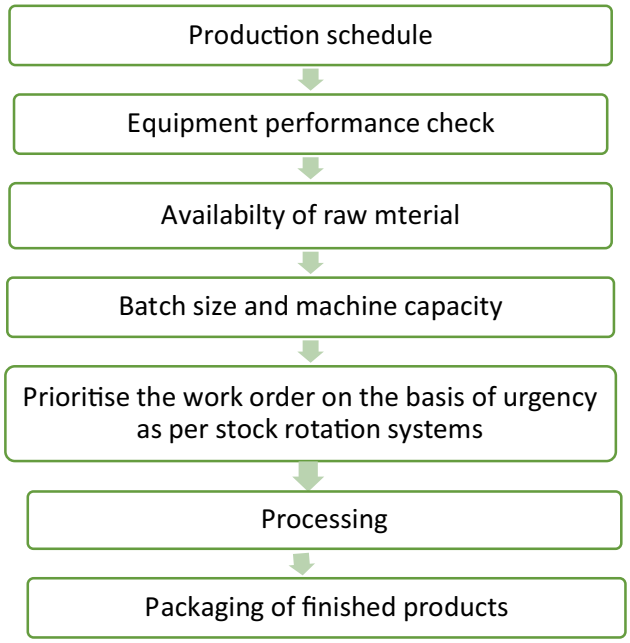


Fig .3 4.5. Production flow chart

1. Check the day's production schedule and note it down in your notepad.
2. Check that the required machineryis performing well and ready for production.
3. Check the availability of raw materials as per the schedule for production.
4. Prioritise the batch or lot delivered urgently per the SOP and stock rotation system (FIFO and FEFO).
5. Identify the packaging material required as per the SOP. Once the product is ready, send it for packing and storing.
6. Arrange for appropriate packaging as specified in the schedule for the finished products.

Precautions:

- Follow the production schedule and the time for each process parameter as specified.

Observation:

Sr no	Planning steps	Equipment to be used	Time to finish the activity (hrs)
1			
2			
3			
4			
5			
6			

Conclusion :

Table P 1.2 write the conclusion in the table

Sr no	Batch details	Batch size	Production time	Quantity of finished products (packaged lots)
1				
2				
3				
4				
5				
6				

Table3.4.2 write observations in the table

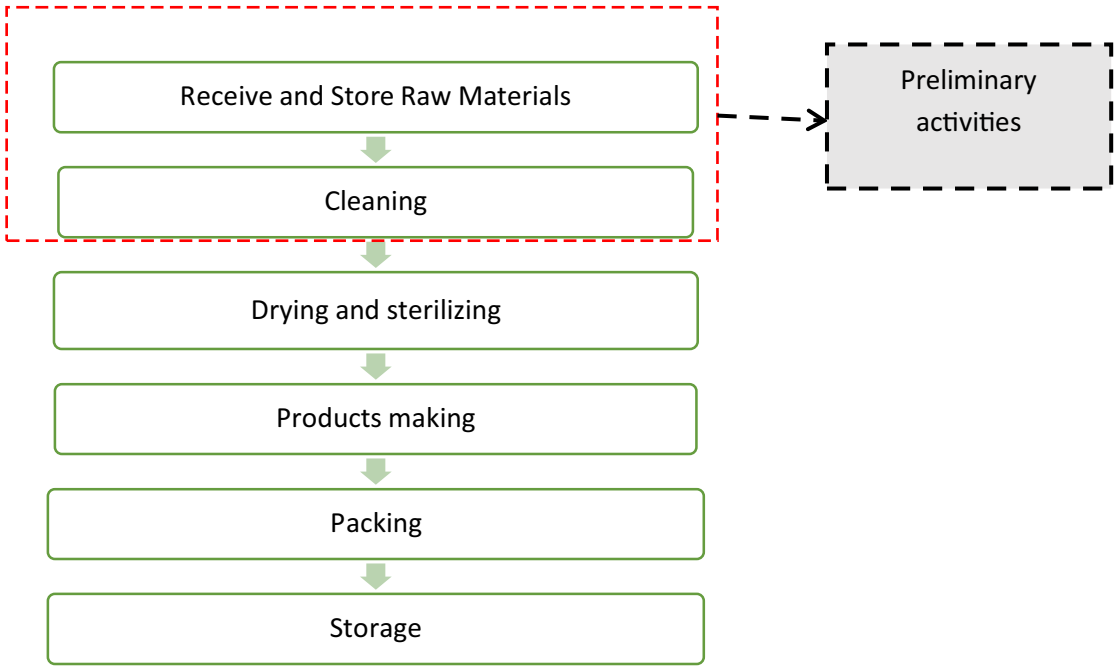
Practical 2

Pre-requisite knowledge:

- Execute the drying method for the production of spices and seasonings.

Method:

1. Check the weather condition before starting the drying process the natural drying process is followed.
- Use the sun drying method if the weather is dry.
- Use artificial or mechanical drying methods if the weather is wet.



Pass the spices in to the mechanical dryer for drying.

Used to remove water or moisture from the spices by forcing either ambient air or heated air through the bulk for rapid drying	

2. Check the moisture content for complete drying of spices.

Sr no	Spice	Maximum final moisture content % (wet basis)
1	Mace	6.0
2	Nutmeg, cloves	8.0
3	Turmeric, coriander	9.0
4	Cinnamon	11.0
5	Pepper, chillies,ginger	12.0
6	Cardamom	13.0

Fig 3 4.7 Mechanical dryer

3. Sterlise the dried spices using asteriliser containing layers of conveyor belts.

To decontaminate spices and spice powder without effecting the quality with a very short contact of high pressure steam (102°C and 122°C)	

Precautions:

- Make sure that the recommended moisture content as per the SOP is achieved for different types of spices selected.
- Ensure that the dried spices are passed through the UV rays completely to remove any bacterial or microbial contamination.
- Ensure that the spices are not overheated during mechanical drying (maximum air temperature for drying = 50^0C).

Observation:

Sr no	Name of dried spices	Moisture content after drying	Sterilisation done(yes/no)
1			
2			
3			
4			
5			

Table 3 4.3 write observations in the table

Conclusion:

Write your conclusion here.

Sr no	
1	
2	
3	
4	
5	

Table 3 4.4 write observations in the table

Practical 3:

Pre-requisite knowledge:

- Produce Spice Products.

Method:

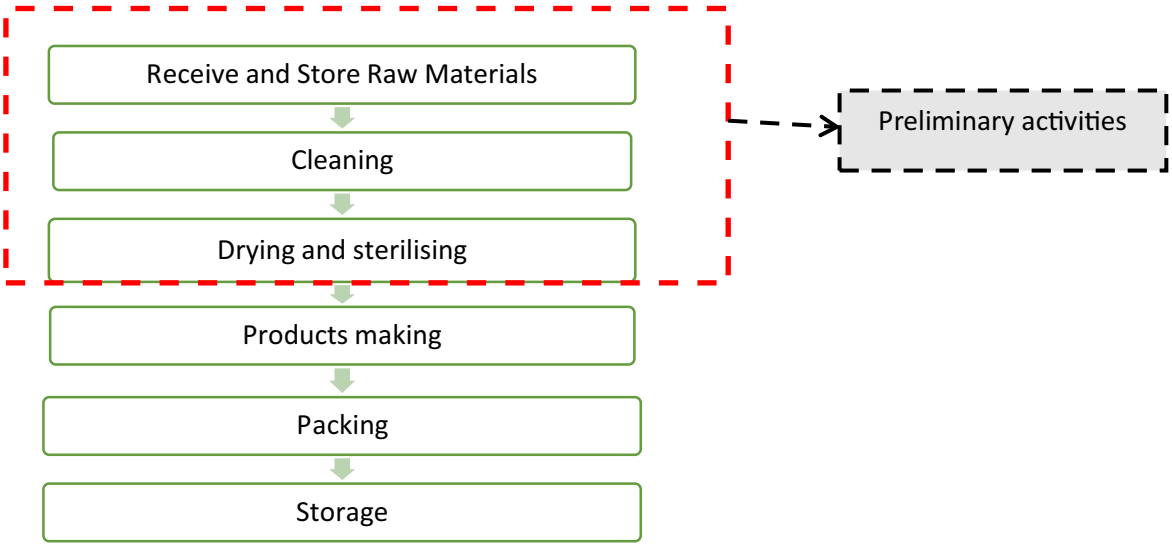


Fig.3.4.7. Spice processing

1. Refer to the process flow given for making spice powders.

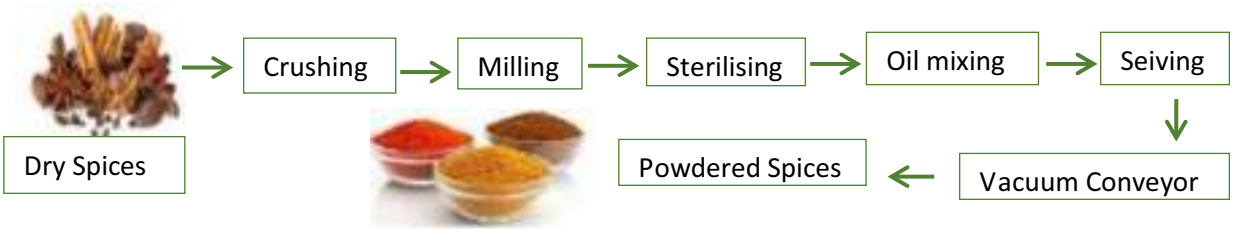


Fig. 3 4.8. Spice powder from dried spices

2. Move the dried spice to the crusher containing two rotary blades which rotates in opposite directions.

Fig. 3.4.8 Cone crushet

It is a compression type of machine that reduces material by squeezing or compressing the feed material between a moving piece of steel and a stationary piece of steel

3. Move the cut spices to the pin mill to reduce the average sized material to fine powder.

Fig. 3.4.9. Pin mill

The two pin discs rotate in opposite directions at a high circumferential speed for producing fine grinds

4. Sterlise the spice powder using a steriliser containing layers of conveyor belts.
5. Ensure that the spice powders are passed through the UV rays completely to remove any microbial contamination.
6. Add oil in the powdered spices (this adds flavour to the powder) with the help oil mixer.

Fig.3.4.10. Oil mixer

Used for proper mixing of oil with powdered spices

7. Using a vibro screen pass the spices through the seive to make sure there are no lumps and get the desired mesh size.

 *Fig.3.4.11. Vibro screen*	 *Fig.3.4.12. Motorised vibratory inclined* screen
Mechanical sifter sieve with circular screens operated with vibration	Vibrating screens operated at an inclined angle to assist material flow

8. After sieving pass the spice powder through the vacuum conveyor to pull the powder completely from sieve.
9. Finally pass the powder to packing machines to be packed.

Preparation of powdered red chilly

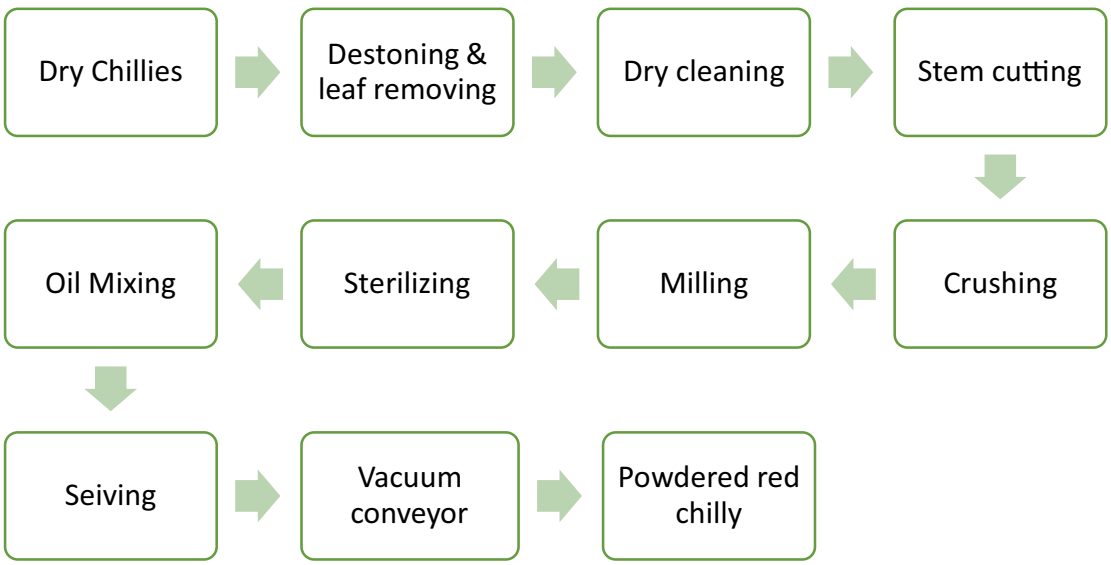


Fig.3.4.12. Process for powdered red chilly

Preparation of powdered turmeric

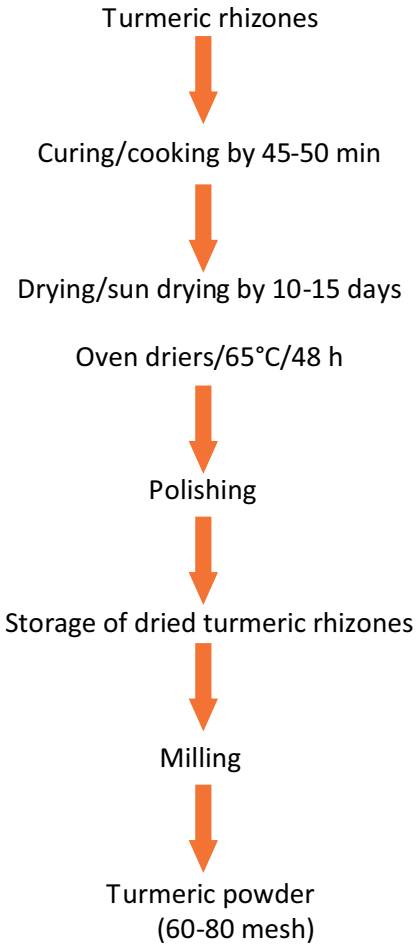


Fig.3.4.13. Process for powdered turmeric

Preparation of garam masala powder

1. Follow the process of making spice powder from dried spices.
2. Take the mix of spices as given in the table for preparation of *garam masala* powder.
   Note: The proportion and the mix of spices for *garam masala* ***varies from organisation to organisation.***The sample proportion given in the table is for 100g of*garam masala* powder. For large quantity processing increase the ingredients proportionately.

Ingredients	Proportion
Cumin seeds	30 grams
Coriander seeds	15 grams
Fennel seeds	10 grams
Black cardamom	20 grams
Green cardamom	15 grams
Black pepper	20 grams

Table.3.4.5. Ingredients for Garam Masala

Precautions:

- Ensure that there is no lump after mixing the oil with spice powders.
- Ensure that the spices are fed between the blades and getting cut into small pieces
- Ensure that the pin mill's air cooling is working well to maintain the temperature of the final product.

Observation:

Sr no	Name of spice	Raw material quantity	Final quantity
1			
2			
3			
4			
5			
6			

Table.3.4.6. Write observations

Conclusion:
Write your conclusion here.

Sr no	Write the processing steps for spice powder from dried spices
1	
2	
3	
4	
5	

Table.3.4.7. Write Conclusion

Practical 4

Execute the packaging of Spices and seasonings

Pre-requisite knowledge:

- Produce Spice Products.

Method:

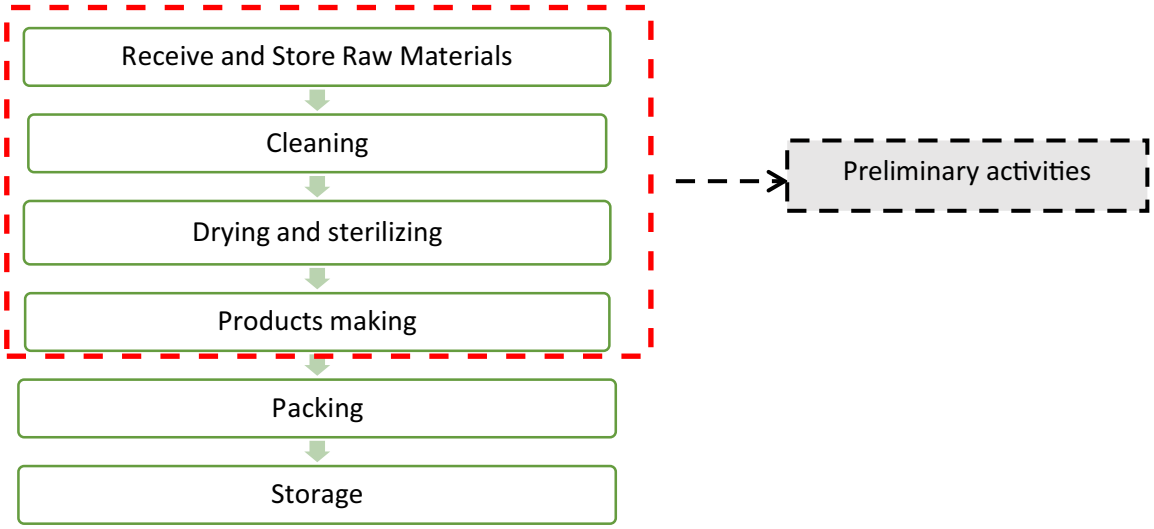


Fig.3.4.14. Spice processing

- Before starting the packing, ensure that final products and packaging material is sterlisied.
- Identify the appropriate packaging as per SOP and send the prepared spice powder for packing

Fig.3.4.15. . Automatic packaging machine

Fig.3.4.16. .Packaging material

Precautions:

- Ensure that final products and packaging material is sterlisied.
- Store the spices in a barrier film such as polypropylene (primary packing) and then in boxes in areas of high humidity to prevent contamination and losses.

Observation:

Sr no	Machinery used	Sterilisation done (Yes/no)	Packing material used
1			
2			
3			
4			
5			

Table.3.4.7.Write observations

Conclusion:
Write your conclusion here.

Sr no	Conclusion
1	
2	
3	
4	
5	

Table.3.4.8.Write Conclusion s

Notes

Scan the QR Codes to Watch the related Videos

Demonstration on Red Chili Powder

Demonstration on Sambhar Powder

Demonstration on Ginger powder processing

Spice adulteration

Demonstration on Ginger powder processing

Demonstration on Turmeric powder processing

Demonstration on Large Cardamom powder processing

Packaging and Storage

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C

FICSI
Food Industry Capacity and Skill Initiative

4. Ensuring Food Safety and Personal Hygiene

Unit 4.1 - Introduction to Food Safety
Unit 4.2 - Schedule IV requirements of FSSAI
Unit 4.3 - Personal Hygiene
Unit 4.4 - Health Safety

FIC/N9901

Key Learning Outcomes

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

1. Identify the hazards, types of hazards (Physical, chemical, biological and Allergenic) and risks at workplace
2. HACCP, TACCP, VACCP, Control measures, CCP, Critical limit
3. Explain the preventions of product contamination
4. Discuss the factors affecting food spoilage and food storage techniques
5. Describe Schedule IV requirements of FSSAI
6. Discuss cleaning and sanitization process, needs and importance and storage of sanitizing materials
7. Discuss health and safety policies and procedures
8. Discuss Employee health do's and don'ts, Food borne illness and preventive health checkups

UNIT 4.1: Introduction to Food Safety

Unit Objectives

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

1. Identify types of hazards and risks at work place

4.1.1 Food Safety

Food safety refers to routines in the preparation, handling and storage of food meant to prevent food borne illness and making food safe for human consumption. Safe food handling practices and procedures are thus implemented at every stage of the food production life cycle in order to curb these risks and prevent harm to consumers.

4.1.2 Food Safety Hazard and Risk

Hazard is a factor or agent which may lead to undesirable effects like illness or injury in the absence of its control, whereas, risk refers to the probability that the effect will occur.

Hazard is that part of food which somehow entered in the food and which is non-consumable.

Types of hazards and risks at work place

There are two types of hazards: one is food safety hazard and second is health safety hazards.

Food Safety Hazard

There are four major hazards that may be introduced into the food supply any time during harvesting, processing, transporting, preparing, storing and serving food. These hazards may be microbiological, chemical, physical and allergens.

Microbiological hazards

When harmful microorganisms are found or grown on food it is called microbiological hazards. Food which contains harmful or pathogenic bacteria when eaten can make people ill.

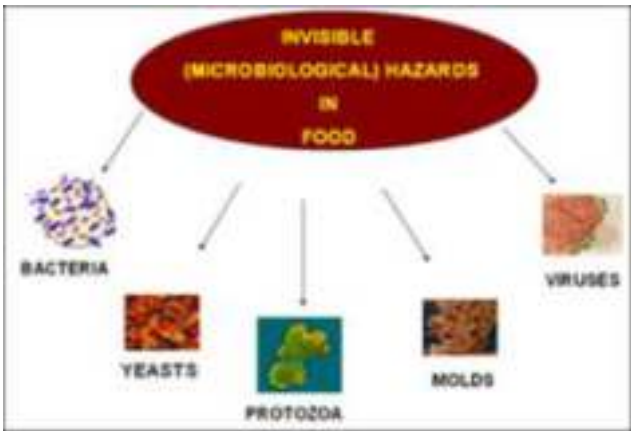


Fig. 4.1.1: Microbiological Hazards

Food spoilage and deterioration is no accident. It is a naturally occurring process. To understand how to maintain the quality of food and prevent spoilage, we need to know what can cause it.

Food spoilage: The microorganisms that can cause food-borne illness are called pathogenic microorganisms. These microorganisms grow best at room temperatures (25-30°C), but most do not grow well at refrigerator or freezer temperatures. Pathogenic microorganisms may grow in foods without any noticeable change in odor, appearance or taste. Spoilage microorganisms, including some kinds of bacteria, yeasts and molds, can grow well at temperatures as low as 4°C. When spoilage microorganisms are present, the food usually looks and/or smells awful.

Fig. 4.1.2: Food Spoilage

FAT TOM- This is a term used commonly in food industry to describe the six favorable conditions required for the growth of the food borne pathogens/micro-organisms.

Fig. 4.1.3: FATTOM Food Safety

Physical Hazards

These include any foreign material, which you would not expect to find in your food. Hair, finger nails, pieces of wood, metal, plastic, glass and insect debris are examples of what can find their way into food as foreign matters.

Fig. 4.1.4: Physical Hazards

Chemical Hazards

Chemical hazards include, food contact materials, cleaning agents, pest control substances, contaminants (environmental, agricultural and process e.g. acrylamide), pesticides, biocides and food additives. They are naturally occurring, intentionally added or unintentionally added.

- Preservatives
- Colours and dyes
- Flavour enhancers
- Water additives
- Packaging materials
- Processing aids

Allergen

An allergen is any protein that is capable of producing an abnormal immune response in sensitive segments of the population.

A known component of food which causes physiological reactions due to an immunological response (e.g.- nuts, gluten, egg, ,milk etc, identified in legislation relevant to country of production or sale)

Fig. 4.1.5: Allergens

It is important to be aware of food allergens in food industry as this is the risk associated with the unintended presence of allergen due to cross contamination and should take this a matter of serious concern. Food allergies can cause serious and even deadly reactions.

What Are the Most Common Food Allergens?

There appears to be eight common allergens accounting for most food allergic reactions. They stand to be- milk, eggs, peanuts, soya, wheat, tree nuts (like walnuts and cashews), fish and shelfish (such as shrimp).

What Are the Signs & Symptoms of a Food Allergy?

The common sign and symptoms are: trouble breathing; coughing; hoarseness; throat tightness' belly pain' vomiting' diarrhe' itchy, wateru, or swollen eyes; red spots; swelling, a dropi in blood pressure and is capable of happening because a person can't digest a substance, such as lactose.

Handling of Allergenic Foods:

The common sign and symptoms are: trouble breathing; coughing; hoarseness; throat tightness' belly pain' vomiting' diarrhe' itchy, wateru, or swollen eyes; red spots; swelling, a dropi in blood pressure and is capable of happening because a person can't digest a substance, such as lactose.

4.1.3 Contamination, Cross Contamination and Prevention

Contamination: The presence of unwanted materials such as dust and particles during the manufacturing and transportation time is called contamination. The term contaminants include any unwanted matter that is found in the product. These contaminants affect the quality of the product or the process.

The most common types of contaminant include:

- Physical contaminant Examples: fiber material, particles, chips from your pill press tooling.
- Chemical contaminant. Examples: vapor, pesticides, grease. detergents, and so on.
- Biological contaminant Examples: fungus, bacteria, virus.

Cross contamination is possible when the unwanted matter is introduced or brought from one process to the next during manufacturing.

A leak in the holding containment would contaminate the product inside it; this would be an example of physical contamination.

Certain metals standing to be more advantageous to health, like iron, appearing to be globally added to some foods, involving infant formulas as well as breakfast cereals, to highlight their dietary advantages.

For biological contamination, bacteria may thrive if the container is not properly cleaned and dried. The contaminated container will then affect the product and microbes may thus be introduced to the batch.

Prevention of Contamination:

- Determine the cause of the contamination
- Anticipate the effect
- Eliminate the source material

- To remove the contaminant carrier:
  - Reduce human involvement
  - Regulate the use of the equipment
  - Regulate the use of air
  - Regulate the use of water
- To reduce human carrier risk:
  - Ensure that proper attire is worn when coming and going from the production area
  - People frequently touch their eyes, nose, and mouth without even realizing it. Germs can get into the food through their contaminated unwashed hands.
- To reduce water as carrier:
  - As water is the number one source for cross contamination, it is important to reduce and prevent water contamination
  - Water borne contaminants: particulates (such as minerals) and pathogens (e. coli, salmonella, etc.)
  - Use of preventive measure such as filtration devices, distillation or reverse osmosis, UV treatments
- To reduce air as carrier:
  - Control air flow through AHUs (Air Handling Unit)
  - Use of air locks
  - Installation of HEPA (High Efficiency Particulate Absorbing Filters) filters
  - Ultra-Low Particulate Air

4.1.4 Storage (Importance of Storing Food at Specified Temperature)

Storage temperature is one of the most important factors in the preservation of food because microorganisms have been found to grow in almost all temperature.

Food storage is a major issue when keeping food safe. Food which is not correctly stored can spoil or become contaminated, which can make people sick. There are very specific rules regarding the temperatures that food must be stored at, cooked to and reheated to and if not followed, the risk of becoming ill as a result of contamination increases.

Room Temperature Food Storage

Keep dry storage areas clean with good ventilation to control humidity and prevent the growth of mold and bacteria. 21°C is adequate for dry storage of most products. One of the first things to check regarding food which has been stored in the 'use-by' or 'best-before' dates printed on the packaging.

These dates will give you the most accurate indication of a food's shelf life, however, when a packet or can is opened, the expiry date almost always changes.

Refrigerating and Freezing Food

To reduce the risk of bacterial contamination, many foods must be stored in the refrigerator and thus kept below 5°C. These foods are often classified as 'high-risk foods' and include – meat, poultry, dairy,

seafood, eggs, small goods and cooked rice and pasta. This also refers to ready-to-eat foods that have high-risk foods as ingredients and include – casseroles, quiche, pasta salad, pizza, sandwiches and many cakes.

By keeping these high-risk foods under 5°C it stops them from entering the 'danger-zone' – temperatures between 5°C and 60°C. The danger-zone is the temperature zone which provides bacteria with the perfect environment to rapidly grow and multiply to numbers that cause food poisoning.

By freezing food its longevity is increased because the water content of the food freezes – this prevents bacteria from multiplying and food spoiling. Food should be kept frozen at –18°C; when thawing, it should be stored in a refrigerator that reaches no more than 5°C until it is ready to be prepared.

4.1.5 Transportation

Selling fresh and high-quality produce is essential in groceries and retail food businesses. That's why the transport and storage of foods is so important, and refrigerated transport is essential to achieve this.

Refrigerated Transportation

Refrigerated transportation is a shipping cargo with advanced temperature adjustment features. It is built and designed mainly for climate-sensitive goods such as vegetables, fruits, meat, all-prep meals, bread, etc. in which the freight is loaded with ice and salt to maintain the food's quality at a particular temperature.

Fig. 4.1.6: Refrigerated Transportation

Ambient Temperature for Shipping

When it comes to cold chain logistics, maintaining ambient temperature tends to mean maintaining a temperature between 15°C to 25°C or 59°F to 77°F. These temperatures fall in the range of comfortable room temperature instead of being on one extreme and of temperature ranges.

4.1.6 HACCP, TACCP, VACCP, control measures, critical control point, critical limit

HACCP (Hazard Analysis Critical control point): It is a systematic approach in identification, evaluation and control of food safety hazards and it's written documented plan based on HACCP principles known as HACCP Plan. It has 12 steps and 7 principles as:-

- Assembly of HACCP Team
- Describe Product
- Identify indent use
- Draw Flowchart / Diagram
- Verify Flowchart/ Diagram
- Conduct a hazard analysis (Principle 1)
- Determine critical control points (CCPs) (Principle 2)
- Establish critical limits (Principle 3)
- Establish monitoring procedures (Principle 4)
- Establish corrective actions (Principle 5)
- Establish verification procedures (Principle 6)
- Establish record-keeping and documentation procedures (Principle 7)

VACCP (Vulnerability Analysis Critical control points):

It focuses on food fraud as well, and widens the scope to include systematic prevention of any potential adulteration of food, whether intentional or not, by identifying the vulnerable points in a supply chain. It is especially concerned with economically motivated adulteration (EMA). Examples include product substitutions, unapproved product enhancements, counterfeiting, stolen goods and others.

TACCP (Threat Analysis Critical control points): generally requires a wider range of employee involvement than HACCP, as it covers issues such as manufacturing plant and transportation security, IT security, and employee background checks. Some points will overlap with HACCP, such as tamper-proof seals and various quality control checks.

Reduce the likelihood (chance) and consequence (impact) of a deliberate attack;

Protect organizational reputation;

Reassure customers and the public that proportionate steps are in place to protect food;

Demonstrate that reasonable precautions are taken and due diligence is exercised in protecting food.

Control: It is means to prevent, eliminate, or reduce hazard.

Control measures: It is means of any action or activity that is used to prevent, reduce to acceptable levels, or eliminate a hazard.

Critical limit: it is means a point, step, or procedure in a food process at which a control measure can be applied and at which control is essential to prevent, reduce to an acceptable level, or eliminate an identified food hazard.

UNIT 4.2: Schedule IV requirements of FSSAI

Unit Objectives

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

1. Identify requirements in Schedule IV in FSSAI

4.2.1 Schedule IV Requirements of FSSAI

To provide assurance of food safety, Food businesses must implement an effective Food Safety Management System (FSMS) based on Hazard Analysis and Critical Control Point (HACCP) and suitable pre- requisite programmes by actively controlling hazards throughout the food chain starting from food production till final consumption.

As per the condition of license under FSS (Licensing & Registration of Food Businesses) Regulations 2011, every food business operator (FBO) applying for licensing must have a documented FSMS plan and comply with schedule 4 of this regulation. Schedule 4 introduces the concept of FSMS based on implementation of Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) by food businesses and is divided into five parts as under:.

Schedule 4	General Requirements
Part 1	General hygienic and sanitary practices to be followed by food business operators applying for registration - Petty food operators and Street food vendors
Part 2	General hygienic and sanitary practices to be followed by food business operators applying for license- Manufacturing/ processing/ packaging/storage/distribution
Part 3	General hygienic and sanitary practices to be followed by food business operators applying for license- Milk and milk products
Part 4	General hygienic and sanitary practices to be followed by food business operators applying for license- Slaughter house and meat processing
Part 5	General hygienic and sanitary practices to be followed by food business operators applying for license- Catering

Table 1.2.1: Five Parts of Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP)

Part II: General hygienic and sanitary practices to be followed by food business operators applying for license- Manufacturing/ processing/ packaging/storage/distribution

- **Location and Surroundings**
- Location shall be:
  - away from environmentally polluted areas
  - away from industrial activities which produce:
  - Disagreeable or obnoxious odor,
  - Fumes
  - Excessive Soot
  - Dust

Well Guarded Entrance of the Plant

Demarcation of the area

Fig. 4.2.1: Location and Surrounding factors

- Smoke
- Chemical or biological emissions
- Pollutants
- Layout and Design of Food Establishment Premises

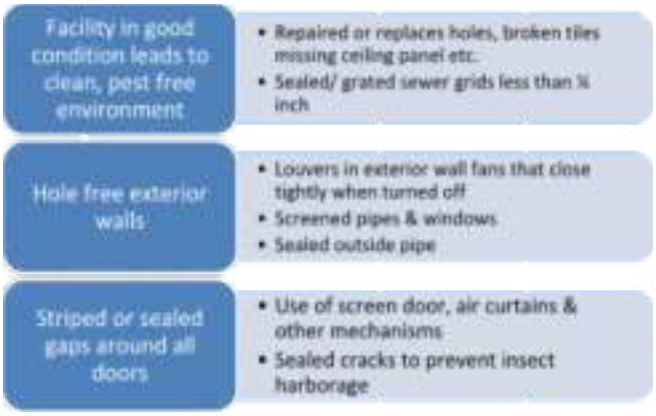


Fig. 4.2.2: Layout and Design factors

- **Equipment and Containers**
  - made up of non-corrosive / rust free material
  - smooth, free from any grooves
  - easy to clean and maintain
  - non-toxic and non-reactive
  - of food grade quality

Fig. 4.2.3: Equipment and Container factors

- **Facilities**
  - **Water supply**
    - Only potable water meeting BIS (Bureau of Indian Standards) standards
    - Appropriate facilities for storage and distribution of water
    - Periodic cleaning of storage tanks and its record
    - Non-potable water, if used, only for cooling of equipment, steam production, fire fighting
    - Distinguished non-potable water pipes

Fig. 4.2.4: Water Supply

- Drainage and waste disposal
  - Disposal of sewage and effluent in conformance with the requirements of Factory
  - Designed and constructed to reduce risk of contamination to food and potable water
  - Separate waste storage area
  - Covered containers for waste storage
  - No accumulated waste in food handling, food storage or other working areas
  - Periodic disposal of waste/refuse
  - Pedal operated adequate size bins for waste collection

Fig. 4.2.5: Waste Disposal

  - Waste bins emptied and washed daily with a disinfectant and dried before next use

Fig. 4.2.6: Drainage System

- Personnel facilities and toilets
  - Facilities for washing and drying hands
  - Supply of hot and cold water
  - Separate lavatories of appropriate hygiene design for males and females separately
  - Suitably located Changing facilities for personnel
  - No direct opening of such facilities in food processing, service or storage area

Fig. 4.2.7: Personal facilities

- **Ventilation and Lighting**
  - Air quality and ventilation:
    - Natural / mechanical ventilation system including air filters, exhaust fans
    - Designed and constructed as such air does not flow from contaminated areas to clean areas
  - Lighting
    - Adequate Natural /artificial lighting
    - Protected lightings to avoid contamination by breakages

Fig. 4.2.8: Ventilation and Lighting

- **Food Operations And Controls**
  - **Procurement of raw materials**
    - Quality raw materials (free of parasites, micro-organisms, pesticides etc.)
    - Raw material conforming to the regulations under the act
    - Records of raw material as source of procurement

Fig. 4.2.9: Procurement of raw materials

  - **Storage of raw materials and food**
    - Adequate food storage facilities to protect food from contamination
    - Cold storage facilities according to requirement
    - Segregation of storage area for raw and processed food, recalled materials, packaging materials, stationary, cleaning materials/ chemicals
    - Separate cold storage of raw food like meat/poultry/seafood product away from the area of WIP (Work in Progress), processed, cooked and packaged products.
    - Monitoring of temperature and humidity
    - FIFO First received (In) materials must move out first
    - Non –toxic containers for food storage
    - Stored on racks or pallets well above the floor and away from the wall

Fig. 4.2.10: Storage of raw materials and food

Review Of Product Label /Packaging Usage And Control

Labels should be reviewed allergens are mentioned don it prior to their receipt for their accuracy. Line Personnel should be trained to ensure labelling is changing when a changeover takes place.

Food Processing / Preparation, Packaging and Distribution / Service

- **Storing at appropriate temperature:** The Food Business shall develop and maintain the systems to ensure that time and temperatures are controlled effectively where it is critical to the safety and suitability of food. Such control shall include time and temperature of receiving, processing, cooking, cooling, storage, packaging, distribution and food service till it reaches the consumer, as applicable.
- **Food Packaging:** Packaging materials shall provide protection for all food products to prevent contamination, damage and shall accommodate required labelling as laid down under the FSS Act & the Regulations there under.
- **Transportation:** All critical links in the supply chain need to be identified and provided for to minimize food spoilage during transportation. Processed / packaged and / or ready-to-eat food shall be protected as per the required storage conditions during transportation and / or service.
- **Management and Supervision**
  - Provision of resources to implement & maintain Food Safety
  - Developing SOPs for processing, packing, dispatch & storage of food
  - Competent Technical Managers & Supervisors:
    - having skills on food hygiene principles & practice
    - taking appropriate preventive & corrective action
    - ensure effective monitoring and supervision.
- **Maintaining Process related records (e.g. production records)**
- **Sanitation And Maintenance of Establishment Premises**
  - Facilities should permit effective cleaning.
- **Cleaning Program**
  - areas to be cleaned,
  - cleaning frequency,
  - procedure,
  - equipment,
  - cleaning material and method

Fig. 4.2.11: Cleaning Program

- **Maintenance**
  - Preventive and Corrective Maintenance
  - Lubricants and heat transfer fluids shall be food compatible Procedure for releasing maintained equipment back to production
  - Maintenance personnel shall be trained in the product hazards associated with their activities

Fig. 4.2.12: Maintenance

- **Pest Control Systems**
  - Report pest infestations immediately.
  - Do not use pesticides/insecticides in food processing area.

Fig. 4.2.13: Fly Catcher and Rodent Traps

- **Personal Hygiene**
  - Health Status
    - Personnel suffering from disease or illness shall not be allowed to enter in food handling area
    - System to report illness or symptoms of illness to management
    - Medical examination of food handlers/ employees once in a year
    - Records of medical examination
    - Factory shall be compulsorily inoculated against the entire group of diseases and recorded
    - In case of epidemic, all workers to be vaccinated irrespective of the yearly vaccination.
  - **Personal Cleanliness**
    - High degree of personal cleanliness by food handlers
    - Food business shall provide to all food handlers;
    - Protective clothing
    - Head covering
    - Face mask
    - Gloves
    - Foot wear

Fig. 4.2.14: Personal Cleanliness

- **Visitors Generally**
  - Generally visitors should be discouraged to go inside the food handling areas
  - The food business shall ensure visitors to its food manufacturing/ handling areas shall;
  - Wear protective clothing
  - Footwear
  - Adhere to personal hygiene provisions envisaged in the respective section
- **Product Information And Consumer Awareness**
  - Batch Identification
    - Identifies producer
    - Product recall
    - Effective stock rotation - FIFO
  - Product Information
    - Adequate information & enables other person in food chain to handle, display, store, prepare & use the product safely & correctly
  - Labeling
    - Should confirm to Legal Requirements
- **Consumer Education**
- **Training**
  - Awareness & responsibilities
  - Training Programmes
    - Nature of food
    - Control Spoilage
    - Handling of food
    - Storage
  - Training Records
  - Instruction & supervision
    - Periodic assessment of training & effectiveness
  - Refresher training
- **Good Manufacturing Practices For Whole Premise**

  Good Manufacturing Practices* (GMPs) are the basic operational and environmental conditions required to produce safe foods. They ensure that ingredients, products and packaging materials are handled safely and that food products are processed in a suitable environment.

  GMPs address the hazards associated with personnel and environment during food production. They provide a foundation for any food safety system. Once GMPs are in place, processors can implement a Hazard Analysis Critical Control Point (HACCP) system to control hazards that may affect the ingredients and packaging material during food processing.

GMPs Address:

Fig. 4.2.15: GMPs Address

- **Environmental control (premises):** Location, design and construction of the building and its interior, equipment, water supply.
- **Personnel practices:** Personal hygiene, hand washing, clothing/footwear/headwear, injuries and wounds, evidence of illness, access and traffic patterns, chemical use.
- **Shipping, receiving, handling, storage:** Inspection procedures for transport vehicles; loading, unloading and storage practices; inspection procedures for incoming products; shipping conditions; returned and defective products; allergen control; chemical storage; waste management.
- **Pest control:** Monitoring procedures for the exterior and interior of the building (ex: surveillance, fumigation) and the use of pesticides.
- **Sanitation:** Cleaning and sanitizing procedures and pre-operational assessment.
- **Equipment maintenance:** Procedures describing preventive maintenance and calibration of all the equipment and instruments that can affect food safety (ex: thermometers, thermocouples, metal detectors, scales, pH meters)
- **Recall and traceability:** Procedures that ensure final products are coded and labeled properly; incoming materials; in-process and outgoing materials are traceable; recall system is in place and tested for effectiveness (ex: procedures for mock recalls).
- **Water safety:** Water safety monitoring procedures for water, ice and steam, and water treatment procedures that ensure it is potable for use in food processing

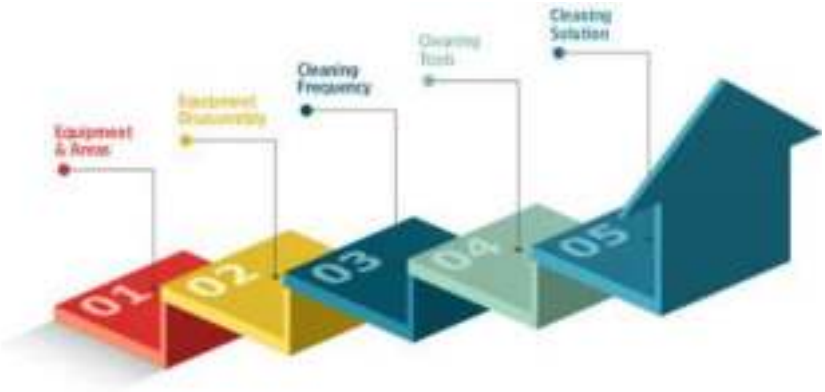


Fig. 4.2.16: Storage of sanitizing materials

Where and How to Store Your Cleaning Supplies

- **Clean, Cool, Dry:** Store your cleaning supplies in an area that is clean and free of debris. Make sure that there aren't any temperature extremes in the area where your cleaning supplies are stored. Another thing to make sure of is that the area is dry.
- **Original Containers:** Keep cleaning supplies in their original containers. If you mix your own cleaners, make sure you use new clean bottles and label them to avoid a mixup.
- **Safe Storage:** Be sure to keep your cleaning supplies stored in places where your children and/or pets will not be able to get to them. Consider higher storage or locked storage options to protect small children and pets.

Cleaning and Sanitization Process, Need and Importance

Workplace Sanitation: Maintaining a clean work environment is critical in preventing foodborne illness. Bacteria can grow on unsanitary surfaces and then contaminate food. Just because a work surface looks clean does not mean that it is sanitary. Always ensure that you clean and sanitize a work area before starting to prepare food.

Cleaning Procedures and Schedules: Cleaning with soap and other detergents is just one step of the cleaning procedure. It is also necessary to sanitize. Cleaning will remove any dirt or grease, but will not necessarily kill any bacteria or other pathogens. Only a sanitizer will kill bacteria and ensure the area is safe for food preparation. Leading sanitizers used in the food service industry are chlorine solutions (bleach), quaternary solutions (quarts), and iodine. Use these materials according to the manufacturer's instructions that accompany the product and that are found on the material safety data sheet (MSDS) using the appropriate personal protective equipment.

A sanitation plan is important in any food service preparation area. It ensures that all surfaces are cleaned on a regular basis and reduces the risks of transferring bacteria or other pathogens from an unclean surface to clean equipment such as cutting boards or tools. A sanitation plan has two components:

- A list of cleaning and sanitizing agents or supplies with instructions on their safe use and storage
- A cleaning schedule, outlining how each item needs to be cleaned, who is responsible, and how frequently it happens

Routine Equipment Maintenance

Refer to the manufacturer's instructions and training provided by your employer or instructor on how to do this safely. Some equipment is intended to be cleaned in place. This should be identified in your sanitation plan and cleaning schedule.

All equipment must be routinely cleaned and inspected. Older equipment may have nooks and crannies where dirt and bacteria can hide, which can be difficult to clean effectively. Proper cleaning procedures must be established and followed at all times with regular review to ensure that procedures are working. If equipment is replaced or cleaning materials change, the process may have to be adjusted. If you notice any safety concerns with the equipment while cleaning it, such as a frayed cord, missing guard or loose parts, let your supervisor know immediately.

- **Good Food Hygiene Practices**
  - Cleaning
    - Food areas and equipment between different tasks, especially after handling raw food shall be cleaned.
    - The surface shall be thoroughly cleaned in case if somebody spills food / water / drink.
  - Raw materials
    - Raw materials shall be purchased from reliable and known dealers and checked for visible deterioration & off-odour, physical hazards and foreign body contamination.

Fig. 4.2.17: 8 Principles based on eight quality management principles

- Cooking
  - The preparation/ processing/ cooking should be adequate to eliminate and reduce hazards to an acceptable level which might have been introduced at the raw food level.
  - The preparation/ processing/ cooking methods should ensure that the foods are not re-contaminated.
  - The preparation/ processing/ cooking of veg. & non-veg. products should be segregated.
  - Whenever cooking or reheating of food is done, it should be hot all the way through, it is especially important to make sure that food is cooked thoroughly.
  - Re-use of cooking oil should be avoided.
  - In case of reheating of oil use maximum three times to avoid the formation of Trans fat. It is ideal to use once if possible.
- Chilling
  - Semi cooked or cooked dishes and other ready-to-eat foods such as prepared salads and desserts having short shelf life should not be left standing at room temperature.
  - Chilled food intended for consumption should be cold enough.
  - Food items that need to be chilled should be put straight away into the fridge.
  - Cooked food should be cooled as quickly as possible and then put it in the fridge.
  - Chilled food should be processed in the shortest time possible.
  - Fridge and display units should be cold enough and as per requirement. In practice, fridge should be set at 5°C to make sure that food is kept in chilled condition. Also, fridge and display units should be maintained in good working condition to avoid food spoilage and contamination.
- Cross-contamination

  Following should be done to avoid cross-contamination.
  - Separation of each crop/species and also processed and unprocessed foods.
  - Hands should be thoroughly washed after touching.
  - Work surfaces, chopping boards and equipment should be thoroughly cleaned before the preparing of food starts and after it has been used.

- Personal Hygiene
  - High standards of personal hygiene should be maintained.
  - All employees handling food should wash their hands properly:
    - before preparing food
    - after touching raw food or materials, specially meat/poultry or eggs
    - after breaks
    - after using the toilet after cleaning the raw materials or utensils / equipments
  - Street shoes inside the food preparation area should not be worn while handling & preparing food.
  - Food handlers should ensure careful food handling & protect food from environmental exposure.
- Transportation and Handling Of Food
  - Food shall be adequately covered during transportation to assure food safety.
  - Transportation vehicles
    - Vehicle inspection
    - Shall not contaminate foods & packaging
    - Should be easy to clean and maintain

- Provide effective protection from dust & dirt
- If required maintain temperature, humidity, atmosphere
- If required allow monitoring of temperature, humidity, etc.
- Should be used only for carrying food.
- Regular maintenance of vehicles is required.
- Appropriate supply chain to minimize food spoilage
- Non-toxic, clean, well maintained food containers during transportation
- Temperature and humidity control during transportation
- Dedicated vehicles for food transportation
- Effective cleaning and sanitation of vehicles between loads carrying high risk foods as fish, meat poultry to avoid cross contamination

Fig. 4.2.18: Transportation and handling of food

- Storage
  - It is very important to store food properly for the purpose of food safety. Following things must be ensured:
    - Raw meat/poultry should be stored separately from other foods
    - Storage temperature of frozen food should be -18°C or below.
    - Storage instructions over food packaging should be followed.
    - Dried foods (such as grains and pulses) should be stored off the floor, ideally in sealable containers, to allow proper cleaning and protection from pests.
    - Store commercial ice cream at temperatures below 0°F.
    - Store biscuit, brownie, and muffin mixes at room temperature.

Stock rotation

The rule for stock rotation is FIFO (first in, first out) to make sure that older food is used first. This will help to prevent wastage. Older product will have nearer shelf life expiry, so older product should be moved out first, but new products will have time to move out since expiry is so far. That's why a rule of FEFO does also exist which means First Expiry First Out. It is called Good Distribution Practice.

UNIT 4.3: Personal Hygiene

Unit Objectives

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

1. Identify types of health and safety policies and procedures

4.3.1 Personal Hygiene

The expression "food hygiene" is often associated to personal hygiene. The concept of food hygiene really refers to the general cleanliness state of the food handlers' body and clothes. Microorganisms can easily pass to food and reach the consumer if the handler comes into contact with any pathogenic microorganism by their clothes, hands, hair, nails, rings and then sets out to prepare food. As so, the personal hygiene of whoever contacts with food, as well as behaviors they assume during its processing, constitute an important preoccupation in the food business. The set of rules, conditions and practices that assure adequate personal hygiene make up the good practices for personal hygiene.

4.3.2 Importance of Personal Hygiene

It is imperative for safe food-handling outcomes for all workers to be familiar with standard sanitation and hygiene practices. One of the basic principles is to break the cycle by avoiding cross-contamination, which can be achieved by ensuring personal hygiene practices are followed.

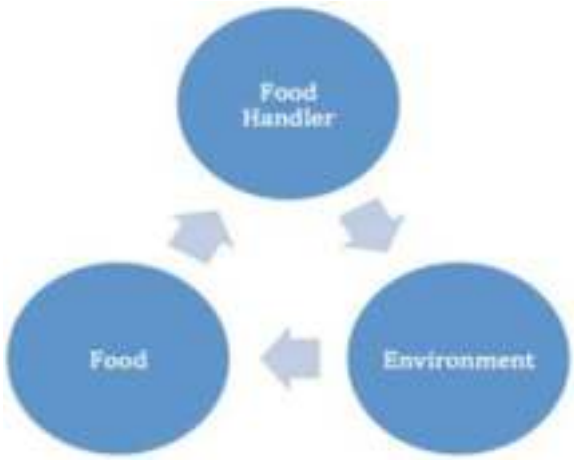


Fig. 4.3.1: Importance of Personal Hygiene

Proper personal hygiene is critical in any food service premise. Personal hygiene includes:

- Showering and bathing regularly
- Keeping hair clean hair and covered or tied back
- Keeping clean clothing and footwear that is used only at work
- Hand washing regularly

Fig. 4.3.2: Personal hygiene

4.3.3 Hand Washing

Proper and regular hand washing is a critical part of any food safety system.

Fig. 4.3.3: Methods of washing hand

How to Use Sanitizer?

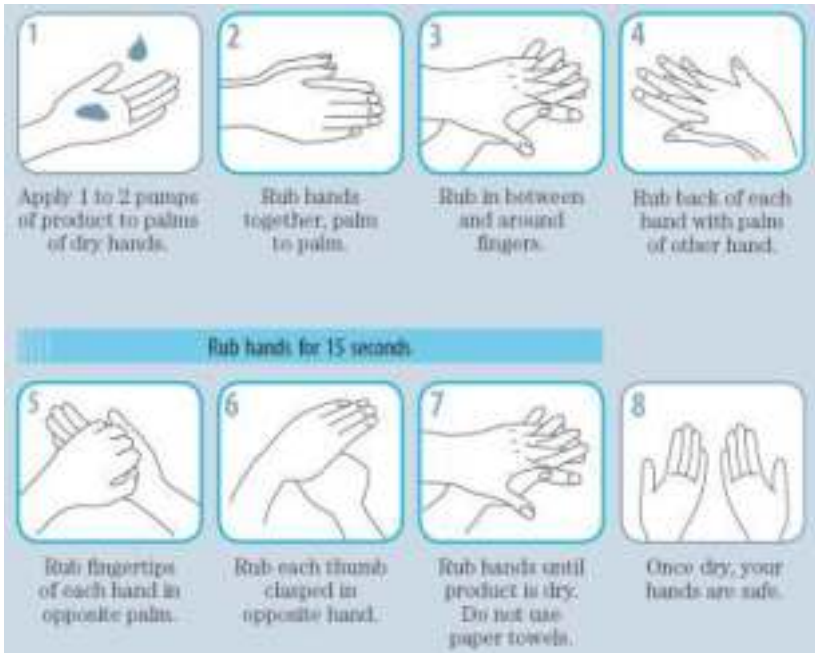


Fig. 4.3.4: Usage of Sanitizer

When to Wash and Sanitize Hand?

Fig. 4.3.5: Times to wash and sanitize hand

We need to stop the spread of COVID-19 in food industry by washing hands regularly with soap and water for 20 seconds – especially after going to the bathroom, before eating, and after coughing, sneezing, or blowing our nose.

4.3.4 Good personal hygiene can prevent food poisoning.

Bacteria that cause food poisoning can be on everyone – even healthy people. You can spread bacteria from yourself to the food if you touch your nose, mouth, hair or your clothes, and then food.

Good personal hygiene also makes good business sense. Customers like to see food-handling staff who take hygiene seriously and practice safe food handling.

- Personal hygiene is important to prevent food poisoning.
- When handling food, wash your hands thoroughly and often.
- If you are sick, do not go to work, because you can contaminate food more easily.
- Food handlers should be properly trained in safe food handling.

Food handling businesses ensure the following factors are considered to ensure personal hygiene:

- **Hand Washing —** ensure effective hand washing techniques are followed at appropriate times
- **Minimise hand contact with food —** try to minimise direct hand contact with raw food by using appropriate utensils and safe use of disposable gloves
- **Personal cleanliness —** cover hair; do not sneeze or cough over food; cover cuts and sores; and do not wear jewellery
- **Wear protective clothing —** wear suitable clean protective clothing and handle appropriately to prevent cross contamination
- **Exclude ill staff —** staff must report illnesses; exclude staff with vomiting or diarrhoea

UNIT 4.4: Health Safety

Unit Objectives

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

1. Illustrate the concept of health safety
2. Understand the hazards of health safety
3. Explain the health and safety policies and procedures
4. Describe the personal protective equipment
5. Discuss the types of personal protective equipment

4.4.1 Health Safety

The term Health and Safety is generally used to describe Occupational Health and Safety, and relates to the prevention of accidents and ill health to employees and those who may be affected by their work.

4.4.2 Health Safety Hazards

Safety hazards exist in every workplace, but how do you know which ones have the most potential to harm workers? By identifying hazards at your workplace, you will be better prepared to control or eliminate them and prevent accidents, injuries, property damage, and downtime.

First of all, a key step in any safety protocol is to conduct a thorough safety hazard assessment of all work environments and equipment

In a safety hazard assessment, it is important to be as thorough as possible because after all, you can't protect your workers against hazards you are unaware of and unprepared for. Avoid blind spots in your workplace safety procedures by taking into consideration these 3 types of workplace hazards:

- **Safety hazards**

  Safety hazards are number one on the list of 3 types of workplace hazards. These hazards play an effect on employees who work directly with machinery or in construction sites. Safety hazards are unsafe working conditions that that can cause injury, illness, or death.

  Safety hazards are the most common workplace risks. They include:

  Fig. 4.4.1: Safety hazards

  - Anything that can cause spills or trips such as cords running across the floor or ice
  - Anything that can cause falls such as working from heights, including ladders, scaffolds, roofs, or any elevated work area.
  - Unguarded and moving machinery parts that a worker can accidentally touch.
  - Electrical hazards like frayed cords, missing ground pins and improper wiring
  - Confined spaces

- **Ergonomic hazards**

  Ergonomic safety hazards occur when the type of work, body positions, and working conditions put a strain on your body.

  Ergonomic Hazards include:

  - Improperly adjusted workstations and chairs
  - Frequent lifting
  - Poor posture
  - Awkward movements, especially if they are repetitive
  - Having to use too much force, especially if you have to do it frequently
  - Excessive vibration

Fig. 4.4.2: Ergonomic Hazards

- **Work organization hazards**

Safety hazards or stressors that cause stress (short-term effects) and strain (long-term effects). These are hazards associated with workplace issues such as workload, lack of control and/or respect, etc.

Examples include:

- Workload demands
- Workplace violence
- High intensity and/or pace
- Respect (or lack thereof)
- Flexibility
- Control or say about things
- Social support or relations
- Sexual harassment

4.4.3 Health and Safety Policies and Procedures

Overview

The law says that every business must have a policy for managing health and safety.

A health and safety policy sets out your general approach to health and safety. It explains how you, as an employer, will manage health and safety in your business. It should clearly say who does what, when and how.

4.4.4 What is Personal Protective Equipment?

Personal protective equipment, commonly referred to as "PPE", is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.

Employers are also required to train each worker required to use personal protective equipment to know:

- When it is necessary
- What kind is necessary
- How to properly put it on, adjust, wear and take it off
- The limitations of the equipment
- Proper care, maintenance, useful life, and disposal of the equipment

If PPE is to be used, a PPE program should be implemented. This program should address the hazards present; the selection, maintenance, and use of PPE; the training of employees; and monitoring of the program to ensure its ongoing effectiveness.

4.4.5 Types of PPE

Head protection

Examples of head protection equipment:

- Helmets;
- Hard hats;
- Hair nets

Hand protection

Examples of hand protection equipment:

- Work gloves and gauntlets;
- Wrist cuff arm nets.

Eye and face protection

- Safety glasses and goggles;
- Eye and face shields;

Fig. 4.4.3: Eye and face protection

Respiratory Protection

This type of PPE must be present when being in contact with large amounts of gases, powders, dust and vapors.

Fig. 4.4.4: Types of Respirators

Hearing protection

Examples of hearing protection equipment:

- Earplugs and defenders;
- Noise meters;
- Communications sets;
- Acoustic foam.

Foot protection

As examples of foot protection equipment can be pointed out the following ones:

- Safety boots and shoes;
- Anti-static and conductive footwear.

Height and access protection

As examples of height and access protection equipment can be mentioned in the following ones:

- Fall-arrest systems;
- Body harnesses;
- Lowering harnesses;
- Rescue lifting;
- Energy absorbers and others

Fig. 4.4.5: FSSAI dos and don'ts for food handlers

First aid kit

The kit should be kept in an accessible location and /or close to areas where there is a higher risk of injury or illness. The first aid kit should provide basic equipment for administering first aid.

Pictograms

Not only is preparing your workshop for accidents a smart thing to do, it is even smarter to organize your workshop in such a way that no serious accidents can take place. A simple way to make your workshop safer is to use pictograms: indicating flammable materials, the necessary use of hearing protection, indicating emergency exits.

Health and Safety Policy

FBO is committed to the goal of providing and maintaining a healthy and safe working environment, with a view to continuous improvement. This goal is only achievable by adherence to established objectives striving to exceed all obligations under applicable legislation, and by fostering an enthusiastic commitment to health, safety and the environment.

In particular:

Management, working in cooperation with the Joint Health and Safety Committee, will strive to take all reasonable steps to reduce workplace hazards to as low as reasonably achievable.

Supervisors and managers are held accountable for the health and safety of all employees under their supervision. This includes responsibility for applicable training and instruction, appropriate followup on reported health and safety concerns, and implementation of recommended corrective action.

FBO is committed to providing all necessary training and instruction to ensure that appropriate work practices are followed on the job, and to promote their use off the job.

Health, safety, the environment and loss control in the workplace are everyone's responsibility. Company expects that everyone will join in our efforts to provide a healthy and safe working environment on a continuous day to day basis.

Importance of Preventive Health Checkups

No matter what age group you are a part of, regular preventive health tests are essential for each one of us.

Whether one is feeling fit from within or is still in his early years of life, a preventive health checkup is an important practice that one must inculcate in his or her daily life.

- It can detect developing disease and prevent them
- Increase better chances for treatment and cure
- Can identify health issues early and prevent them
- It helps to improve lifestyle and increase productivity at work.

FSSAI Format for health check up

PERFORMA FOR MEDICAL FITNESS CERTIFICATE FOR FOOD HANDLERS

(FOR THE YEAR .....)

(See Para No. 10.1.2, Part- II, Schedule - 4 of FSS Regulation, 2011)

It is certified that Shri/Smt./Miss..... employed with M/s....., coming in direct contact with food items has been carefully examined* by me on date ..... Based on the medical examination conducted, he/she is found free from any infectious or communicable diseases and the person is fit to work in the above mentioned food establishment.

Name and Signature with Seal
of Registered Medical Practitioner /
Civil Surgeon

***Medical Examination to be conducted:**

1. Physical Examination
2. Eye Test
3. Skin Examination
4. Compliance with schedule of Vaccine to be inoculated against enteric group of diseases
5. Any test required to confirm any communicable or infectious disease which the person suspected to be suffering from on clinical examination.

Fig. 1.4.6: Format for health check up

Medical examination to be concluded –

1. Physical examination
2. Eye Test
3. Skin examination
4. *Compliance with schedule of vaccine to be inoculated against enteric group of diseases
5. Any test required to confirm any communicable or infectious disease which the person suspected to be suffering from on clinical examination

* Vaccine to be inoculated against enteric group of diseases shall be decided by the medical practitioners in accord to remove the ping to the list as declared by the municipal corporation of that area.

Summary

- Food safety refers to routines in the preparation, handling and storage of food meant to prevent food borne illness and making food safe for human consumption. Safe food handling practices and procedures are thus implemented at every stage of the food production life cycle in order to curb these risks and prevent harm to consumers.
- It is important to be aware of food allergens in food industry as this is the risk associated with the unintended presence of allergen due to cross contamination and should take this a matter of serious concern. Food allergies can cause serious and even deadly reactions.
- The presence of unwanted materials such as dust and particles during the manufacturing and transportation time is called contamination. The term contaminants include any unwanted matter that is found in the product. These contaminants affect the quality of the product or the process.
- Refrigerated transportation is a shipping cargo with advanced temperature adjustment features. It is built and designed mainly for climate-sensitive goods such as vegetables, fruits, meat, all-prep meals, bread, etc. in which the freight is loaded with ice and salt to maintain the food's quality at a particular temperature.
- The retail food industry plays a significant role in assuring a safe food supply for its consumers. At the retail level, activities to control food safety risks can be divided into four key areas: the supplier and source of foods and food ingredients; in-store practices and procedures; education and training of employees and food handlers; and consumer engagement.
- Good Manufacturing Practices (GMPs) are the basic operational and environmental conditions required to produce safe foods. They ensure that ingredients, products and packaging materials are handled safely and that food products are processed in a suitable environment.
- Maintaining a clean work environment is critical in preventing foodborne illness. Bacteria can grow on unsanitary surfaces and then contaminate food. Just because a work surface looks clean does not mean that it is sanitary. Always ensure that you clean and sanitize a work area before starting to prepare food.
- The rule for stock rotation is FIFO (first in, first out) to make sure that older food is used first. This will help to prevent wastage. Older product will have nearer shelf life expiry, so older product should be moved out first, but new products will have time to move out since expiry is so far. That's why a rule of FEFO does also exist which means First Expiry First Out. It is called Good Distribution Practice.
- The expression "food hygiene" is often associated to personal hygiene, being many times limited to the care of washing hands. The concept of food hygiene really refers to the general cleanliness state of the food handlers' body and clothes.
- Health and Safety is a term that generally covers the legal requirements that fall under the Health and Safety at Work Act etc. 1974. The term Health and Safety is generally used to describe Occupational Health and Safety, and relates to the prevention of accidents and ill health to employees and those who may be affected by their work.

Exercise

A. Answer the following questions briefly.

1. _____ refers to routines in the preparation, handling and storage of food meant to prevent food borne illness and making food safe for human consumption.
   a. Food Safety
   b. Fire Safety
2. _____ is a factor or agent which may lead to undesirable effects like illness or injury in the absence of its control, whereas, risk refers to the probability that the effect will occur.
   a. Threat
   b. Hazard
3. The presence of _____ materials such as dust and particles during the manufacturing and transportation time is called contamination.
   a. wanted
   b. unwanted
4. _____ is one of the most important factors in the preservation of food because microorganisms have been found to grow in almost all temperature.
   a. Storage temperature
   b. Hazard temperature
5. Selling fresh and _____ produce is essential in groceries and retail food businesses.
   a. low-quality
   b. high- quality

B. Answer the following questions by choosing the correct option:

1. What are the most common types of contaminant?
2. Outline the layout and design of food establishment premises.
3. Explain VACCP
4. What are the facilities provided by water supply?
5. What are the two components of the sanitation plan?

Notes

_____

_____

_____

Scan the QR Codes to Watch the related Videos

Introduction to schedule 4 Part1

Introduction to schedule 4 Part2

Basic storage and transportation

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C

FICSI
Food Industry Capacity and Skill Initiative

5. Managing Accidents and Emergencies

FIC/N9901

Key Learning Outcomes

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

1. Recognize the types of hazards, risks as well as accidents
2. Categorize the standard precautions and practices
3. Examine the utilization of the electrical equipment
4. Explore the usage of personal protective equipment
5. Recognize the organizational protocols
6. Monitor the ways to handle the toxics
7. Identify fire prevention and fire extinguisher
8. Evaluate CPR as well as the artificial respiration
9. Discuss the evacuation and rescue
10. Catalogue the first aids
11. Understand the ill health as well as potential injuries
12. Demonstrate the precautions in mobility
13. Discuss the significance of various types of hazard and safety signs

UNIT 5.1: Hazard, Risk and Accidents

Unit Objectives

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

1. Identify the types of hazards, risks as well as accidents

5.1.1 Types of hazards, risks and accidents

Hazard is considered a sort of incident or source that can fundamentally harm something, whether in a living or non-living state. It states to be significant to identify the hazard and the amount of risk or impact it would create on its surroundings. Thus, an individual must be prepared from the initial stages to manage such occurrences.

It is important to control workplace hazards by eliminating and identifying the capable risks. This is required as it is capable of causing accidents or hazards, along with finding the access based on the ways to isolate the risk which can lead to the hazard.

To ensure the safety of an individual and the workplace surrounding, an individual requires to regularly participating in the safety drill, which is conducted at their specific times.

Types of Hazards:

- **Safety Hazard:** A safety hazard is among the most common dangers found in every workplace. A safety hazard is capable of causing specific serious injuries or damage to the industrial workers. The safety hazards perform a practical part on the employees who have regularly contacted the heavy equipment or machinery throughout their working hours.

  Some of the safety hazards which lead to accidents in the workplace tend to include:

  - Anything capable of causing a fall, such as floor holes or opening walls, slippery surfaces, unprotected edges, and ladders which is unsafely situated.
  - Heavy-duty mechanisms, which is seen to be usually present in every industry, such as construction, manufacturing, mining and so on, can sometimes be the cause behind the accident. It is due to loose machinery parts, sharp edges, hot surfaces causing severe cuts, burns and wounds.
- **Chemical Hazards:** Chemical substances are seen to include but are also not restricted to acidic substances, petroleum products, reagents, acids, flammable liquids and many more.
  - Acidic substances are firmly alkaline in their state as they tend to possess properties to damage the accidental arrival in contact with the other substances by forming a chemical reaction.
  - The petroleum products generate gasoline such as Butane, Propane, Kerosene, and LPG as they are incredibly flammable hazards and can damage on a larger scale.
  - Acids occur to be more hazardous, relying on their corrosive materials. The common acid includes Hydrochloric Acid, Sulphuric Acid, and Nitric Acid.
- **Biological Hazards:** Biological hazard is also known as the biohazard and is connected to the biological substances that lead to sickness and illness in humans during its occurrence in direct contact.

  Sources through which the biological hazard might include are:

  - Bacteria, viruses, insects, plants and humans are capable of being the hazard carrier that adversely impacts their health, causing skin irritation and can also lead to serious infections, like Tuberculosis, AIDS, and carcinogenic infection.

- Toxins from biological sources stand to be extensively poisonous in their state as they are manufactured by harmful animals and plants, such as snake venom toxins and botulinum toxins.
- The most recent example of the biological hazard is the outbreak of Covid-19.

- **Physical Hazard:** A physical hazard is the least common hazard at the workplace and is not limited only to physical presence. Extreme weather conditions or unfavourable working environments are the major causes of physical hazards.

  Physical hazard has a prolonging effect on the health of the workers. These types of hazards are generally unrecognizable, like:

  - The temperature can also be a cause of danger for the workers who attempt to work indoor as well as outdoors, having the factors such as overexposure to heat and cold leading to some serious illness like heat stroke, sweaty palm increasing the risk of accident, frostbit hypothermia which can eventually lead to death also.
  - Harmful radiation like micro-waves, radio-waves, electro-magnetic waves, and so on.

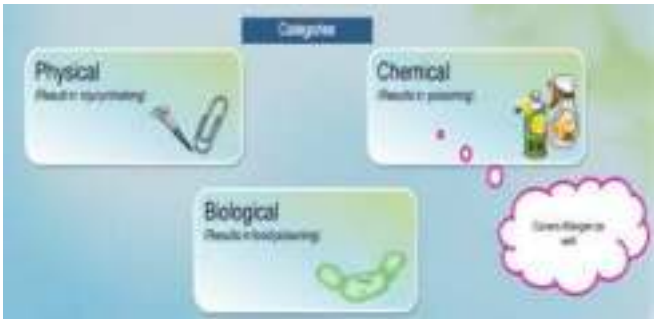


Fig. 5.1.1: Examples of physical, Chemical, Biological hazards

- **Ergonomic Hazard:** An ergonomic hazard is a type of hazard that adversely affects the workers' physical health, having continuous work leading to lower back pain, joint pains, muscles ache, and ligaments pain.

  Ergonomic hazards may include:

  - Poor sitting or standing postures.
  - Improperly adjusted chairs and workstation height.
  - Too much vibration or loud noise in the workplace.
  - Frequent lifting of heavyweights.
  - Prolong working conditions demanding physical force

- **Work Organization Hazard:** Work organization hazard usually defines the issues related to the workplace such as;
  - Excessive workload
  - Inappropriate behaviour of peers
  - Bullying
  - Lack of mental support
  - Work-related stress

Fig. 5.1.2: Sources of different types of hazards

5.1.2 Hazard Identification and Risk assessment

Risk Assessment (RA) and environment review (ER) were done for hazard and environmental impact. It is done from different stages, from evaluating a new operation, modification to the existing facilities, maintenance work and others.

RA identify all safety and health hazards – Including Operational, mechanical, electrical, chemical, biological and ergonomic for ER indicate the environmental aspects and impacts taken into consideration.

Review and update of R.A and ER to be done under following circumstances: -

- Amendments/addition in legal, corporate and other voluntary requirements.
- Change in process or product handled or new developments/ modifications in activities/ products/ services.
- Occurrence of the accident, emergency
- While initiating any corrective and preventive actions
- While purchasing and erecting any new equipment/ machinery/ building

UNIT 5.2: Standard Practices and Precautions

Unit Objectives

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

1. Categorize the standard precautions and practices

5.2.2 Standard Practices and Precautions

- Hand hygiene- Physical, Chemical or Biological hazard
- Usage of personal protective equipment- Safety hazard
- Respiratory hygiene/ Cough Etiquette- Biological hazard
- Sharp Safety- Safety hazard
- Safe injection practices- Biological or Physical hazard
- Sterile instruments and Devices- Biological or Physical hazard
- Avoiding ergonomic hazard

- **Hand hygiene:** Washing hands regularly is a significant step towards cleanliness, protecting us from various diseases and infections. Washing hands can keep us healthy well as it protects us from viruses capable of travelling from one person to another person. Germs and bacteria are the only host which comes from touching the nose, eyes with dirty hands, or eating/cooking food with smeary hands.
- **Usage of Personal Protective Equipment**
  - Personal protective equipment, or PPE, protects its user against any physical harm or hazards that the workplace environment may present. It is important because it exists as a preventative measure for industries that are known to be more hazardous, like manufacturing and mining. Some of the personal protective equipment are: gloves, masks and eyewear.
- **Respiratory Hygiene / Cough Etiquette:** One should follow the below guidelines to maintain respiratory hygiene.
  - Covering the mouth and nose with a cloth or elbow while coughing or sneezing.
  - Throw the used tissues in a separate bin.
  - Washing of the hands or sanitizing before touching the nose or mouth
- **Sharp Safety:** Sharp objects such as needles, lancets, and surgical knives must be handled with utmost care to prevent injury or spread of infection.
- **Avoiding ergonomic hazard:** Headsets, monitor stands, and adjustable chairs are just some devices that can be easily integrated into a workspace to diminish the risk of injury from repetitive motions. Awkward locating refers to positions in the body when a person deviates significantly from a neutral position while performing tasks.

UNIT 5.3: Uses of Electrical Equipment

Unit Objectives

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

1. Examine the utilization of the electrical equipment

5.3.1 The Utilization of the Electrical Equipment

Electrical equipment is generally that equipment that requires electrical supplies for their operations. It generally consists of several small components in an enclosed form and is controlled by a power switch. It tends to include:

- Electric switchboard
- Distribution board
- Circuit breakers and disconnects
- Electricity meter
- Transformer

Fig. 5.3.1: Different type of electrical equipment's

Hazards Related to Electrical Equipment's

The five hazards described here are very common and easily preventable.

- Working on live circuits
- Skipping Lockout/Tagout. It is also known as LOTO, which disconnects electricity and avoids electrical hazards.
- Forgetting PPE.
- Improper grounding.
- Damaged extension cords.

Fig. 5.3.2: Electrical hazard symbols

UNIT 5.4: Usage of Personal Protective Equipment

Unit Objectives

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

1. Explore the usage of personal protective equipment

5.4.1 The Usage of Personal Protective Equipment

Personal protective equipment is majorly used to protect oneself from serious accidents or illnesses originating from the workplace's physical, biological, chemical, and mechanical hazards.

Personal protective equipment includes:

Fig. 5.4.1: The usage of personal protective equipment

Importance of PPE in Food Industry

Protective Clothing Reduces Injury and Contamination Risks. In the food manufacturing units, workers are at a surprising risk of exposure to harsh and toxic chemicals, which can cause further contamination of the food product. Also, PPE importance can be identified during working at height to avoid slip, trip and fall.

UNIT 5.5: Organisational Protocols

Unit Objectives

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

1. Recognizing the organizational protocols

5.5.1 The Organizational Protocols

Accidents are unplanned experiences resulting in injuries, illness, death, and loss of property and/or production. While there is no way to avoid accidents, some actions, plans, and preparations are capable of being taken to diminish them.

Knowledge of the Hazards

- Be aware of the environment. Look around and recognize workplace risks that are capable of causing harm.
- Look for manners to diminish or eliminate hazards and implement them.
- Report unsafe areas or practices.
- Dress for the weather.
- Use the EHS (Environmental Health & Safety) Job Hazard Analysis devices to recognize hazards linked with job sorts.

Originate a Safe Work Sector

- Keep an orderly job place. Poor housekeeping is capable of causing safety hazards and serious health. The workplace's layout requires to have accurate egress routes as well as be debris' free.
- Take breaks as well as mobilize around regularly all through the day. Short breaks (moving around and standing up) can make a big distinction in combating the threats of residing in a static position all day long.
- Pay attention to workstation ergonomics.

Use Safe Lifting Techniques

- Follow the following safe lifting practices:
    - Lift from a position of power
    - Keep the load close
    - Use a staggered stance
    - Cable/Rope/Slings in good repair
    - Hoist chain/Rope free of kinks and twist
    - Hooks not deformed or damaged and safety latches intact
    - Display of testing date, capacity and safe working load
    - Do not attempt to twist while lifting
- Training in body mechanics can reduce strain injuries and keep employees safe during moving and lifting.
- Regular Interaction
    - Notify supervisors regarding the safety hazards
    - Speaking up as well as being included in safety strategizing.
    - Constantly cultivate a safety level
- Training as well as Education
    - Make sure for everyone who possesses the appropriate safety training linking to the job's

threats.

- Take benefit of Environmental Safety and Health online training events.
- Each employee's responsibility is to take an active role in maintaining safety.

Emergency Preparedness Plan

Nowadays, many organizations, including the food industry, also implement their emergency preparedness plan, which includes hazards identified during their past years of operation; possible weather or climatic condition; spillages during operational activities, etc. Hazards can be classified as low, moderate and significant impact on the organization based on the geolocation of the unit.

Incident Reporting and Investigation

Incident

It is an event that causes damage to equipment material or other property. It may or may not be accompanied by human injury. It can be categorized as: -

- **No Injury Incident / Dangerous Occurrences**

  Fire– An incident in which a fire broke out which has the potential of causing burn injury to humans or damage to property.

  Near Miss– An incident that has the potential for causing an injury to humans or damage to property but narrowly escapes
- **Industrial / Injury incident:** An incident is a sudden and unforeseen event, attributable to any cause, which happens to the person, arising out of or in this course of his or her work and resulting in an employment injury to that person.
- **Major Incident** An incident results in a human fatality, permanent disability or extensive loss of equipment or materials.
- **Lost Time Incident**- Human injury incident prevents the person from doing his work for more than 48 Hrs.
- **Minor Incident–** An incident that causes minor injury to a human which may prevent him from undertaking his work up to 48 Hrs.
- **First Aid Case–** An injury incident that requires a person to go to a dispensary for a one-time treatment and/or any follow-up visit for observation of minor scratches, cuts, burn, splinters or other minor industrial injuries which do not ordinarily require medical care.
- **Unsafe Act:** The violation of a commonly accepted safe procedure or practice which resulted in the incident or was against the safety guidelines. Examples are operating without authority, operating at an unsafe speed, making safety devices inoperative, posture or unsafe position, failure to use personal protective equipment. Etc
- **Unsafe condition:** The condition which has the potential to cause injury/harm & damage to property material/ environment or process, improper guarding, defective tools/ equipment, hazardous arrangement or process, Improper ventilation, high temperature/dust Noise.

Incident Investigation

- Persons investigating any incident should collect all information, evidence regarding the situation under which the incident; this shall also include the condition of the persons, physical and mental conditions.
- The investigation should be based on fact-finding, and immediate causes of incidents are listed in two groups (Unsafe Condition and Unsafe Act). The investigating team shall find out and note down. The investigation team shall attempt to list all unsafe conditions and all unsafe behaviours on personnel.

UNIT 5.6: Dealing with Toxics

Unit Objectives

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

1. Monitor the ways to handle the toxics

5.6.1 The Ways to Handle the Toxics

Toxics are chemical substances that can cause serious harm to the person if he/she comes directly in its contact. One should be extra careful while handling such substances and an organisation must have clear labelling, separate storage rooms and proper guidelines for its usage.

- **Exposure hazards:**
  - **Contact or Absorption:** It can cause when a person comes in direct contact with toxic substances. It can result in drying or defatting of skin, skin irritation, or redness.
  - **Inhalation** occurs when a person inhales the fumes or vapour of toxic substances. It can cause shortness of breath, sore throat, coughing, an effect on the nervous system, and irritation during the breath.
  - **Ingestion:** It occurs when people accidentally consume toxic material. It can result in diarrhoea, vomiting, indigestion, effect on the functioning of the liver and kidney.

- **Storage requirement:**
  - Toxic substances must be stored in designated storage compartments only.
  - It should be stored under the optimum condition as prescribed. Always take the material in desired quantity and never put the used or remaining material in the original container.
  - One should always look for an alternative before using the toxic agent.
  - Only authorised
  - Personnel should be given access to the storage compartment.

- **Labelling requirement:**
  - Toxic substances or materials should be labelled in clear and readable format and proper usage instructions.
  - Work areas should be labelled properly where toxic substances are used regularly or excessively.
  - Always label the emergency contact number near the storage and the work area.

- **Spill and accident procedures:**
  - In case of a spill or accident, immediately alert the people in that area and inform the supervisors.
  - Evacuate the area and seize the entry.
  - Inform the relevant authority in case of leakage or spillage in larger quantities.
  - The trained professional of designated staff should only perform cleaning of toxic spillage.
  - Usage of absorbent while cleaning the corrosive or other harmful liquid.
  - Usage of neutralizing agent while cleaning the acidic, toxic substances.
  - Never touch the toxic substance with naked hands.

- **Waste management:**
  - Toxic waste must be segregated separately in accordance with its nature.
  - It should be managed separately from other wastes.
  - Flammable chemicals, acids should be disposed of carefully and separately in order to prevent any type of accident or injury.
  - Never dispose of the toxic substance in an open area.
  - It should always be disposed of in a leak-proof and airtight container.

Fig. 5.6.1: Waste disposal process for a different type of waste

UNIT 5.7: Fire Prevention and Fire Extinguishers

Unit Objectives

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

1. Identify fire prevention and fire extinguisher

5.7.1 Fire Prevention and Fire Extinguisher

Prevention from fire is necessary to avoid excessive damage. Their major goal remains to educate the workers on the ways to prevent the environment from fire.

To prevent the workplace from fire, we must enforce the following measures:

- Workers should be highly trained for the mock drill.
- No smoking signs around the highly flammable liquid and gases.

Causes of fire

- **Flammable and combustible liquids:** This requires proper storage and handling in order to prevent the occurrence of fire which must be stored under a well labelled and closed container to avoid any accident.
- **Liquified Petroleum Gases:** LPG gas has a low density and is heavier than air. It usually accumulates in low lying areas so that the workers are warned if they tend to find any leakage or hole in the cylinders. Moreover, they must not use fire; instead of that, they are capable of utilizing soapy water and finding out the bubbles.

Prevention of the Casualties from Fire

- **Fire Alarm Devices:** These are the devices used to warn people during fire and smoke or any other types of fire emergencies. These alarms are automatically activated once smoke and heat are detected. It should be installed on the telephone desk and the employer's entrance in order to evacuate promptly.
- **Fire Extinguisher:** It is a lifesaver device that is used to control small fires as well as in emergency situations. It should not be used in indented fire issues if it is reached to the walls, ceiling or where there is no route for escape.

  Placement of fire extinguishers at workplace or organization must include.

  - The fire extinguisher should always be placed or mounted on a wall and should be properly marked.
  - Employees should be well trained with PASS methods or firefighting.
  - The fire extinguisher should always be kept at the ease of location to all employees.
  - Vehicles should also carry out one ABC rated extinguisher in case of emergency.
  - All extinguishers should be well marked and labelled and should be clearly visible.
  - All extinguishers should be inspected on a monthly basis, and their place it has not tampered with.
  - For the point of safety, all extinguishers should be examined yearly or required to be refilled in order to ensure operability.
  - A tag should also be attached to ensure its maintenance or refilling date and the signature of the authorized person.

- **Fire Extinguisher Classes:** There are four types/classes of fire extinguishers, which are most common, i.e., A, B, C and D, where every class is capable of putting out a varied sort of fire.
  - Class A extinguishers would be capable of putting out fires in ordinary combustibles such as wood and paper.
  - Class B extinguishers are utilized for flammable liquids like grease, gasoline and oil.
  - Class C extinguishers are used only for electrically energized fires.
  - Class D extinguishers are used on flammable metals.

Fig. 5.7.1: Types of fire extinguishers

Uses of Fire Extinguishers

Once it is installed in the workplace or industry, it is important for every employee to get familiar with the usage and the direction of fire extinguishers so as to be well prepared for the sudden occurrence of any hazardous incidents and accidents. Fire extinguishers are relatively easy to use in case of small fires by using some simple technique called PASS.

Fig. 5.7.2: Pass technique for Fire Extinguisher use

Fire Hydrant/ Fire Hydrant Pump

Fire hydrant consists of a system of pipework connected directly to the water supply mainly to water to every hydrant outlet as well as is attempted to present water for the firemen in order to fight a fire. The water is seen to be discharged into the fire engine, from which it is then pumped and sprayed over the fire. Where the water supply is not inadequate or reliable, hydrant pumps requires to be presented to pressurize the mains of the fire.

UNIT 5.8: Artificial Respiration and CPR

Unit Objectives

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

1. Evaluate CPR as well as the artificial respiration

5.8.1 CPR As Well As the Artificial Respiration

Artificial respiration and CPR is an act (or) technique used for stimulating respiration when there is a sudden stoppage of breathing or lung functioning.

Techniques used to provide artificial respiration are:

- Mouth-to-mouth breathing
- Prone-pressure method
- Cardiopulmonary resuscitation (CPR) or external chest compression

There are two types of ways to provide Artificial respiration. They are:

- Manual and,
- Mechanical

Manual ways consist of:

- Mouth-to-mouth breathing
- Prone Pressure Method
- Back Pressure Arm-Lift

Mouth-To-Mouth Breathing

The steps to perform in this specific process are:

		
Position your hand	Interlock fingers	Give chest compressions

		
Open the airway	Give rescue breaths	Watch chest fall
		
Repeat chest compressions and rescue breaths		

Table 5.8.1: CPR steps

Prone Pressure Method

This method, additionally known as the Schafer method, stands to be a type of artificial respiration which is used for a patient in case of drowning. In this, the patient is placed in a prone or placed in a face-down position allowing rhythmically pressure with the help of hand on the thorax by means of which the water present would get expelled from the lungs allowing air to enter by clearing the passage in order to breath.

Back Pressure Arm-Lift

This particular method is used as an alternative when other methods are not possible or are not working out.

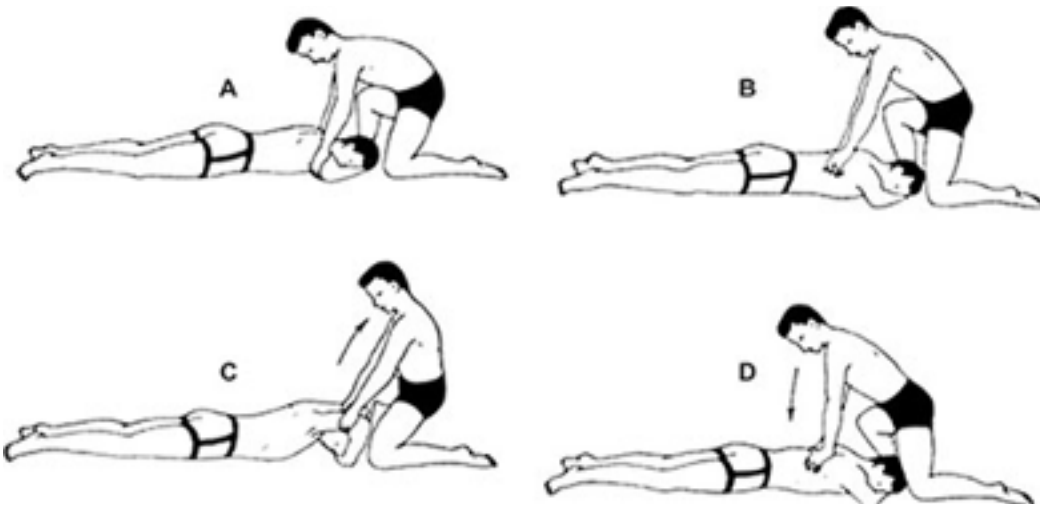


Fig. 5.8.1: Back Pressure Arm-Lift

A Mechanical Method of Artificial Respiration

These types of artificial respiration methods are generally performed by highly trained professionals such as a doctor, nurses, and paramedic forces. The mechanical method often uses machine-like ventilators. Another device that is used in the mechanical method is a bag valve mask. It has the self-inflate and deflates mechanism as well as has an air supply that is controlled by the valve.

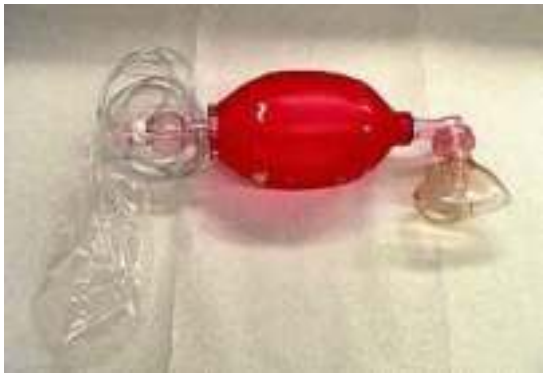


Fig. 5.8.2: Big Valve mask

Fig. 5.8.3: Ventilator

UNIT 5.9: Rescue and Evacuation In Case Of Fire

Unit Objectives

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

1. Discuss the evacuation and rescue during a fire incident

5.9.1 The Evacuation and Rescue during a Fire Incident

A "Fire Emergency Evacuation Plan (FEEP)" stands a scripted document that involves the activity to be adapted by all staff in the event of a fire and the sequences for calling the fire brigade.

Staff Fire Notice High fire threats or extensive premises that would be required a more illustrated emergency evacuation strategy which takes account of the findings of the assessment of fire risk, e.g. the staff importantly at threat and their spots. In addition, notices providing transparent and concise routine's instructions to be followed in the instance of fire that requires to be appropriately showcased.

In some instances, the inidviduals requires to be nominated inidviduals in order to conducr the fire action plan as well as provide them enough training in firefighting as well as procedures for evacuation. The following items require to be taken into consideration where appropriate:

Fig. 5.9.1: Staff Fire Notice

Fire Evacuation Plan

You require taking into consideration of how you would tend to arrange the premises' evacuation in the light of your risk evaluation as well as the other fire precautions that the individuals possesses or intended to put in spot.

Simultaneous Evacuation

In most premises, the evacuation in the instance of fire would easily be by means of each one responsing to the warning signal given when a fire is discovered, then making their way, by regards of escape, to a spot of safety away from the boundaries. This is referred as a simultaneous evacuation and would generally be initiated by the sounding of the normal alarm over the system of fire warning.

Vertical Phased Evacuation

In certain larger complex premises, the emergency arrangements are designed to allow people who are not at immediate risk from fire to delay initiating their evacuation. It might be accurate to start the evacuation by initially performing the evacuation by only the sector closest to the fire as well as warning other individuals to stand by. This is generally done by suddenly evacuating the floor where the fire is spotted as well as the floor located above. The other floors are then evacuated among the individuals to neglect congestion on the escape paths. The rest of the indivdiuals are then evacuated if it is important to do so. The fire warning system requires to be capable of providing two distinctly different signals (warning and evacuation) or giving accurate voice messages. Horizontal phased evacuation in hospitals as well as care homes: the floor may be divided into a number of fires resisting compartments, and the occupants are moved from the compartment involved in the fire to the adjacent compartment as well as, if required, moved again. Depending on the fire situation, it might eventually be significant to take into consideration vertical evacuation.

Other Fire Precautions

- systems of voice alarm
- fire control points
- compartmentation of the premises using fire-resisting construction
- sprinklers in buildings where the top floor is 30 meters or more above ground standards

Staff Alarm Evacuation (Silent Alarm)

In certain instances, it might not be accurate for a normal alarm to start immediate evacuation (Cinemas and Theatres). This could be as of the number of members of the public provided and the requirement for the staff in order to put pre-arranged strategies for the safe evacuation of the premises into action. In the mentioned situations, a staff alarm is capable of being provided (by fire records, personal pagers, discreet sounders, or a coded phrase on a public address system etc.). Following the staff alarm, a more normal alarm signal is capable of being provided, as well as a phased or simultaneous evacuation initiated. The general alarm might be activated automatically if manual initiation has not taken place within a pre-determined time.

Defend in Place

This strategy might be taken into consideration in blocks of flats where each flat is a minimum 60-minute fire-resisting compartment. It might additionally be considered in hospitals or nursing homes where patients are connected to life-supporting equipment as well as is not capable of being moved. The concept authorises the occupants to stay put as well as authorise the fire facility to extinguish the fire. If the fire spreads as well as it is not capable of being controlled, then they would tend to initiate an entire evacuation. In the instance of patients connected to life-supporting equipment, a decision has to be made which choice stands to be the best, stay or move; in either manner, the patient would be at grave threat.

You should only strategise in order to utilise defend-in-place, phased evacuation schemes or a alarm system for the staff if the individuals have sought the suggestion of a competent individual as well as the fire and rescue service.

Action on Hearing the Fire Alarm

On discovering a fire, it is the duty of every person to sound the nearest fire alarm immediately. The plan should include the method of raising the alarm in the case of fire.

People, on hearing the alarm, should proceed to pre-determined positions to assist members of the public and staff in leaving the building by the nearest safe route.

Lifts and escalators should not be used due to possible electrical failure unless they are part of a Personal Emergency Evacuation Plan.

Calling the fire brigade

The Fire Service should also be informed to combat from fire.

Power/Process Isolation

Close Down Procedure – Adopt your own 'Close Down' procedure as appropriate.

Fig. 5.9.2: Fire evacuation process

UNIT 5.10: First Aid

Unit Objectives

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

1. Cataloguing the first aids

5.10.1 First Aids

First aid, as the name suggests, stands to be the first and immediate care or assistance provided to the person in case of either minor, serious injury or illness. First-aid provided on time can save the life in case of life and death kind of situation as well as additionally assists to control the condition from worsening further.

First aid is often controlled by the 3 P's principle:

- Prevent further injury
- Preserve life
- Promote recovery

It is necessary that each floor or manager should have the first aid box handy with them and can be easily accessed by the employees in case of emergency or need.

Fig. 5.10.1: First Aid Kit

UNIT 5.11: Potential Injuries and Ill Health

Unit Objectives

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

1. Understanding the ill health as well as potential injuries

5.11.1 The Ill Health As Well As Potential Injuries

The major role of work is based on enhancing self-esteem, wellbeing and social mobility. However, work-related accidents or illnesses can impact the employees' health in longer or shorter terms and may result in economic as well as social repercussions for the employer.

It is mandatory for an employer to have precautionary measures in place to avoid such incidents. A few common work-related injuries and illnesses are:

- **Slips, trips and falls:** One of the most common causes of injury are slippery surface, fall from ladder or height. It can be avoided through a safety grill or safety bars.
- **Muscle strains:** Muscle strain occurs at the workplace due to lifting heavy items regularly and long-standing or sitting hours. This can be prevented easily through exercise, training and guidance.
- **Being hit by falling objects:** Employees working in warehouses often encounter injuries caused by fall-ing objects. It can be controlled by providing adequate storage and encouraging staff to store the item safely.
- **Cuts and lacerations:** It generally occurs by inappropriately handling sharp objects and is capable of being controlled by delivering the proper training to the staff, wearing proper protection and providing safety equipment to the workers.
- **Inhaling toxic fumes:** Workers who are dealing with chemicals are more likely to become a victim of an injury caused by toxic materials like inhaling dangerous gases or fumes. It is mandatory for the em-ployer to provide adequate safety gear to its worker who regularly meets such kinds of substances.
- **Crashes and collisions:** It can happen in warehouses and construction sites due to vehicle movement, and prevention can be done through necessary safety measures such as PPE, sufficient light, safety alert etc.
- **Exposure to loud noise:** Industrial deafness can occur to employees working in loud noise areas, and it can be avoided by wearing earplugs or earmuffs.
- **Fights at work:** Disagreement or tension may lead to fighting at work. It is a must to have an employee grievance department in order to deal with such cases.

UNIT 5.12: Precautions in Mobility

Unit Objectives

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

1. Demonstration of the precautions in mobility

5.12.1 The Precautions in Mobility

For the safety of the workers or employees at the workplace or any industry, one should always take the necessary precautions.

All manufacturing owners need to comply with the legal requirements to order to ensure that their industry and workplace is safe to work for everyone, from the customers to employees, suppliers, visitors, contractors and others.

In order to provide better productivity for a workplace, the management of the organization:

- Should minimize illness and injury of employees.
- Should reduce the risk of accidents.
- Should maximize productivity.
- Should reduce the cost of injuries and workers compensation.
- Should meet their legal requirements and responsibilities.
- Should retain their staff for better performance.

Precautions at the workplace may include.

- Keep every corner organised, clean and clutter-free
- Usage of mats on slippery floors
- Properly stored combustible material
- Ensure proper training while handling equipment and machinery

It is very important to have medical facilities and proper first aid for the employees working with heavy equipment and machinery.

1. **Clothes for each different appropriate task:** The people who are working with tools or with machinery must have proper clothing while operating the machinery. They must wear the right size of gloves according to the type of work and must wear safety shoes as well as all protective equipment while handling the tools, machinery and chemicals.

   Different industries have different types of personal protective equipment based on their mode of work. Those are:

   - **The food processing industry:** In this particular industry, they do not require special types of uniforms unless they require antibacterial head caps, clothing or aprons in order to prevent bacterial contamination.
2. **Implementation of emergency procedures:** This procedure usually contains emergencies that do not announce themselves, and there can be the expectation of fire and accidents. For this, there is a need to be prepared beforehand for such emergencies in order to ensure the safety of the employees, workers, visitors as well for business.

3. **Reduce workplace stress:** The common cause of stress during work is working for long hours, insecurity of job and conflicts between employees, which can sometimes lead to depression, difficulties during work and affects the concentration of the employees. Employers must avoid excessive workload on their employees as it may lead to employee's frustration which will provide a direct impact on employee productivity.

In order to promote a healthy and stress-free environment at the workplace, it is the employers' duty to take care of both the physical and emotional well-being of its employees by conducting regular training on time management, outdoor activities, small group discussion and many more.

UNIT 5.13: Significance of various types of hazard and safety signs

Unit Objectives

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

1. Understanding the impact of various types of hazard and safety signs

5.13.1 The Impact of Various Types of Hazard and Safety Signs

Safety Hazard Significance

A hazard is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural in origin.

Safety hazards are number one on the list of 6 types of workplace hazards. These hazards play an effect on employees who work directly with machinery or on construction sites. Safety hazards are the most common workplace risks. They include:

- Anything that can cause spills or trips such as cords running across the floor or ice
- Anything that can cause falls, such as working from heights, including ladders, scaffolds, roofs, or any elevated work area.
- Unguarded and moving machinery parts that a worker can accidentally touch.
- Electrical hazards like frayed cords, missing ground pins, and improper wiring
- Confined spaces.

Safety Hazards Symbol

Safety symbols, hazard symbols or safety labels are meaningful and recognizable graphical symbols that warn of or identify hazards associated with the location or item.

Fig. 5.13.1: Role of hazard in Risk assessment

Chemical Hazard Significance

A chemical hazard is a (non-biological) substance that has the potential to cause harm to life or health. Chemicals are widely used in the home and in many other places.[1] Exposure to chemicals can cause acute or long-term detrimental health effects. In the workplace, exposure to chemical hazards is a type of occupational hazard. The use of personal protective equipment (PPE) may substantially reduce the risk of damage from contact with hazardous materials.

Chemical Hazards Symbol

Hazard pictographs are a type of labelling system that alerts people at a glance that there are hazardous chemicals present. The symbols help identify whether the chemicals that are going to be in use may potentially cause physical harm or harm to the environment.

These pictographs are also subdivided into classes and categories for each classification. The assignment for each chemical depends on its type and severity.

Fig. 5.13.2: Chemical hazard safety signs

Biological Hazard Significance

Biological health hazards include bacteria, viruses, parasites and moulds or fungi. They can pose a threat to human health when they are inhaled, eaten or come in contact with skin.

Fig. 5.13.3: Biological hazard safety signs

Biological Hazards Symbol

The biohazard symbol is used or displayed only to signify the actual or potential presence of a biological hazard. Appropriate wording may be used in association with the symbol to indicate the nature or identity of the hazard, the name of the individual responsible for its control, precautionary information, etc., but never should this information be superimposed on the symbol.

Ergonomic Hazard Significance

Poor ergonomics contributes to muscle strain, muscle imbalances, and fatigue. Many muscle strains result from performing the same motion over and over again. These become repetitive stress injuries, which are some of the most common workplace injuries.

Ergonomics alone won't eliminate this type of injury. However, proper ergonomics will significantly reduce fatigue and strain.

Ergonomic Hazard Symptoms

Signs and symptoms of ergonomic injuries include pain which may be dull and aching, sharp and stabbing or a burning sensation—tingling or numbness; swelling, inflammation, stiffness. Muscle weakness or discomfort; extremities are turning white or cold.

Work Organization Hazard Significance

A few examples of work organization hazards and it is effective they are defined below.

- Falls and Falling Objects- It can result in serious injury or fatality
- Fire Hazards- It can result in loss, serious injury or fatality
- Electrical Hazards- It can result in loss, serious injury or fatality

Work Organization Hazard Symbol

There are multiple signs or symbols used in an organization to alert the people in their workstations.

Fig. 5.13.4: Work organization related hazard safety signs

Summary

- Hazard can be identified as an extended-term as it is capable of causing severe disruption to the environment or surroundings.
- Risk Assessment (RA) and environment review (ER) were done for hazard and environmental impact. It is done from different stages, from evaluating a new operation, modification to the existing facilities, maintenance work and others.
- Electrical equipment is generally that equipment that requires electrical supplies for their operations.
- Personal protective equipment is majorly used to protect oneself from serious accidents or illnesses originating from the workplace's physical, biological, chemical, and mechanical hazards.
- Accidents are unplanned experiences resulting in injuries, illness, death, and loss of property and/or production. While there is no way to avoid accidents, some actions, plans, and preparations are capable of being taken to diminish them.
- The "Occupational Safety and Health Administration (OSHA)" needs to implement the organization with a fire prevention event in order to prevent injuries and accidents from the occurrence of fire in the workplace. Prevention from fire is necessary to avoid excessive damage.
- Fire hydrant consists of a system of pipework connected directly to the water supply mainly to water to every hydrant outlet as well as is attempted to present water for the firemen in order to fight a fire. The water is seen to be discharged into the fire engine, from which it is then pumped and sprayed over the fire.
- Artificial respiration and CPR is an act (or) technique used for stimulating respiration when there is a sudden stoppage of breathing or lung functioning. It requires metabolic processes to exchange the gases which tend to be present in the body by external or pulmonary ventilation.
- Fire drills can be initiated with a defined frequency in a surprising manner to ensure employees are well aware of the fire evacuation process. Attendance can be taken in assembly points, and briefing also can be arranged to further train the staff.
- First aid, as the name suggests, stands to be the first and immediate care or assistance provided to the person in case of either minor, serious injury or illness. First-aid provided on time can save the life in case of life and death kind of situation as well as additionally assists to control the condition from worsening further.
- The major role of work is based on enhancing self-esteem, wellbeing and social mobility. However, work-related accidents or illnesses can impact the employees' health in longer or shorter terms and may result in economic as well as social repercussions for the employer.
- A hazard is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural in origin.
- Poor ergonomics contributes to muscle strain, muscle imbalances, and fatigue. Many muscle strains result from performing the same motion over and over again. These become repetitive stress injuries, which are some of the most common workplace injuries.

Exercise

A. Answer the following questions briefly.

1. Is Covid -19 a biological hazard?
   A True B False
2. Which of the following is included in Personal Protective equipment?
   A Spectacles or clear goggles B Earmuffs
   C Hard hat D All of them.
3. Can toxic substances spillage be wiped off with a normal cloth and with bare hands?
   A True B No
4. A simple technique for using fire extinguisher_____.
   A. PASS method B Installation on telephonic desk
5. Which is not a part of potential injury at the workplace?
   A Muscle strain B Cuts
   C Slip or fall D Drowning

B. Answer the following questions by choosing the correct option:

1. Explain the golden rule of “First Aid”.
2. Why is Organisational Protocol necessary for an organisation?
3. Describe any two types of electrical equipment?
4. Explain why hand hygiene is necessary for oneself.
5. Describe the various types of hazards involved while handling or dealing with toxic?

Notes

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Food Industry Capacity and Skill Initiative

6. Working Effectively in an Organization

FIC/N9902

Key Learning Outcomes

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

1. Categorize the organizational policies
2. Catalogue the Legislations, standards, policies, and procedures
3. Analyse the reporting structure
4. List the inter-dependent functions
5. Discuss the impact of harassment and discrimination
6. Monitor the ways of prioritising the task
7. Record the types of communication skills
8. Evaluate the ways of carrying out teamwork
9. Highlight the ethics and discipline
10. Illustration of the grievance's solution
11. Recognize the interpersonal conflicts
12. Identify the disabilities and challenges
13. Outline the gender sensitivity and discrimination
14. Discuss the applicable legislations, grievance redressal mechanisms
15. Analyse the process of transacting with others without personal bias

UNIT 6.1: Organizational Policies

Unit Objectives

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

1. Categorize the organizational policies

6.1.1 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 6.2: Legislations, standard, policies, and procedures

Unit Objectives

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

1. Catalogue the Legislations, standards, policies, and procedures

6.2.1 The Legislations, Standards, Policies, and Procedures

It is the legal requirement of an organisation to comply with the local laws as well as regulations and keep them updated time-to-time. The HR department is mainly responsible for continuously updating the regulations and making sure that it is communicated across the organisation. It also states that the laws and regulations of local authorities take over the organisational policy when required.

Standard practices at a workplace must have:

- Employers to define clear expectations from their employees.
- Provide a chance to utilise one's skills to perform a task.
- Support one's employees
- Motivate employees to collaborate and participate in decision making
- Welcoming nature for the feedback from the organization's employees.
- Investment in the employees learning and development process.
- Feedback received from employees and attempts to make a great workplace.

Policies and procedures at the workplace:

A policy is a general set of guidelines that are designed in line with the company's objective for dealing with an issue. Policies communicate the connection between the organization's vision and values.

A procedure sets out the specific task or action plan for implementing or carrying out a policy. Procedure tells employee's how to deal with a situation and when.

Importance of Policies and Procedure:

- It makes sure of the smooth functioning of the business and its day-to-day tasks.
- It clearly sets out the instruction for the employees which is expected from them.
- Having policy and procedure in place become handy at times while dealing with any kind of issue.
- It improves the overall image of an organisation in the market.
- It sends out a clear message to its external stakeholders and helps the organisation to build trust among its stakeholders.
- It enhances the goodwill of an organisation and, in turn, increases the market value.

The difference between policy and procedure is described below:

Fig. 6.2.1: Difference between Policy and Procedure

UNIT 6.3: Reporting Structure

Unit Objectives

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

1. Analyse the reporting structure

6.3.1 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. 6.3.1: Company's Reporting Structure

UNIT 6.4: Inter-Dependent Functions

Unit Objectives

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

1. List the inter-dependent functions

6.4.1 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.

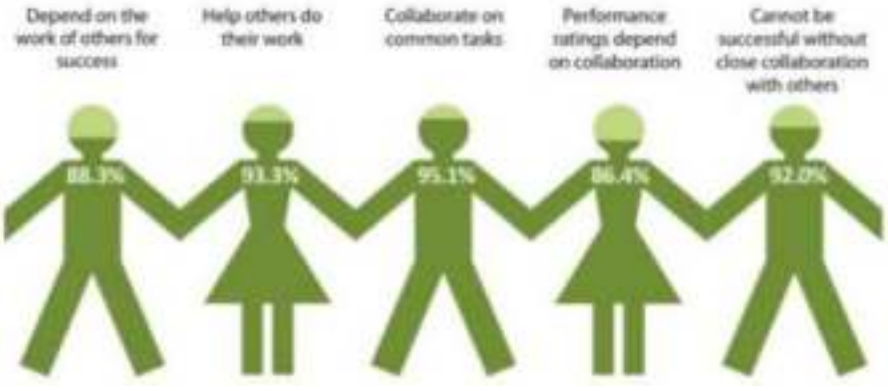

Fig. 6.4.1: Process of the concept of Inter-dependence

UNIT 6.5: Harassment and Discrimination

Unit Objectives

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

1. Discuss the impact of harassment and discrimination

6.5.1 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.

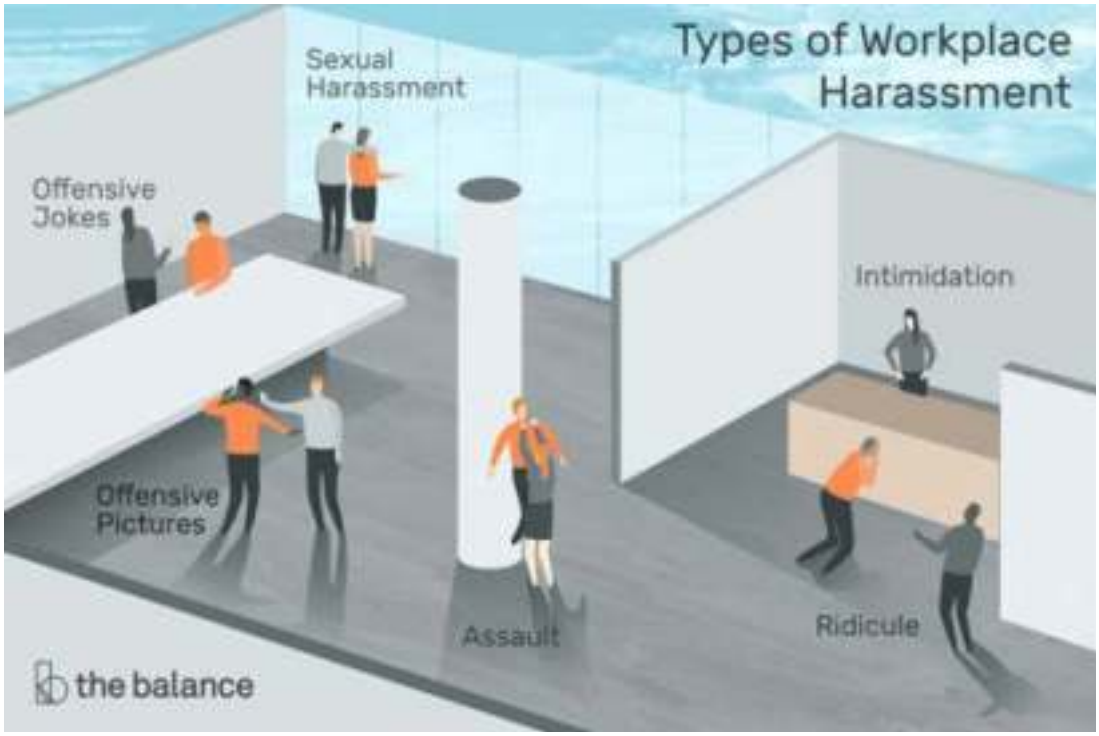

Fig. 6.5.1: Types of Workplace Harassment

UNIT 6.6: Prioritising Tasks

Unit Objectives

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

1. Monitor the ways of prioritising the task

6.6.1 The Ways of Prioritising the Task

Prioritizing a task or work is a process of having an understanding of which task requires to be achieved first by determining the level of importance and urgency of task, thing or event. However, each task or work appears to be equally vital. Prioritization also helps the employees to attain more work or tasks in a less amount of time. It is very important for the employees and workers to prioritize their work in order to be productive rather than being reactive, which will indirectly decrease their efficiency of providing productive work.

How to Prioritize Task on Workplace When Everything's Important?

Seven strategies for prioritizing tasks at the workplace:

- Having a list that contains all tasks or works in one place
- Identify what's important
- Highlight what is necessary
- Prioritize based on importance
- Avoid competing with priorities
- Consideration of the efforts made in the tasks
- Constantly reviewing task and be realistic

UNIT 6.7: Communication Skills

Unit Objectives

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

1. Record the types of communication skills

6.7.1 The Types of Communication Skills

Communication skill mainly addresses to the ability of the ways in order to communicate effectively with managers, colleagues and staff. It is an essential part for every industry. Communication is the act of transferring information from one place to another. It may be vocally (using voice), written (using printed or digital media such as books, magazines, websites or emails, visually (using logos, maps, chats or graphs), nonverbally (using body language, gestures, tone and pitch of voice). In practice it is often a combination of several of these. Productive communication skills in the workplace can reduce conflicts, lower the risk of projects indirectly and thus would make the work more agreeable.

In today's scenario having technical skills is not only enough to get the work done in the workplace. Completing the task must require the support of the whole team, and without proper communication, things will remain stringent in order to get better communication in the workplace. Communication skills are absolutely necessary for successful communication both in the workplace and in private life.

Fig. 6.7.1: Essential Communication Skills

- **Body Language (non-verbal):** When there is a discussion about body language, it refers to the ways by an individual presents themselves while interacting with someone. It includes body posture, hand movements or gestures, the type of eye contact that is made, and the voice tone.
- **Listening:** Communication in the workplace is not entirely about speaking; it mainly represents atwo-way channel. Onehas to pay close attention while talking, as this allows the team members to ask and clarify their doubts as well asinquiries to ensure that they are on the same page or track.

Fig. 6.7.2: 7 Key Active Listening Skills

- **Clarity and Conciseness:** One of the major ingredients for effective communication in the workplace is clarity, which mainly stands to be responsible to expresses the attempt of conveying an individual's message in the simple way possible. Before you start a conversation, type an email or being a discussion, have in mind what the purpose of the communication is and what information you hope to obtain as a result.
- **Friendliness:** In order to engage with the team members in an open or honest discussion, a person needs a friendly tone, a personal question, or simply a smile. It is important because the team members would not hesitate to contact the individual as they would be easily approachable for the conversation.

- **Empathy:** Showing compassion or empathy even when the individual disagrees with an employer, co-worker, or employee state to be very important as it helps in understanding their point of view and also respects their decision.
- **Confidence:** It is an important step to be confident when an individual tends to interact with others. As in all interactions, confidence (but not overconfidence) is crucial part. Conveying with confidence will give you peoples, faith in your abilities and will take you seriously.
- **Respect:** The employee must respect their co-workers' roles, skill set and ideas in order to meet the company's overall goal as a team.

  The team must communicate with each other in a respectful manner every time. Conveying them with respect through email by taking the time in order to edit their message is also required. If the individual would send them a sloppy written, confusing email, the recipient will think them to be disrespectful and also encourage them to think through the person's communication.

Summarizing the concept:

Effective and clear communication at the workplace ensures that the healthy work environment supports the overall team development, engagement of employees, innovative idea, which in turn help the overall company's growth, enhancing the goodwill and trust of its customers.

UNIT 6.8: Teamwork

Unit Objectives

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

1. Evaluate the ways of carrying out a teamwork

6.8.1 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 6.9: Ethics and Discipline

Unit Objectives

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

1. Highlight the ethics and discipline

6.9.1 The Ethics and Discipline

Work ethics refers to the ways by which the employees govern themselves and their attitude towards their work. It also refers to morality in the workplace.

A person having a good work ethic tends to create a healthy workplace environment for him/her as well as for their fellow co-workers.

It is mandatory for an employer to develop strong work ethics among the employees. It can be done in various ways.

- Setting clear goals and objectives
- Mentoring
- Set example
- Need of right work environment
- Encourage professionalism
- Discipline
- Listen to your employees
- Feedback
- Rewards and recognition
- Remove obstacles
- Discipline at Workplace

UNIT 6.10: Grievances Solution

Unit Objectives

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

1. Illustration of the grievance's solution

6.10.1 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 6.11: Interpersonal Conflicts

Unit Objectives

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

1. Recognize the interpersonal conflicts

6.11.1 The Interpersonal Conflicts

Interpersonal Conflicts

Interpersonal conflicts refer to any type of conflict among two or more people. The idea mainly refers to the situation when a person or group of employees try to interfere in some other employee's work.

Ways to Resolve Conflict at the Workplace

- Communicate
- Listen carefully
- Show empathy
- Never hold back any grudges
- Effective communication skill

UNIT 6.12: Disabilities and Challenges

Unit Objectives

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

1. Identify the disabilities and challenges

6.12.1 The Disabilities and Challenges

People with disabilities are far more impacted by personal and environmental barriers than normal people. By the end of this module, you will be able to get clarity on the rights of disabled people in the workplace.

These challenges to employment can range from a variety of physical and social ones. These can include:

- Physical barriers
- Nature of co-workers and stereotyping
- Communication barriers
- Policy barriers

Physical Barriers

They can take the form of structural issues in an environment that retrogrades the basic functioning of disabled people. As an instance, the lack of a wheelchair ramp or an elevator can hamper basic tasks for disabled people or not allow them access to modern equipment that would authorizethem to perform tasks.

Nature of Co-Workers and Stereotyping

Judgements and assumptions against people with disabilities are pretty much the norms of our present-day society. They tend to prevent disabled people from getting hired or having a positive experience in the workplace. For example, a person might be denied useful resources because their employer believes that they don't tend to possess a learning ability. This is common for people suffering from autism, ADHD or several other 'invisible' disabilities.

Communication Barriers

Communication barriers can create an inefficacy to effectively write, speak, read or understand the necessary requirements for a job. Some examples would involve the inability to use a phone due to hearing disability, lack of braille prints for blind people, and usage of languages that are too technical for people with cognitive impairments.

Policy Barriers

Policy barriers can also be a defining factor for the challenged people to get a job in a cooperative workplace. These include giving people not enough time to complete their tasks.

UNIT 6.13: Gender Sensitivity and Discrimination

Unit Objectives

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

1. Identify the disabilities and challenges

6.13.1 The Disabilities and Challenges

Gender sensitivity has also been an ongoing dialogue inside the workplace. The workplace has frequantly been referred to as an "inhospitable place" for women due to the multiple decisions taken by the HRs (i.e., policies, decisions and their enactment, training, wage).

Ways to Build Gender Sensitivity and Eliminate Discrimination

- Recognizing the workplace's "Gender Equality Maker (GEM)."
- By being open and informative about it
- Altering existing policies to make room for gender diversity and equality
- Strict implementation of the policies

Recognize the Workplace's Gender Equality Maker

Being gender-sensitive is just one of the many necessary steps to be taken in order to have a gender-fluid workplace. Recognizing your company's current status in its diversity can be helpful and would point you in the right direction.

By Being Open and Informative About It

An open atmosphere in a workplace would help a company and its employees to excel in all directions. Understanding their needs and fulfilling them accordingly would help the employers and workers in a similar manner to achieve a gender-balanced environment.

For example, having group discussions with men, women, and LGBTQ+ would help people to understand their needs and concerns.

Altering Existing Policies to Make Room for Gender Diversity and Equality

The "Equal Remuneration Act of 1976" of India has prohibited differential pay to men and women employees for conducting the same work or work of the same nature.

Strict Implementation

Rules and regulations are only followed up with when implemented strictly. There are lots of rules and policies that can be put in place in order to check inequality and help a workplace to go from being gender-sensitive to gender transformative. One example which can be taken under consideration is the ensuring of nearly everyone to be confident and open to a leadership role if offered, while the otherscould portray equal pay amongst colleagues in the same position. Lastly, for sexual harassment, implementing strict rules against this kind of behaviour is paramount and shows that a corporation is heading in the right direction. Companies must realise that employees are working in a safe environment and do not need to be anxious about a harassment encounter.

UNIT 6.14: Applicable Legislation, Grievance Redressal Mechanisms

Unit Objectives

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

1. Discuss the applicable legislations, grievance redressal mechanisms

6.14.1 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 6.15: Transacting With Others without Personal Bias

Unit Objectives

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

1. To administer with others without personal bias

6.15.1 Personal Bias

When it arrives at making choices at work, it's important to know they are not based on bias. It is essential for organizations to have concrete processes and procedures in place to curb unconscious bias. Nevertheless, there are many stages that can be adopted to check the biases and to create an inclusive environment for the team.

Recognizing an Individual's Own Biases

Recruitment is known to be an area where unconscious bias may come into play as it has been seen that people may unwittingly tend to favour applicants from their own familiar backgrounds.

Focusing on People

Many organizations are so focused on their processes that they lose sight of their own people. Of course, there is a requirement to find time, for example, to write reports, define job descriptions, and set up performance appraisals, but it's important that there is also the establishment of expectations communicate plans, and givingas well asreceiving feedback from everyone involved in the team.

Increasing Exposure to Biases

Many organizations assume that their policies on avoiding discrimination are robust and work well, so perhaps they fail to weed out some subtle biases. Declaration of the intentions about valuing a diverse workforce is extensively required. Saying words out loud, or writing them down, sends a clear message to everyone with whom an individual is working, as well as is involved inone's own subconsciousness.

Summary

- Organizational policy or work place policy is a type of statement which provides the outlining of any organization that practices out the procedures. This eventually leads to its business which covers and everything, starting from the operations to concerns and compliances along with the employee's legislation.
- It is the legal requirement of an organisation to comply with the local laws as well as regulations and keep them updated time-to-time. The HR department is mainly responsible for continuously updating the regulations and making sure that it is communicated across the organisation.
- Policies communicate the connection between the organization's vision and values.
- The reporting structure acts as a command it is hierarchal within every employee report to another employee who resides to be one level higher in their authority or position within the organisation including communication and decision channels.
- Teams of employees working together in hierarchy of organizational structure tend to demonstrate high chances of success rather than working individually.
- Prioritizing a task or work is a process of having an understanding of which task requires to be achieved first by determining the level of importance and urgency of task, thing or event.
- Effective and clear communication at the workplace ensures that the healthy work environment supports the overall team development, engagement of employees, innovative idea, which in turn help the overall company's growth, enhancing the goodwill and trust of its customers.
- Discipline at the workplace lays a strong foundation of trust between the employer and its employees. It includes reporting on time, maintaining decorum during working hours and at the workplace, appropriate dressing, proper communication, etc.
- A grievance can prove to be quite harmful if not dealt with in time. It may lead to frustration among the employees, and they can start losing their trust from the employers. In order to handle grievances properly, one should have an adequate set of procedures that lays out a clear step by step process in order to deal with the grievances.
- Women have been witnessed to have fought for their rights and for their place in this world for hundreds of years. However, it's not just women now, and the LGBTQ+ communities are also fighting for their rights and their voices in order to be heard.
- The Indian Constitution guarantees equality and prohibits discrimination on the grounds of religion, race, caste, sex, birthplace, and residence.
- A transparent, quick, robust and confidential grievance redressal system can effectively help in order to handle conflicts in the workplace and potentially go a long way in bringing harmony to the workplace.
- Recruitment is known to be an area where unconscious bias may come into play as it has been seen that people may unwittingly tend to favour applicants from their own familiar backgrounds. But a person can take practical steps in order to reduce this bias.

Exercise

A. Answer the following questions briefly.

1. Which policy stands to be the workplace or organizational policy?
   A. Social Media Policy B. Environment Protection Policy
2. _____ at workplace lays a strong foundation of trust between the employer and its employees/
   A. Communication B. Discipline
3. _____ can prove to be quite harmful if not dealt in time.
   A. Actions B. Grievance
4. The employment barriers might include:

A. Communication barriers B. Disciplinary barriers

5. _____ requires employers to pay equal remuneration to the workers.

A. Equal Remuneration Act, 1976 B. Republic Act No. 9710

B. Answer the following questions by choosing the correct option:

1. List down the importance of having the company policies in force.
2. State the differences between policies and procedures.
3. What do you understand by communication skills?
4. What are policy barriers?
5. What are some of the central and state-specific labour laws in India for focusing on the grievance redressal mechanism?

Notes

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C

FICSI
Food Industry Capacity and Skill Initiative

7. Material Conservation

SGJ/N1702

Key Learning Outcomes

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

1. Identify the ways to handle materials.
2. Categorize the workstation layouts, electrical and thermal equipment.
3. List the organizational procedures for minimising waste.
4. Analyse the practices of efficient and inefficient management.
5. Discuss the material and water usage.

UNIT 7.1: Material Handling

Unit Objectives

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

1. Identify the ways to handle materials

7.1.1 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.

7.1.2 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 7.2: Workstation Layout, Electrical and Thermal Equipment

Unit Objectives

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

1. Categorize the workstation layouts, electrical and thermal equipment

7.2.1 The Workstation Layouts, Electrical and Thermal Equipment

Workstation Layout

Workstation or workplace is also known as the floor space occupied by the workers, as well as by the machines or a group of machines. An ergonomic workplace is a scientific discipline that is concerned with improving the productivity, health, comfort and safety of people in order to promote effective interactions among people, the environment and technology.

During the design of the workstation layout, the following space requirements are taken into considerations:

- Requires having spaces for racks, bins and conveyor stations that either contain the under processed work or receive the work after it has been completed by the machine.
- There should be a rectangular space occupied by the length and width of the machine or group of machines. They need to include the space for the travel of moving parts as well as the projected parts of machines which include shafts, levers, pulleys, handles and wheels.
- There requires being a proper workspace for the workers in order to efficiently complete their tasks.
- Requires having clearance space for feeding the work on and off the machine.
- There needs to be a space for tool racks, workbenches, etc., required by the individual machine, if any.
- There needs to be proper floor space for the power source, or if in case of any electric motor, it has to be placed on the floor or within the working area.

Storage Space Requirement

In any plant layout, the space for workstations allocation requires to be made for the storage of material and space essentially required inside the plants. Every department and area need to be designed in such a way so that they are capable of providing waiting, processing and moving facilities.

The storage space requirement depends on various factors such as:

- Quantitative use of raw material per hour
- Movement of semi-built parts between two machines depending upon the weight and volume.
- Movement of parts between the departments, depending upon the weight and volume.
- The dependence upon the scrap weight and volume
- Vertical heights of the building plants.
- Production capacity of the assembly.

- Floor load-bearing capacity.
- Storage practices.

Once the space requirement for all machines has been estimated, the employer needs to have the provision for the basic amenities like canteen, drinking water, first aid, restrooms, sales department, changing room (for factory worker like machine operators), refreshment place, etc.

Workplace Layout Design:

Employee productivity stands to be directly in proportion to workplace conditions. A good and comfortable workplace always results in high productivity per employee.

Some important aspects which need to be considered while designing the workplace are:

- Cleanliness
- Proper lighting
- Noise
- Too ls and Material positioning
- Chairs and Workbench
- Machine design

Electrical and Thermal Equipment

In order to build an efficient workplace layout, one needs to consider the electrical and thermal requirements of the workers. Workstations that are well equipped with electrical supply takes care of the power source needs of employees in order to operate the required equipment and tools.

The following points require to be considered while designing an electrical workstation.

- Placement of electricity outlet or strips
- Power/voltage requirement of different equipment
- The number of power outlets required
- Alternative or emergency power source outlets

UNIT 7.3: Organisational Procedures for Minimising Waste

Unit Objectives

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

1. List the organizational procedures for minimising waste.

7.3.1 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. 7.3.1: Overproduction

- **Defects:** A defect usually refers to a specific product that is of no use. This results in either discarding the product or reworking on them and is capable of incurring the additional operational cost.

Tips

- For having an effective system of food processing implementation of automated statistical process control systems are extensively required
- Maintaining a high level of supply chain visibility is also considered to be important for efficient food processing

UNIT 7.4: Practices of Efficient and Inefficient Management

Unit Objectives

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

1. Analyse the practices of efficient and inefficient management

7.4.1 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 7.5: Material and Water Usage

Unit Objectives

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

1. Discuss the material and water usage.

7.5.1 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.

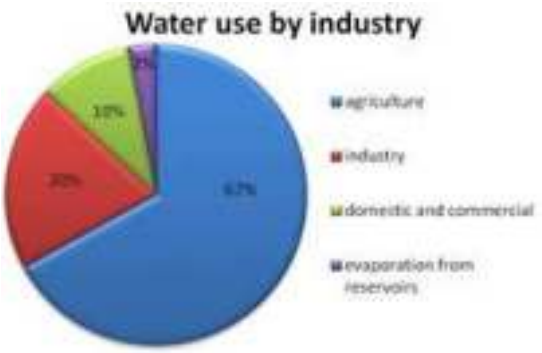

Fig. 7.5.1: Industry-wise water consumption

Industrial usage of water:

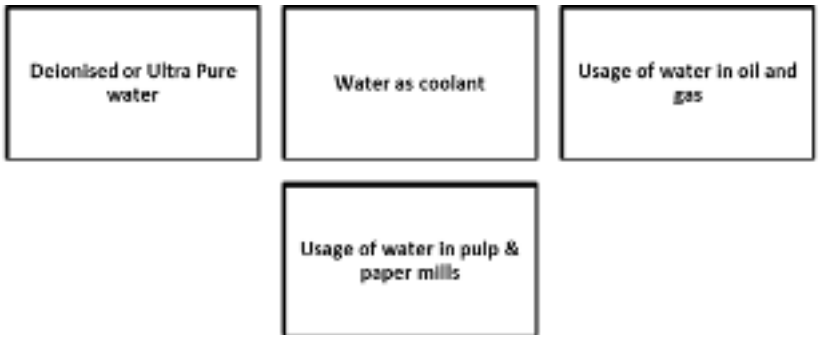

Fig. 7.5.2: Industrial wastage of water

Summary

- Material handling is also known as the integrated system, which involves such activities of the movement, storage, protection and control of types of materials and products throughout the manufacturing, distribution, consumption and disposal.
- Workstation or workplace is also known as the floor space occupied by the workers, as well as by the machines or a group of machines.
- Employee productivity stands to be directly in proportion to workplace conditions.
- An efficient management practice refers to those practices which can perform the task with minimal wastage of resources.

Exercise

A. Answer the following questions briefly.

1. What is the manufacturing labour cost for material handling?

A. 20- 23% B. 20- 25% C. 20- 30% D. 20- 35%

2. What stands to be the full form of AGV?

A. Automated Guided Vehicle

B. Activated Guided Vehicle

C. Accurately Guided Vehicle

D. Action Guided Vehicle

3. _____ is the major component for manufacturing semiconductors and chips, which are widely used in mobile phones, computers and various other electronic goods.

A. Nitrogen B. Silicon C. Hydrogen D. Lithium

4. _____ directly affects the efficiency of the workers.

A. Proper lighting B. Noise C. Cleanliness D. Machine design

5. The appropriate temperature at the workplace usually requires being at _____ degrees Celsius.

A. 22

B. 30

C. 18

D. 16

B. Answer the following questions by choosing the correct option:

1. What are the key indicators of inefficient management?
2. What are the four ways to control the defects types of waste?
3. What are the points required to consider while designing an electrical workstation?
4. What are the important aspects which need to be considered while designing the workplace?
5. What are the requirements for a storage space?

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8. Energy and Electricity Conservation

Unit 8.1 - Define Electricity

Unit 8.2 - Basics of electricity

Unit 8.3 - Energy efficient devices

Unit 8.4 - Standard Practices for Conserving Electricity

SGJ/N1702

Key Learning Outcomes

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

1. Define electricity
2. State the basics of electricity
3. Identify the energy-efficient devices
4. Explain the standard practices to be followed for conserving electricity
5. Illustrate electrical equipment and appliances

UNIT 8.1: Define Electricity

Unit Objectives

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

1. Define electricity

8.1.1 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:

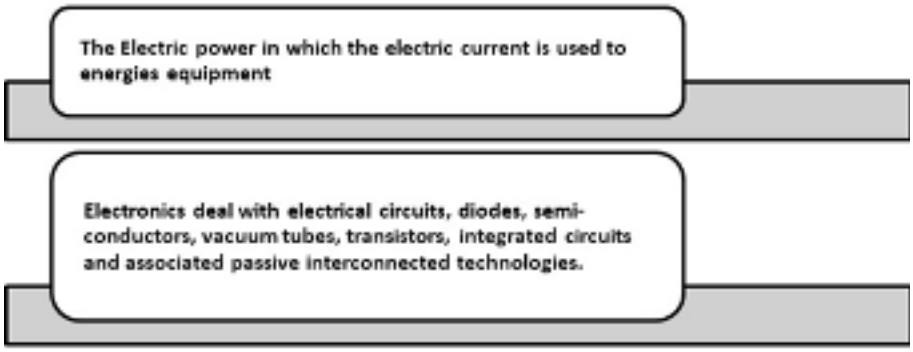

Fig. 8.1.1: Electricity utilization

UNIT 8.2: Basics of electricity

Unit Objectives

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

1. State the basics of electricity

8.2.1 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.

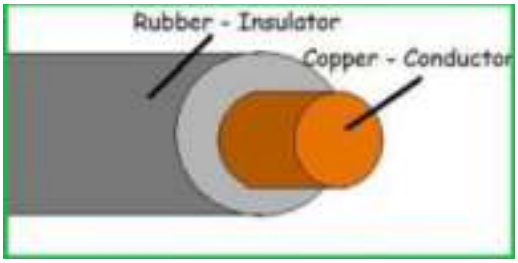

Fig. 8.2.1: Conductor of Electricity

There are three primary electrical parameters:

- Volt
- Ampere
- Ohm

Volt: The amount of external force exerted on free electrons is known as "Electromotive Force (EMF)". Volt is the amount of EMF needed to push a current of one ampere through a conductor with the resistance of one ohm.

Ampere: Ampere defines the rate of flow of electric current. For example, when one coulomb of charge flows through a given point on a conductor in a second, it is defined as a current of one ampere.

Ohm: Ohm is the unit of resistivity of a conductor. Three factors determine the resistivity of a conductor:

- Size of conductor
- Composition of conductor
- Temperature of conductor

UNIT 8.3: Energy efficient devices

Unit Objectives

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

1. Identify the energy-efficient devices

8.3.1 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. 8.3.1: Energy-efficient devices

Energy-Efficient Devices

Devices like LED bulbs, fluorescent lighting or natural skylights reduce the amount of energy required to attain the same amount of illumination compared to using traditional incandescent light bulbs. Modern appliances such as freezers, dishwashers, ovens, stoves, dryers use significantly less energy than their previous generation models and line-ups. For example, modern energy-efficient refrigerators use 40% less energy than their conventional models did in 2001.

Energy Conservation

Energy conservation is broader in comparison to energy efficiency in including active efforts to decrease energy consumption. For example, through behavioural change it has an addition to using energy effectively. Energy conservation is a challenge requiring stringent policy programmers, technological development and behaviour change to go hand in hand. Many energies intermediary organizations, government, non-government, regional, local or at the national level, are working in order to meet this challenge.

8.3.2 Common Ways to Identify Electrical Problems

Electricity appears to be something most of us understand it for granted. When the individuals need it, you turn to the nearest switch or outlet, and there it is, ready to serve you 24/7.

Yet that electric energy faithfully facilitating us is additionally a potential destruction's source.

Several electrical fire dangers are hidden within the walls of your house or offices or other workplaces. Nevertheless, if the indivdiuals have the knowledge the ways to point the warning signs, the individuals are capable of making proactive — and less expensive — repairs that will also help protect your home in the long run. Here are certain manners to spot common issues and what to do about them.

- **Unknown odour:** When you detect an odd smell arriving from an electrical store, unplug anything linked to it, as well as don't utilise it again until a qualified electrician has tended to check it. In addition to this, if the individual's breaker panel or fuse box is emitting an odd odour, call an electrician immediately.
- **ARC faults:** Arc faults tend to take place when an electrical circuit veers off its intended path, frequently via a breach in the wiring. Arc faults stand to be preventable via the installation of a tool referred as an arc-fault circuit interrupter (AFCI).
- **Sparking or warm switches and outlets:** If the individual's light switches stand to be warm to the touch or an store is sparking, call a expertised the electrician immediately to see if your wiring needs repairs or the fixture should be replaced.
- **Buzzing sounds:** If you hear any buzzing, cracking or sizzling sounds when you flip a switch or plug into an outlet, turn off the power to that fixture immediately and consult a professional electrician.
- **Flickering lights:** Flickering lights usually indicate a power surge. These power surges don't necessarily have to come from a catastrophic event — more than likely, your appliances are making demands on the electrical system that it cannot handle.
- **Broken light switches and loose outlets:** If switches or outlets stop working or work only intermittently, it could be a sign of loose wiring — and another potential fire hazard. Loose outlets also create a potential for electrical shock.
- **Hot ceiling fixtures:** Occasionally check the area around your ceiling fixtures for warmth that could indicate a lack of sufficient insulation. Also, exceeding recommended bulb wattages can cause overheating. Either issue poses a potential fire hazard. Consider switching to compact fluorescent light (CFL) or light-emitting diode (LED) bulbs as these don’t produce as much heat as incandescent bulbs.
- **Circuit breaker problems:** Circuit breakers are designed to trip when a circuit is overloaded. Tripping prevents overheating and eliminates fire hazards. Occasional tripping probably indicates a simple overload, but if it occurs repeatedly, you need to call in an electrician and have them evaluate your entire electrical system.

UNIT 8.4: Standard Practices for Conserving Electricity

Unit Objectives

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

1. Explain the standard practices for conserving electricity

8.4.1 Standard Practices for Conserving Electricity

Renewable energy sources have received plenty of attention in recent years, but the conservation of electricity is also important for sustainability. Nevertheless, the best results are acquired when clean power is combined with energy conservation, reducing the pressure to invest in newer infrastructure.

Environmental Reasons to Conserve Electricity

All systems of power generation have an environmental influence that must be taken into consideration before an investment decision. This is evident while dealing with fossil fuels since their combustion emits a constant stream of greenhouse gases in the atmosphere. The process of construction also has an environmental impact. Some waste materials are unavoidable, heavy machinery releases emissions and the ecosystem is seen to be disrupted.

Practices for Saving Electricity

For an average consumer, saving electricity can be good for the pocket and in turn, it reduces the increasing stress on the environment. Those savings can be diverted to alternative sources of energy like solar panel arrays, especially in a tropical country like India, where seasons are relatively moderate and 'timed'. Some practices and habits changes which would help in saving electricity are:

- Turning down the refrigerator
- Usage of energy-efficient LED bulbs
- Air drying the dishes and clothes
- Cooking under the right-sized burner
- Washing clothes with cold water
- Using window shades to alter sun rays entering the house
- Turning off electrical appliances, fans, lights when not in use
- Using low flow faucets and showerheads

Summary

- Electricity is a basic form of energy observable in a positive and negative form
- The main motivation for saving energy is frequently and simply saving money by decreasing the cost of purchasing energy.
- Energy conservation is broader in comparison to energy efficiency in including active efforts to decrease energy consumption.
- Renewable energy sources have received plenty of attention in recent years, but the conservation of electricity is also important for sustainability.
- All systems of power generation have an environmental influence that must be taken into consideration before an investment decision.
- Electrical equipment involves any machine powered by electricity.

Exercise

A. Answer the following questions briefly.

1. On the basis of conductivity, conductors possess:

   A. Materials whose conductivity lies between 10-6 to 104-ohm m

   B. Materials whose conductivity lies between 104 to 107-ohm m

   C. Materials whose conductivity lies between 10-20-to-10-10-ohm m

   D. None of the above

2. What is the full form of EMF?

   A. Electromotive Force

   B. Electromagnetic Force

   C. Electro mobile Force

   D. Electro massive Force

3. _____ energy sources have received plenty of attention in recent years, but the conservation of electricity is also important for sustainability.

   A. Renewable

   B. Non- renewable

   C. Sustainable

   D. Non-sustainable

4. Energy _____ is broader in comparison to energy efficiency in including active efforts to decrease energy consumption.

   A. Release

   B. Emission

   C. Conservation

   D. Deletion

5. Modern energy efficiency refrigerators use _____ less energy than their conventional models did in 2001.

   a. 50%

   b. 40%

   c. 60%

   d. 90%

B. Answer the following questions by choosing the correct option:

1. What are the classifications for the materials of electricity?
2. What are the three primary electrical parameters?
3. What are the components of electrical equipment?
4. What are the categories of appliances?

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9. Waste Management and Recycling

Unit 9.1 - Types of waste

Unit 9.2 - Waste Management and Disposal Solutions

Unit 9.3 - Pollution and Remedies

SGJ/N1702

Key Learning Outcomes

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

1. List the types of wastes
2. Describe waste management and disposal solutions
3. Explain pollution and its remedies

UNIT 9.1: Types of waste

Unit Objectives

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

1. List the different types of waste

9.1.1 The Different Types of Wastes

Unwanted, trash, rubbish, excess, superfluous, scrap, extra, rework, unused- there are so many synonyms for waste.

There are different types of waste which are recyclable or non-recyclable. Recycling of waste depends on the scientific progression as well knowledge about different kind of waste handling. Below are lists of different type of waste.

Recyclable waste	Non-recyclable waste
1. Concrete 2. Steel 3. Aluminium 4. Plastic (PET) 5. Newspapers 6. Corrugated Cardboard 7. Plastics (HDPE) 8. Glass 9. Mixed Papers 10. Used Motor Oil 11. Used oil from food industry	1. Garbage. Mixture of different of garbage makes it hard to recycle. 2. Food-tainted items (such as: used paper plates or boxes, paper towels, or paper napkins) 3. Ceramics and kitchenware. 4. Windows and mirrors. 5. Plastic wrap. 6. Packing peanuts and bubble wrap. 7. Wax boxes. 8. Photographs 9. Medical waste 10. Polystyrene or Styrofoam 11. Hazardous chemicals and chemical containers 12. Plastic toys or sporting goods equipment 13. Foam egg cartons 14. Wood 15. Light bulbs 16. Yard waste or garden tools

Table 9.1.1: Lists of different types of waste

'Waste' is any unwanted material. These are objects that have been discarded, either because they do not function as intended or are simply not required anymore. Waste can come in many forms: solid, liquid or even gaseous (although it's mostly solid). There are many types of waste, but the two general ones are:

- Municipal Waste
- Hazardous Waste

Municipal Waste

It consists of everyday items discarded by the population. It includes clothes, wires, glass, unwanted food and a multitude of other things. It is further sub-divided into household, commercial and demolition waste.

- Household Waste – Materials like unused food, unwanted paper, empty batteries come under this category.
- Commercial Waste – Waste collected from establishments like businesses, trading factories, schools, etc., comes under this category.
- Demolition Waste – Evident from its name, this type of waste comes from the destruction of buildings or any structure made of concrete, bricks, wood, etc.

Hazardous Waste

It refers to solid, liquid or gaseous waste that has the properties of corrosiveness, ignitability, reactivity and toxicity. Proper disposal and treatment of this waste are necessary as it is unsafe for the well-being and the environment at large. It is further sub-divided into industrial and biomedical waste.

Fig. 9.1.1: Hazardous wastes

- Industrial Waste – Waste produced by industries such as chemicals, pigments, ashes, metals, etc., come under this category.
- Also cafeteria garbage, dirt and gravel, masonry and concrete, scrap metals, trash, oil, solvents.
- Biomedical Waste – Waste coming from medical facilities such as hospitals, medical colleges, research centres etc., come under this category.

  PPE kits also consider as biochemical waste (specially now a days)

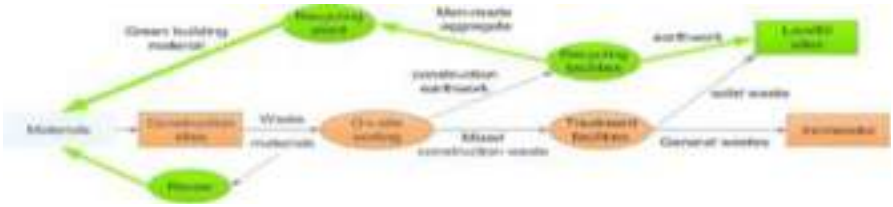

Fig. 9.1.2: Ways to process industrial and biomedical wastes

Significance of Different Coloured Dustbins

Colour coding of waste bin help us to understand which waste can be reuse or recycle and which waste need to dump. It also eliminates the amount waste through segregation process. Disposition process of waste can be defined based on different type of waste. Some waste can be dumped to land fill as it will not impact the soil quality such as food waste (onion, potato skin) as it act as fertilizer whereas industrial waste such as oil, batteries, chemical can't be dumped in land fill as it is hazardous to the soil property. It means if the wastes were separated in the 1st place then it will prevent or reduce any kind of negative impact to the environment due to waste disposition process.

Ideally every place where we discard waste should have three bins.

GREEN – for wet waste, which comes from the kitchen/cooking/food, goes to one bin.

BLUE – Dry recyclable waste such as newspapers, cardboard, packing plastics, bottles, cans, etc., should go to a different bin.

RED – Reject waste, which does not belong to the above two categories, including biowaste like diapers and bandages should go into a third bin.

All over the world, three-way segregation of waste is followed, and it is primarily instituted with some form of colour coding. It works just like the way traffic lights are coded in people's minds.

Govt authorised vendor details for different waste disposal solution-

There are many industries those are known for waste collection and disposal process approved by Indian govt. through registration process.

S No.	Registered PRO	Issued PRO Certificate
1	M/s. Attero Recycling Private Limited, H-59, Sector 63, Noida, UP-201301	11.10.2018
2	M/s. Auctus E Recycling Solutions Pvt. Ltd. A-58, Udyog Kendra-1, Ecotech-III, Village Habibpur, Noida-Dadri Road, Surajpur, Greater Noida (UP) 201306	12.11.2018
3	M/s Earth Sense Recycle Pvt. Ltd., Plot No:37, TSIIC Industrial Park, Mankhal, Maheshwaram Mandal, Rangareddy Dist., Telangana-501359	11.10.2018
4	M/s EPR Compliance Pvt. Ltd., 422, The Summit Business Bay, Andheri Kurla Road, Near WEH Metro Station, Andheri (East), Mumbai-93	12.11.2018
5	M/s Hulladek Recycling Pvt. Ltd., 4 D.L. Khan Road, Block B, Flat-401, 4th Floor, Kolkata-700025	12.11.2018
6	M/s Karo Sambhav Private Limited, 408-409, Fourth Floor, Suncity Business Tower, Sector-54, Golf Course Road, Gurugram-122002, Haryana	29.08.2018
7	M/s Mahalaxmi Metalloys India Private Limited, Plot No. 87, 91/92, Sikhera Road Industrial Area, Modinagar, Dist. Ghaziabad (U.P.)201204	23.10.2018
8	M/s Pegasus Support System Pvt. Ltd. F- 6, 1st Floor, 4648/1, 21, Ansari Road, Daryaganj, New Delhi 110002	14.09.2018
9	M/s Pro Connect, G-7, New Market, Near Khasa Kothi Circle, Jaipur-302016 Rajasthan	12.11.2018
10	M/s R2 PRO Pvt. Ltd., B03-Jain Height-Altura, Kalkondrahalli, Sarjapur Road, Banglore-560102	23.10.2018

Fig. 9.1.3 : Examples of waste collecting vendors

UNIT 9.2: Waste Management and Disposal Solutions

Unit Objectives

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

1. Describe waste management and disposal solutions

9.2.1 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. 9.2.1: Waste management and disposal solutions

Turn Away from Single-Use Plastics

A few instances of these include plastic straws, sanitary napkins, take-out containers etc. There are plenty of reusable alternatives to them, like glass and metal straws.

One good manner of doing this is by shopping at bulk stores and zero-waste stores that provide products without packaging. A good practice is to carry around a reusable bag, metal straw and a stainless steel bottle to cut the dependencies on polluting stuff.

Fig. 9.2.2: Waste Management Hierarchy

Conventional Technologies

It is apparent that certain technologies are no longer applicable to modern waste reduction as well as recycling, but some organizations continue to rely on them because they appear to be cheap. However, more technologies are evolving or being created to solve waste management problems. These technologies can be used to recycle or up cycle waste, creates alternatives from products that normally produce more waste, or find a way to address the ever-growing problem of waste management.

There is seen to be plenty of this technology, including plastic-free shampoo pods and toothpaste pills, machines that sustainably remove waste from bodies of water.

UNIT 9.3: Pollution and Remedies

Unit Objectives

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

1. Explain pollution and its remedies

9.3.1 Pollution and Its Remedies

Today, the air is becoming foul, water is no longer clean, and forests are being cut down unscrupulously. Pollution in and of itself is difficult to define. The term is derived from the Latin word "polluere", which means 'to contaminate any feature of the environment. It may be broadly said to be 'adding to the environment a capably hazardous source or substance of energy faster than the environment can accommodate in it.

Methods to Counteract Pollution

Pollution prevention is considered as any action that reduces the number of contaminants released into the environment. Implementation of such processes reduces the severity and/or a number of hazards posed to both public health and the environment. If companies produce less waste, they do not have to worry about proper disposal. Some common methods for controlling pollution are:

- Reducing, Reusing, Recycling and Mitigating.
- Water pollution is capable of being controlled by using non-toxic soaps, detergents and cleaning products.
- Limiting the use of artificial fertilizers and pesticides helps in controlling soil and water pollution.
- Promoting and enforcing the use of biological methods for pest control.
- Chimneys should be longer in length so that polluting air is released high up in the atmosphere where it would not harm the surrounding environment.
- Automobiles should be installed with emission and pollution control systems.
- The timely servicing of automobiles also checks for air pollution.
- Carpooling and public transportation should be encouraged.
- Alternative sources of energy like wind, sun, water, geothermal should be harnessed and put to use.

Summary

- 'Waste' is any unwanted or un-useful material.
- Municipal wastes consist of everyday items discarded by the population.
- Hazardous waste refers to solid, liquid or gaseous waste that has the properties of corrosiveness, ignitability, reactivity and toxicity.
- Waste management includes the activities as well as actions required to manage waste from its in-ception to its end disposal.
- Proper management of waste is significant for building sustainable and liveable cities, yet it re-mains a challenge for many developing countries and cities.
- The biosphere and ecosystem are self-sustaining, and nature maintains a balance between the land, water, air and living organisms.
- The term "pollution" is derived from the Latin word "polluere", which means 'to contaminate any feature of the environment.
- Pollution prevention is considered as any action that reduces the number of contaminants re-leased into the environment.

Exercise

A. Answer the following questions briefly.

1. Which one stands to be a general type of waste?
   A. Commercial waste
   B. Hazardous waste
   C. Household waste
   D. Demolition waste

2. Which one is the type of hydrocarbon-eating bacteria that feed on oil?
   A. Alcanivorax borkumensis
   B. Bacillus
   C. Spirillum
   D. Vibrio

3. _____, reusing, recycling and mitigating helps in pollution reduction.
   A. Reducing
   B. Reinstalling
   C. Redeeming
   D. Reinvolving

4. The Latin term for pollution is _____
   A. pollueme
   B. polluese
   C. polluere
   D. polluete

5. _____ waste comes from medical facilities.
   A. Municipal
   B. Biomedical
   C. Industrial
   D. Commercial

B. Answer the following questions by choosing the correct option:

1. What are the differences between recyclable waste and non- recyclable waste?
2. What are two general types of wastes?
3. What stand to be the significance of the different colored dustbins?
4. Outline the responsible waste management hierarchy.
5. What are the methods for controlling pollution?

Notes

10. Employability Skills

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11. Annexure

Annexure - III

Chapter No.	Unit No.	Topic Name	Page No.	Link to QR Code	QR Code
Chapter 1. Module 1 (Bridge Module)	Unit 1.1 Introduction to Food Processing Industry	1.1.1 Food Processing	13	https://www.youtube.com/watch?v=J-2EiMVNtpM	Overview of Food Processing Industry | FICSI Food SSC
Chapter 1. Module 1 (Bridge Module)	Unit 1.3 Roles and Responsibilities	1.3.1 Roles and Responsibilities of Food Safety Team Leader	13	https://www.youtube.com/watch?v=5NE_wP229Mo	Roles and Responsibilities
Chapter 1. Module 1 (Bridge Module)	Unit 1.2 The Importance of Continuous Food Safety Training for Food Safety Team Leaders 10	1.2.5 Cleaning and Sanitation	13	https://www.youtube.com/watch?v=ZrMNr_JfmtE&list=PL_mT5DU_smK0LEkawYoU3ktdKVurCm5xZ&index=11	Orientation Video
Chapter-2. Prepare for Spice Production	UNIT 2.2: Clean and Maintain Work Area, Machinery & Tools	2.2.1 - Cleaning and maintenance of the work area	52	https://www.youtube.com/watch?v=VtSrqr0vfDE	Machinery used in Spice processing
Chapter-2. Prepare for Spice Production	Unit 2.1 - Planning for spice production	2.3.2 Obtaining and organizing producon material	52	https://www.youtube.com/watch?v=TZjU927RTZU&t=16s	Spice processing Method

Chapter No.	Unit No.	Topic Name	Page No.	Link to QR Code	QR Code
Chapter – 3 Product Spice and Seasonings	Unit 3.2: Process for Preparing Different Spices and Seasonings	3.2.2 Curry Powder Manufacturing Process	113	https://www.youtube.com/watch?v=bUvyQLCIleA	Demonstration on Red Chili Powder
Chapter – 3 Product Spice and Seasonings	Unit 3.2: Process for Preparing Different Spices and Seasonings	3.2.2 Curry Powder Manufacturing Process	113	https://www.youtube.com/watch?v=bUvyQLCIleA	Demonstration on Sambhar Powder
Chapter – 3 Product Spice and Seasonings	Unit 3.2: Process for Preparing Different Spices and Seasonings	3.2.2 Curry Powder Manufacturing Process	113	https://www.youtube.com/watch?v=-UVrJIt7qH4	Demonstration on Ginger powder processing
Chapter – 3 Product Spice and Seasonings	Unit 3.2: Process for Preparing Different Spices and Seasonings	3.2.2 Curry Powder Manufacturing Process	113	https://www.youtube.com/watch?v=usYWxnR1VfQ	Demonstration on Turmeric powder processing
Chapter – 3 Product Spice and Seasonings	Unit 3.2: Process for Preparing Different Spices and Seasonings	3.2.1 Whole Spices Manufacturing Process	113	https://www.youtube.com/watch?v=jTv_tpIEEzE	Demonstration on Large Cardamom powder processing

Chapter No.	Unit No.	Topic Name	Page No.	Link to QR Code	QR Code
Chapter – 3 Product Spice and Seasonings (FIC/N8515)		3.2.4.1 Problems Occurring During Spice Processing and Their Troubleshoo ng	113	https://www.youtube.com/watch?v=Y5gdDIzXudY	Spice adulteration
Chapter – 3 Product Spice and Seasonings (FIC/N8515)	Unit 3.3: Packaging and Labelling of Various Spice Products	3.1.3.6 Packaging and Storage	113	https://www.youtube.com/watch?v=UjirN0yUhEQ	Packaging and Storage
Chapter 4- Ensuring Food Safety and Personal Hygiene (FIC/N9901)	Unit 4.2 - Schedule IV requirements of FSSAI	4.2.1 Schedule IV Requirements of FSSAI	146	https://www.youtube.com/watch?v=JSh4G2z3eCI	Introduction to schedule 4 Part1
Chapter 4- Ensuring Food Safety and Personal Hygiene (FIC/N9901)	Unit 4.2 - Schedule IV requirements of FSSAI	4.2.1 Schedule IV Requirements of FSSAI	146	https://www.youtube.com/watch?v=9Vjyi0GhVGA	Introduction to schedule 4 Part2
Chapter 4- Ensuring Food Safety and Personal Hygiene (FIC/N9901)		4.1.4 Storage (Importance of Storing Food at Specified Temperature)	146	https://www.youtube.com/watch?v=shAjoTniuI0	Basic storage and transportation
Employability Skills				https://www.skillindiadigital.gov.in/content/list	

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