NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

Participant Handbook

Sector
Food Processing

Sub-Sector
Fish and Sea Food

Occupation
Processing

Reference ID: **FIC/Q4001, Version 3.0**
NSQF level 3

Fish and Sea Food Processing Technician

Published by

Food Industry Capacity & Skill Initiative (FICSI)

Shriram Bharatiya Kala Kendra, 1, Copernicus Marg, Mandi House, New Delhi-110001

Email: admin@ficsi.in

Website: www.ficsi.in

Phone: +91-97112 60230, +91-97112 60240

First Edition, November 2022

This book is sponsored by Food Industry Capacity & Skill Initiative (FICSI)

Printed in India by FICSI

Disclaimer

The information contained herein has been obtained from various reliable sources. Food Industry Capacity & Skill Initiative (FICSI) disclaims all warranties to the accuracy, completeness or adequacy of such information. Food Industry Capacity & Skill Initiative shall have no liability for errors, omissions, or inadequacies, in the information contained herein, or for interpretations thereof. Every effort has been made to trace the owners of the copyright material included in the book. The publishers would be grateful for any omissions brought to their notice for acknowledgements in future editions of the book. No entity in Food Industry Capacity & Skill Initiative shall be responsible for any loss whatsoever, sustained by any person who relies on this material. All pictures shown are for illustration purpose only. The coded boxes in the book called Quick Response Code (QR code) will help to access the e-resources linked to the content. These QR codes are generated from links and YouTube video resources available on Internet for knowledge enhancement on the topic and are not created by FICSI. Embedding of the link or QR code in the content should not be assumed endorsement of any kind. Food Industry Capacity & Skill Initiative is not responsible for the views expressed or content or reliability of linked videos. FICSI cannot guarantee that these links/ QR codes will work all the time as we do not have control over availability of the linked pages.

> 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

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

FOOD INDUSTRY CAPACITY & SKILL INITIATIVE

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Fish and Sea Food Processing Technician'**

QP No. **'FIC/Q4001, NSQF Level 3'**

Date of Issuance: July 29th, 2021
Valid up to: July 28th, 2024

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

Authorised Signatory
(Food Industry Capacity & Skill Initiative)

Acknowledgements

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

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

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

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

About this book

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

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

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

- FIC/N4001: Prepare and maintain work area and machineries for processing fish and seafood
- FIC/N4002: Prepare for execution of fish and sea food processing
- FIC/N4003: Execution of fish and sea food processing
- FIC/N4004: Complete documentation and record keeping related to processing of fish and seafood
- FIC/N9001: Ensure Food safety, hygiene and sanitation for processing food products
- DGT/VSQ/N0101: Employability Skills

Symbols Used


Key Learning Outcomes


Unit Objectives


Exercise


Notes


Practical

Table of Contents

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

1. Introduction

FIC/N4001

Key Learning Outcomes

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

1. Explain the purpose of training
2. Discuss the National Occupational Standards and the Qualification Pack
3. Define food processing
4. List the various sectors of the food processing industry
5. Describe the various stages of food processing for converting raw materials to food products
6. Describe the fisheries industry in India
7. List the various types of fish and sea food products
8. State the methods of processing fish and sea food
9. State the roles and responsibilities of a fish and sea food processing technician
10. State how to conduct yourself at a workplace
11. Undertake a self assessment test

UNIT 1.1: Introduction to the Training Programme

Unit Objectives

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

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

1.1.1 Purpose and Benefits of the Training Programme

This training programme is developed to impart specific skills to individuals who wish to be as a Fish and Sea Food Technician. The training programme is based upon the national occupation standards for the food processing sector. The National Occupational Standards have been described in the following subsection of this chapter.

The training programme will enable an individual to:

- prepare and maintain work area and process machineries for processing fish and sea food
- prepare for execution of fish and sea food processing
- process all types of fish and sea food manually or mechanically to achieve the desired quality as set by the organisation
- complete documentation and record keeping related to processing of fish and sea food
- follow and maintain food safety and hygiene in the work environment.

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

Fig. 1.1.1. Skill cards

1.1.2 Introduction to QP and NOS

This training programme is intended for imparting basic skill and knowledge relevant to the job role, required to perform at a food processing industry. This programme is based on qualification pack called Fish and Sea Food Processing Technician. The Qualification Pack Code for a Fish and Sea Food Processing Technician is FIC/Q4001. This is also called a QP.

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

Under Fish and Sea Food Processing Technician QP, there are five NOS's which detail the functions to be performed at work site as a Fish and Sea Food Processing Technician.

NOS Code	Major Function/Task
FIC/N4001	Prepare and maintain work area and process machineries for processing fish and sea food
FIC/N4002	Prepare for execution of Fish and Sea Food Processing
FIC/N4003	Execution of Fish and Sea Food Processing
FIC/N4004	Complete documentation and record keeping related to processing of Fish and Sea Food
FIC/N9001	Food safety, hygiene and sanitation for processing food products
DGT/VSQ/N0101	Employability Skills

UNIT 1.2: Introduction to the Food Processing Industry

Unit Objectives

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

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

1.2.1 Food Processing

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

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

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

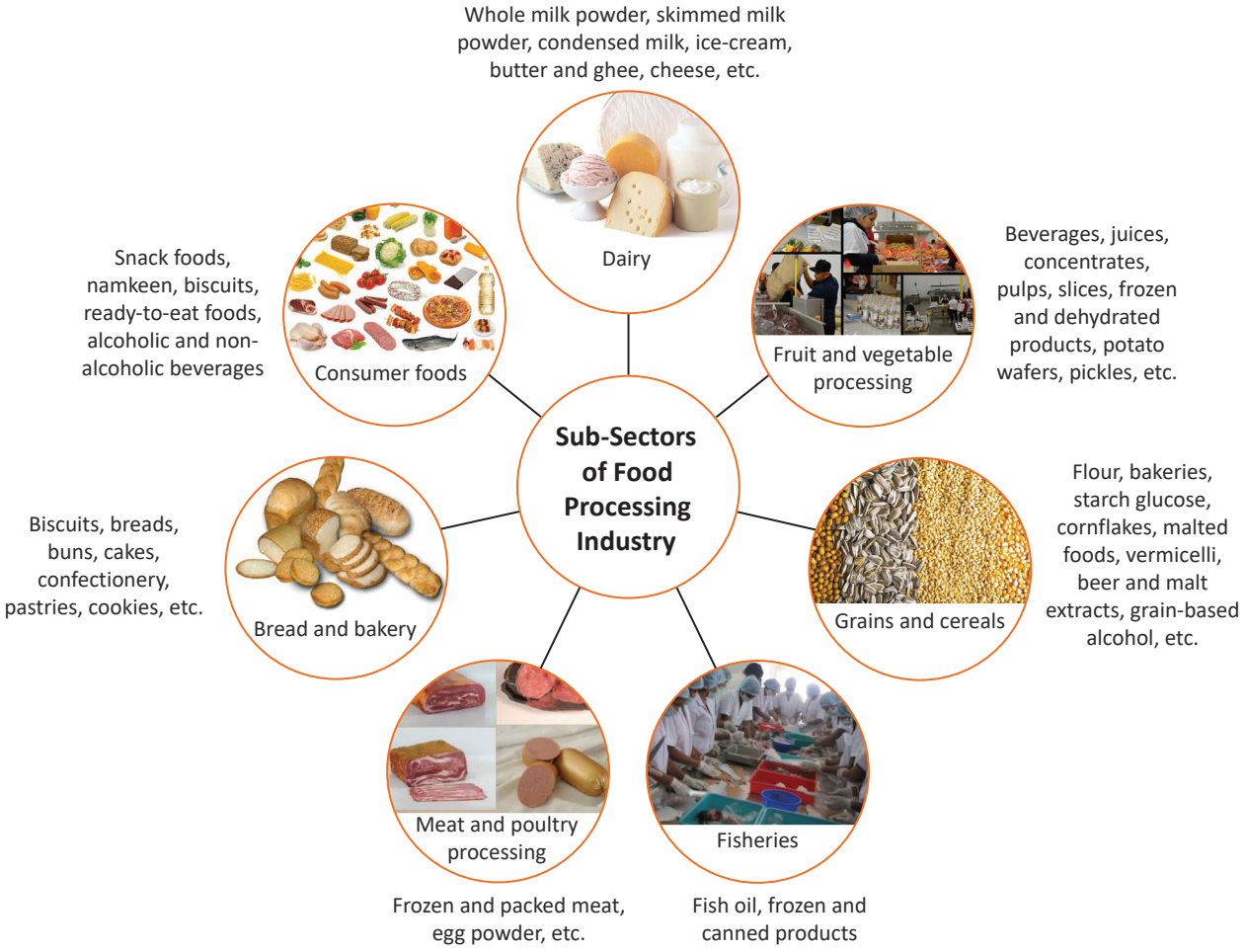


Fig. 1.2.1. Sub-Sectors of food processing industry

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

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

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

1.2.2 Journey of Food from Harvest to Consumer

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

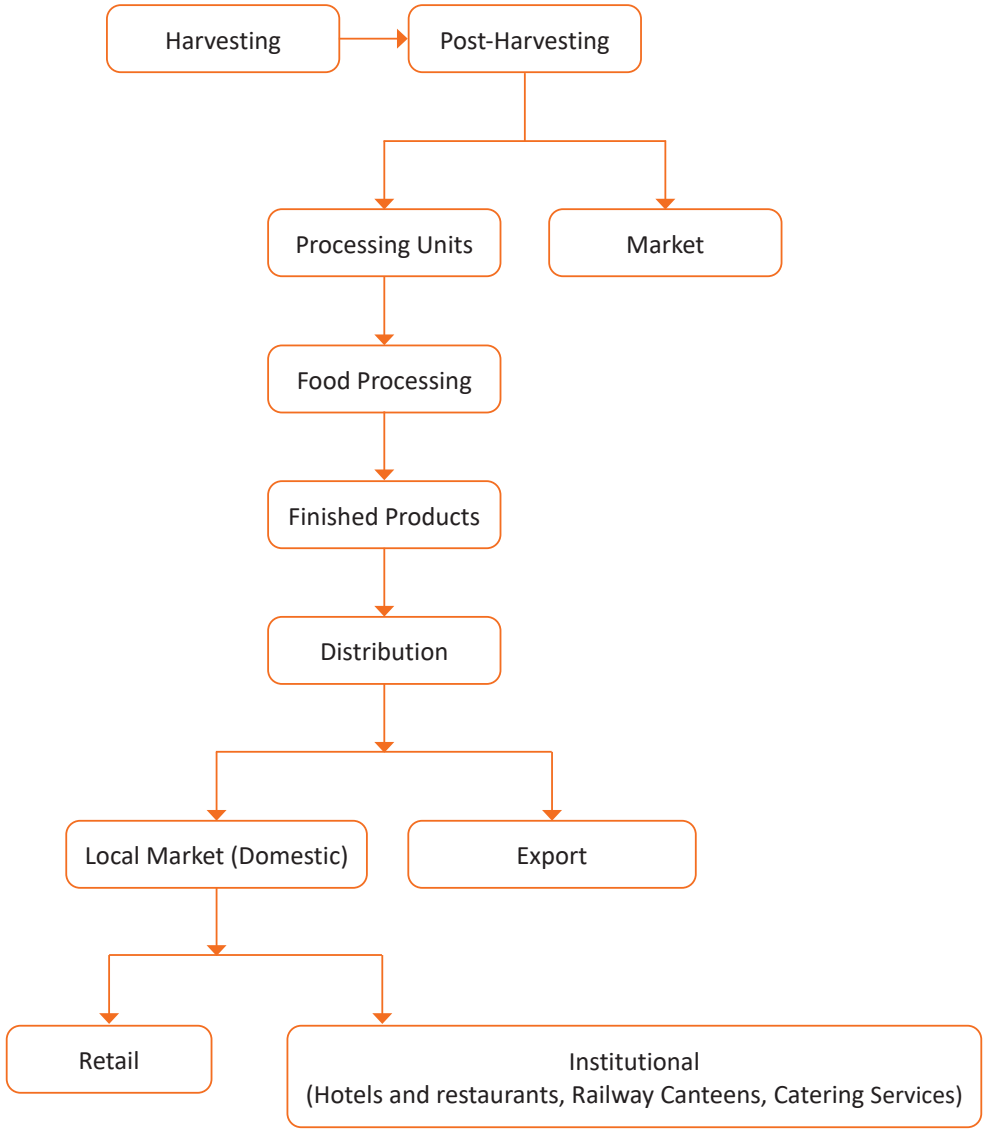


Fig. 1.2.2. Journey of harvested food

UNIT 1.3: Introduction to the Fish and Sea food Processing

Unit Objectives

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

1. Describe the fisheries industry in India.

1.3.1 Fish and Sea Food Processing in India

India is a peninsular country. It has an extended coastline on the east, west, and south borders. Besides this, fish holds a very important position in many diets. All these factors put together has led to a well-established fisheries industry in India.

The fisheries industry in India is huge and is the fourth-largest producer of fish in the world. Nearly 10 million people residing in more than 4,000 coastal regions are engaged in fishery activity and earn a living.

India holds a great potential for both inland and marine fishing. It has huge reservoirs for fishing. The fisheries industry contributes a large percentage to the Gross Domestic Product (GDP) of Indian economy. Massive production and export has made the fisheries sector an essential part of the Indian economy.

Fig. 1.3.1. Fish and sea food processing technician

Fig. 1.3.2. Fish and sea food processing technician

UNIT 1.4: Fish and Sea Food Processing

Unit Objectives

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

1. List the various types of fish and sea food products
2. State the methods of processing fish and sea food.

1.4.1 Types of Fish and Sea Food Products

Fig. 1.4.1. Fish glue

Fig. 1.4.2. Chilled fish

Fig. 1.4.3. Fish oil

Fig. 1.4.4. Sushi (cooked butterfly shrimp)

Fig. 1.4.5. Fish fingers

Fig. 1.4.6. Frozen fish fillets

Fig. 1.4.7. Fish emulsion

Fig. 1.4.8. Squalene

Fig. 1.4.9. Tuna eyes

Fig. 1.4.10. Fish hydrolysate

Fig. 1.4.11. Shrimp head-on cooked (centre peeled)

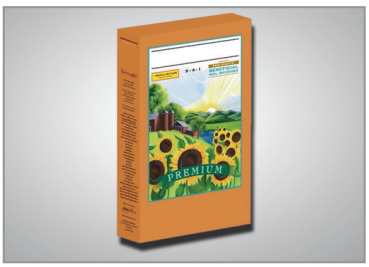
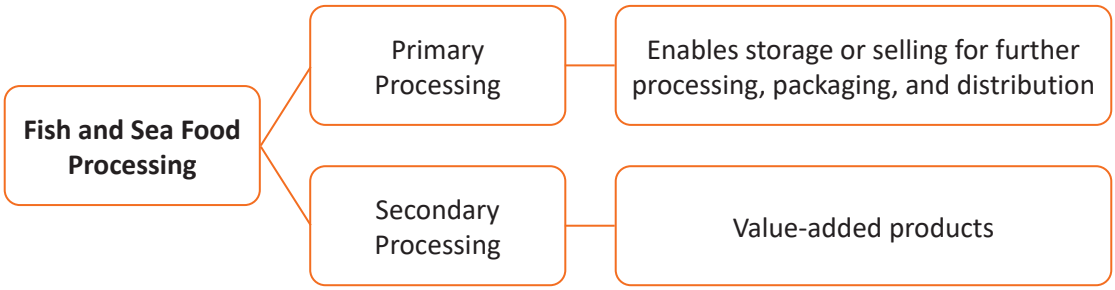


Fig. 1.4.12. Fish meal

Fig. 1.4.13. Fish sauce

Different Methods of Fish and Sea Food Processing



- Primary processing - First methodical assessment of the fish before processing
- Secondary processing - Includes processes at any stage beyond primary processing

The various methods in both the processes are listed below:

Primary Processing	Secondary Processing	
Washing	De-boning	Salting
Cleaning	Skinning	Drying
Heading	Chilling	Smoking
Gutting	Freezing	Canning
Grading	Gilling	Marinating
Filleting	Scaling	Packaging
	Finning	

UNIT 1.5: Attributes of a Fish and Sea Food Processing Technician

Unit Objectives

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

1. State the roles and responsibilities of a fish and sea food processing technician.

1.5.1 Roles and Responsibilities of a Fish and Sea Food Processing Technician

Roles	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 machineries	• Optimise the use of machinery • Ensure smooth operation of machinery to complete production line
Inspect machines and troubleshoot issues	• Ensure smooth operation of machinery to complete production line • Optimise the use of machinery • Attend to minor repairs of tools and machinery when required • Ensure that safety rules and regulations are observed • Prevent accidents • Inform 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 organisational standards
Follow storage and packaging norms	• Ensure safe and proper storage of raw material, packaging material, and finished goods

Table 1.5.1: Roles and Responsibilities of a Fish and Sea Food Processing Technician

UNIT 1.6: Workplace Ethics

Unit Objectives

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

1. State how to conduct yourself at a workplace.

1.6.1 How Should you Conduct Yourself at a Workplace?

Workplace ethics are a set of guidelines that are followed to ensure smooth and effective functioning of a workplace. Some important ones to remember are:

- Address seniors, assistants, and workers with respect
- Follow the processes laid out in the manufacturing unit
- Follow food safety norms at all times
- Do not compromise with the quality of the product at any given cost
- Perform your work with complete honesty
- Perform your roles and responsibility with integrity
- Be a team player

Fig. 1.6.1. Workers taking orders

Fig. 1.6.2. Checklist

Cleaning and Sanitising

1. Pre-cleaning - scrape and rinse to remove left over food items
2. Wash - use cleaning agent to remove stuck-on food.
3. Rinse - to remove food and cleaning agents
4. Sanitise - to kill bacteria and viruses
5. Air Dry - allow to dry

Fig. 1.6.3. Cleaning and sanitising process

Exercise

1. Fill in the blanks with the correct option

a. Food _____ is the method used to convert raw materials into food products.

i. proofing
ii. dispersing
iii. processing
iv. picking

b. Food _____ is an important method to store food products for longer periods of time.

i. preparation
ii. preservation
iii. consumption
iv. allocation

c. Journey of food from harvest ultimately reaches the _____.

i. consumers
ii. bankers
iii. builders
iv. packers

d. The fisheries industry in India is huge and is the _____ largest producer of fish in the world.

i. second
ii. fourth
iii. third
iv. fifth

e. _____ processing is the first methodical assessment of the fish before processing.

i. Secondary
ii. Tertiary
iii. Primary
iv. Multiple

f. The two types of fish and sea food processing methods are _____.

i. first and second
ii. primary and secondary
iii. most important and crucial
iv. pre-production and post-production

g. _____ is not the responsibility of a Fish and Sea Food Processing Technician.

i. Adopting safety and sanitation related measures
ii. Following safety norms and practices
iii. Ensuring smooth operation of machinery to complete production line
iv. Preparing icing mix and top the baked products with icing

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

i. rules and regulations
ii. principles
iii. guidelines
iv. standards

i. The basic methods of applying salt to fish are pickle salting, brine salting, and _____.

i. salting
ii. wet salting
iii. smoking
iv. dry salting

j. Salting reduces the _____ content in the fishery products.

i. salt
ii. taste
iii. gel
iv. moisture or water

2. Identify the processes for various methods of fish and sea food products. Mark a tick against the correct option.

a. Washing	Primary Processing Secondary Processing	☐ ☐
b. Scaling	Primary Processing Secondary Processing	☐ ☐
c. Finning	Primary Processing Secondary Processing	☐ ☐
d. Filleting	Primary Processing Secondary Processing	☐ ☐
e. Marinating	Primary Processing Secondary Processing	☐ ☐
f. Heading	Primary Processing Secondary Processing	☐ ☐
g. Freezing	Primary Processing Secondary Processing	☐ ☐
h. Gilling	Primary Processing Secondary Processing	☐ ☐
i. Gutting	Primary Processing Secondary Processing	☐ ☐
j. Salting	Primary Processing Secondary Processing	☐ ☐

Notes

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

https://www.youtube.com/watch?v=wMu0EpUgCd4

Overview of the Food Processing Industry

https://www.youtube.com/watch?v=NiK1yeDtLPI

Overview of Fish and SeaFood Industry

https://www.youtube.com/watch?v=5HdXvLo16Ws

Orientation Video of Fish and Seafood Processing Industry

https://www.youtube.com/watch?v=GeJip5dK2Ns

Types of Seafood product

https://www.youtube.com/watch?v=2G1uq6k6tVw

Roles and Responsibility of Fish and Seafood Processing Technician

2. Food Safety, Hygiene and Sanitation for Processing Food Products

FICSI
Food Industry Capacity and Skill Initiative

Unit 2.1 - Sanitation and Hygiene

Unit 2.2 - Safety Practices

Unit 2.3 - Good Manufacturing Practices (GMP)

Unit 2.4 - Hazard Analysis and Critical Control Point (HACCP)

FIC/N9001

Key Learning Outcomes

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

1. State the personal hygiene and sanitation guidelines
2. State the food safety hygiene standards to follow in a work environment
3. Follow the fire safety practices in the work area.
4. State the importance of safety, hygiene, and sanitation in the food processing industry
5. Follow the industry standards to maintain a safe and hygienic workplace
6. State the storage requirements for raw materials and finished products
7. Determine the quality of food and intake measures to prevent spoilage
8. Follow stock rotation based on FIFO/FEFO
9. Follow HACCP principles to eliminate food safety hazards in the process and products

UNIT 2.1: Sanitation and Hygiene

Unit Objectives

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

1. State the personal hygiene and sanitation guidelines
2. State the food safety hygiene standards to follow in a work environment.

2.1.1 Personal Sanitation

Sanitation and hygiene are the most important aspects to take care of when working in a food processing area. Some important sanitation and hygiene practices that must be followed are:

Maintain a high standard of personal cleanliness viz. have a bath every day and wear clean clothes to work.

Wear Personal Protective Equipment (PPE) such as aprons, mouth mask, head cover, face mask, hand gloves, gum boots, and beard cover mask at all times during work hours.

Always keep your finger nails trimmed.

Always keep your hair trimmed and wear a hair net while working.

Fig. 2.1.1. Personal sanitation

Fig. 2.1.2. Washing hands with soap and water

Wash your hands and feet at the designated area or wash stations provided.

Wash your hands with soap and water each time before you enter the production area.

Refrain from smoking, spitting, chewing paan, sneezing or coughing over any food when in the production area.

Do not handle food when suffering from a disease, illness, burns, injury or infection.

Fig. 2.1.3. Do not smoke, spit, cough

Fig. 2.1.4. Timely medical treatment

Take proper and timely medical treatment when you are ill or if you have met with an accident.

Visit a registered medical practitioner at regular intervals to keep a check on your health.

UNIT 2.2: Safety Practices

Unit Objectives

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

1. Follow the fire safety practices in the work area.

2.2.1 Symbols

There are some symbols that you must know and understand to ensure safety in case of an emergency or fire. They are:

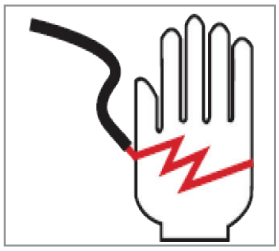
Caution

Danger Fragile Roof

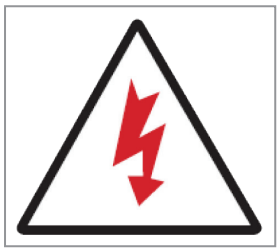
Dangerous Chemicals

Do Not Enter

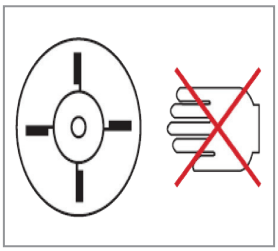
Danger Scaffolding Incomplete



Beware of Electric Shock



Electric Hazard

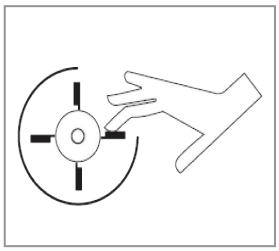


Never put your Hand Inside During the Operation

Highly Flammable

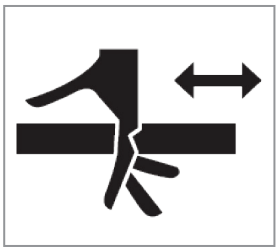
Hot Surface Do Not Touch

Mind Your Head

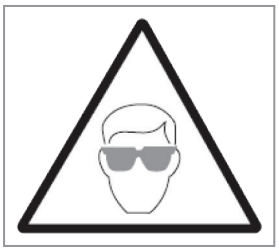


Never Open the Cover During the Operation

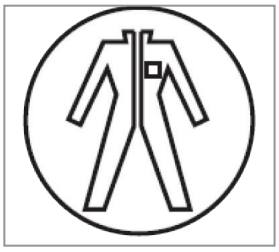
Use the Dustbin



Never Touch Moving Part



Wear Eye Protection



Wear Protective Clothing

Warning Slippery Floor

This is a Tobbacco Free Workplace

Assembly Point

Fire Exit

Fig. 2.2.1. Safety symbols

2.2.2 Emergency Measures

During an emergency, you must follow certain measures to tackle the situation in an organised manner. These measures are:

- Do not panic
- Respond to your senior immediately or inform the matter to the concerned person
- Prepare against the emergency situation by keeping a fire bucket and a water source handy
- Evacuate the work area

After the emergency, you must:

- Report the situation to a senior or the concerned authority
- Undertake recovery measures

Fire Safety Measures

Just like emergency measures, some common fire safety measures must be followed in case of fire. They are:

- Press the closest fire alarm button (if available)
- Call the fire brigade
- Assemble at the assembly point or designated area for safety
- Evacuate the building from the closest fire exit

Types of Fire and Fire Extinguishers

Choosing the right extinguisher can prevent property damage and save lives				
Types of Fire Extinguishers → / Types of Fire ↓	Water	Foam	CO_2	Dry Chemical
Class A: Paper, Wood, Plastic Fabric, Rubber, Trash	✓	✓	✗	✓
Class B: Oil, Petrol, Some Paints and Solvents	✗	✓	✓	✓
Class C: Electrical Equipment, Appliances, Computers	✗	✗	✓	✓

Fig. 2.2.2. Types of fire and fire extinguishers

How to use the Fire Extinguisher?

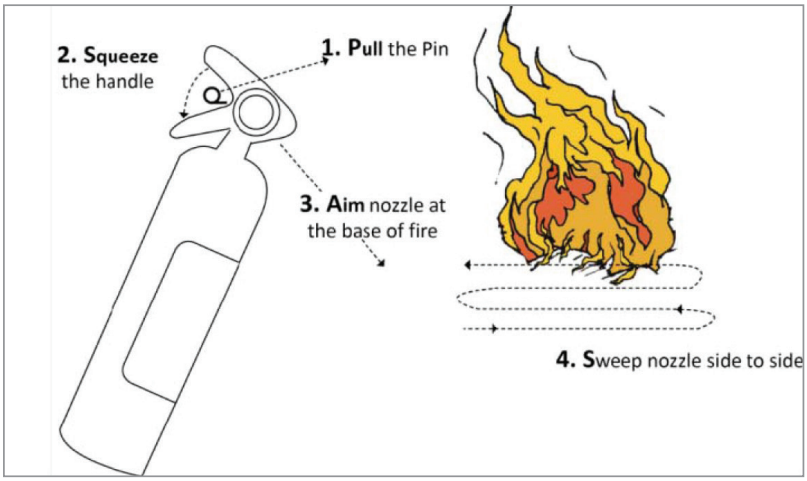


Fig. 2.2.3. Fire extinguisher

How to use the Fire Buckets?

Use the fire bucket filled with sand/water → Dump the sand/ water on the fire → Refill the fire buckets

Fig. 2.2.4. Fire bucket

UNIT 2.3: Good Manufacturing Practices (GMP)

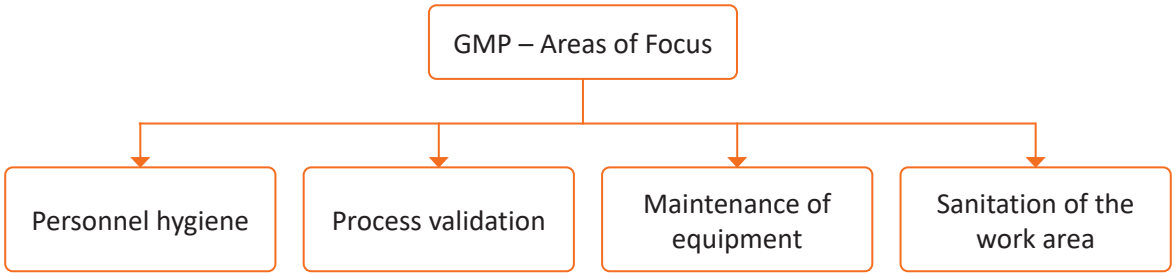
Unit Objectives

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

1. State the importance of safety, hygiene, and sanitation in the food processing industry
2. Follow the industry standards to maintain a safe and hygienic workplace.

2.3.1 Good Manufacturing Practices (GMP)

GMP is a set of guidelines proposed by the Food Safety Standards Authority of India (FSSAI) to ensure the production of high quality and safe processed foods. It requires a qualitative approach towards manufacturing to reduce chances of microbial contamination, spoilage, and errors.



Area of focus	GMP
Personnel hygiene  *Fig. 2.3.1. Personnel hygiene*  *Fig. 2.3.2. Facilities for toilets*	• Your organisation follows strict hygiene and sanitation guidelines • You are provided training on Good Manufacturing Practices (GMP) • You are in a sound health condition during working hours • You follow high standards of cleanliness • Your processing unit has enough facilities for toilets and wash stations
Sanitation of the work area  *Fig. 2.3.3. Designated area for keeping utensils*  *Fig. 2.3.4. Sanitation of the work area*	• The processing unit where you work is located in a clean, pollution-free area • The entire processing unit is well ventilated and has adequate lighting • The entire work area follows high standards of cleaning and sanitisation • There is a designated area for keeping utensils and equipment. It is kept clean and pest-free at all times

Equipment maintenance

Fig. 2.3.5. Equipment maintenance

Fig. 2.3.6. Monthly schedule

- The equipment used for processing foods is protected against contamination from lubricants, metal fragments, fuel, and contaminated water
- The cleaning and maintenance of tools, materials, and equipment is an easy process
- The organisation follows a cleaning and sanitising drill as per daily, weekly, and monthly schedules

Process validation

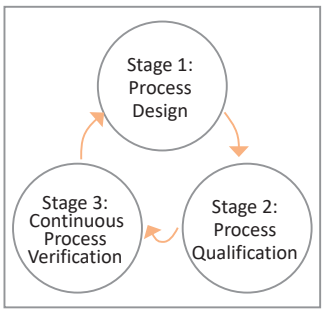


Fig. 2.3.7. Process validation

Fig. 2.3.8. Quality checks

- All processes of production, like raw material procurement, execution, storage, packaging, and logistics follow strict organisational parameters
- Quality checks are conducted at each step of production. This helps to ensure that food quality is maintained as per prescribed norms and standards
- The stock rotation of finished product follows the FEFO and FIFO methods. This is to ensure that there is a minimum chance of food spoilage. It will also help to retain the taste of processed foods

UNIT 2.4: Hazard Analysis and Critical Control Point (HACCP)

Unit Objectives

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

1. Follow HACCP principles to eliminate food safety hazards in the process and products.

2.4.1 What is HACCP?

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

Conduct a hazard analysis

- Evaluate the production process and identify the points where hazards (physical, chemical, and biological) may be introduced

Identify critical control points

- Identify the critical points in the process plan where a hazard may occur
- Plan preventive measures at that critical point to control the risk

Establish critical limits

- State the boundary line between safe and unsafe processes
- State the limit until which a critical point maybe controlled

Establish a monitoring system

- State the process of monitoring critical points and critical limits

Establish corrective measures

- Specify the corrective actions that should be followed when critical limits are crossed

State verification procedures

- State the verification process to check whether HACCP principles are applied and followed
- Test the HACCP plan and ensure compliance on a regular basis
- Check whether the HACCP plan helps to prevent hazards effectively

Follow record-keeping procedures

- Keep records of all the critical points
- Maintain a log of situations when critical limits were exceeded
- State the corrective measures that were applied
- Include records of the development and maintenance of the system

Example of an HACCP Plan

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

Exercise

1. Identify the correct focus area of GMP from the list given below. Mark the correct option

GMP	Area of Focus	
a. All processes of production like raw material procurement, execution, storage, packaging, and logistics follow strict organisational parameters.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
b. The equipment used for processing foods is protected against contamination from lubricants, metal fragments, fuel, and contaminated water.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
c. Your processing unit has enough facilities for toilets and wash stations.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
d. The entire work area follows high standards of cleaning and sanitisation.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
e. The entire processing unit is well ventilated and has adequate lighting.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
f. The organisation follows a cleaning and sanitising drill as per daily, weekly, and monthly schedules.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
g. You are provided training on Good Manufacturing Practices (GMP).	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐
h. You are in sound health condition during working hours.	Personnel hygiene Sanitation of the work area Equipment maintenance Process validation	☐ ☐ ☐ ☐

2. Match the columns

Hazard Analysis	HACCP Principle
a. Plan preventive measures at that critical point to control the risk	i. Follow record-keeping procedures
b. State the boundary line between safe and unsafe processes	ii. State verification procedures
c. Specify the corrective actions that should be followed when critical limits are crossed	iii. Establish critical limits
d. Test the HACCP plan and ensure compliance on a regular basis	iv. Establish a monitoring system
e. Maintain a log of situations when critical limits were exceeded	v. Conduct a hazard analysis
f. Evaluate the production process and identify the points where hazards may be introduced	vi. Identify critical control points
g. State the process of monitoring critical points and critical limits	vii. Establish corrective measures

Practical

Objective

1. Q1) Conduct a practical to demonstrate the steps that need to be followed to maintain safety and hygiene at workplace.

Precautions:

- Always wear protective gloves and goggles when recommended.
- Before using hypochlorite, and liquid chloride, ensure that pH and concentration level is maintained as per the SOP.
- Ensure that the area is well ventilated while using hydrogen peroxide.
- Always read the instructions on the label before use, even if it's a product you use regular-ly. You don't want to accidentally use the product in the wrong area or use it incorrectly.
- Always note the warning symbols and safety precaution symbols displayed in the work ar-ea and follow them.
- Never store chemicals near food, food storage areas or any tools or equipment that will touch food. Keep them under lock in a designated area only for cleaning tools and chemi-cals.
- Never leave chemicals on or near a food preparation area. That includes on top of coun-ters, stoves, etc.
- Do not store chemicals above food prep areas, kitchen sinks or drain boards.
- Store chemicals in their originally labelled containers and make sure they are closed properly.
- Never use food storage containers to store, transport or mix chemicals.
- Always spray chemicals holding the spray nozzle away from you.
- Never mix two different chemicals together.

Observation:

Sr. No.	Name of food contact surfaces cleaned	Name of cleaning agents used	Name of sanitis-ers used	Amount of cleaning agents used
1				
2				
3				
4				
5				

Conclusion:

Sr. No.	Conclusion			
1				
2				
3				
4				
5				

Notes

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

https://www.youtube.com/watch?v=RS4A-uczS6E

Lecture on GMP, GHP and FSMS

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

3. Prepare and Maintain Work Area and Process Machineries for Processing of Fish and Sea Food

FICSI
Food Industry Capacity and Skill Initiative

FIC/N4001

Key Learning Outcomes

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

1. Identify the different equipment used in the fish and sea food processing
2. State the materials and equipment used in cleaning and maintenance of the work area and machineries
3. List the various cleaning chemicals required
4. State the cleaning processes used to clean the work area
5. Describe how to dispose waste as per organisational standards.

UNIT 3.1: Equipment used for Fish and Sea food Processing

Unit Objectives

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

1. Identify the different equipment used in the fish and sea food processing.

3.1.1 Fish and Sea Food Processing Equipment

The equipment used in a fish and sea food processing unit are:

Type of Activity/Process	Tools/Process Machineries/Equipment
Receiving	• Crane (electric hoist and generator) • Crane (2 ton hydraulic) • Brailer • Scale • Slush-ice bag release • Tote (insulated - 1500 lb) • Forklift • Tote keeper for forklift (dumping) • Plastic shovel
Holding	• Ice machine - 5 ton (and enclosure) • Ice machine - 10 ton (enclosed)
General processing	• Tote dumper • Pallet jack • Double hopper • Feed chute and receiving table • Process line-belt conveyor • Rinse tank • Table - grading with bins • Boxing roller - (5" X 2" section) • Knife - 8" • Steel • Knife sharpener • Hand truck • Utility tub & lid • Tub cart • Sink-hand wash • Sink-3 compartment • Eye wash system • Rubber mat
H&G (Headed and Gutted) processing	• Header (automatic)

Type of Activity/Process	Tools/Process Machineries/Equipment
Fillet processing	• Fillet machine • Splitter • Fillet line (belt driven) • Pinbone machine (5-10 fish/min) • Pinbone trim line, belt driven
Smoking	• Smoker-horizontal flow-500 lb cap. • Smoker - vertical flow-500 lb cap. • Fish screens (1 set of 14) • Extra truck and screens (14 tier) • Chart recorder
Brining	• Drum and lid (to make/store brine) • Dolly (6 tub capacity) • Tub (for brine fish) • Auto injector - 16/64 needle • Auto injector 2nd needle set
Freezing/chilling	• Chiller • Blast freezer (20,000 lbs/day) • Freezer/cold storage • Freezer van - used (cold storage) • Truck and rack to hold fish • Glazing bin (dip-spray) • Gel machine with bag sealer 3 • Gel ice freezer
Canning	• Retort with controls • Retort boiler • Can seamer • Cart dolly • Hoist system
Fish cutting	• Knife - 6" 2 • Knife - 12" 2 • Knife scabbard • Racks for holding utensils • Band saw • Saw blade • Meat slicer • Bench scale • Spice scale • Meat hand saw • Hand saw blade • Meat lugger (tub) • Dolly-6 lug capacity and Dolly - 2 lug capacity • Bone scrapers • Block scrapers • Ham pump (multi-needle injector)

Type of Activity/Process	Tools/Process Machineries/Equipment
Fish grinding/stuffing	• Grinder • 1/8 inch plate (C1-32) • 3/16 inch plate (C1-32) • 1/4 inch plate (C1-32) • Knife N1-32 • Mixer 100# • Piston stuffer with table • Stuffing horn • Replacement part kit • Freezer paper dispenser • Spice scoop - 6 oz • Stainless steel zip tier • Dial thermometer+C150
Packaging	• Scale - bench (300 lb) • Scale stand • Strapping machine • Max pac clipper • Box stapler • Vacuum packer - double

Table 3.1.1: Equipment used in a fish and sea food processing unit are:

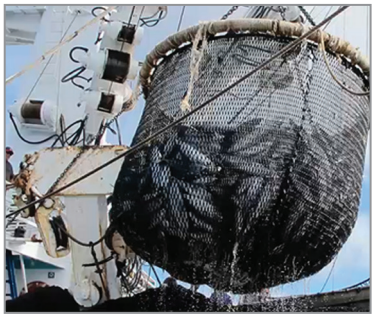


Fig. 3.1.1. Brailer

Fig. 3.1.2. Crane

Fig. 3.1.3. Slush ice bag

Fig. 3.1.4. Filleting machine

Fig. 3.1.5. Pallet jacket

Fig. 3.1.6. Process line-belt conveyer

Fig. 3.1.7. Feed chute and receiving table

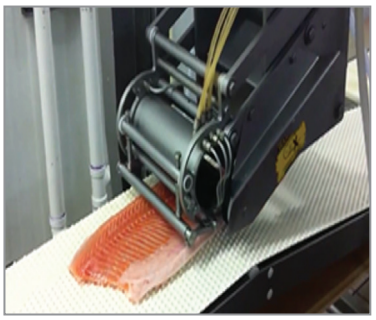


Fig. 3.1.8. Pin bone removal machine

Fig. 3.1.9. Smoking unit

Fig. 3.1.10.Blast freezer

Fig. 3.1.11. Freezer/cold storage

Fig. 3.1.12. Freezer van

3.1.2 Precautions and Safety Measures to Follow

- Avoid direct spillage of water on electrical components
- Clean the tools and equipment before and after each operation
- Ensure regular maintenance of tools and machinery
- Do not open machines with sharp knives during operation. It is safe to open a machine when it is unplugged from an electrical source
- Check machines like the steam-jacketed kettles regularly for efficiency of valves
- Ensure the build-up of pressure in machines is always under control
- Ensure the controls of all the machines are set to prescribed limits

UNIT 3.2: Sanitisation of the Work Area

Unit Objectives

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

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

3.2.1 Cleaning and Sanitisation

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

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

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

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

Table3.2.1: Types of work area for cleaning

Fig. 3.2.1. Food contact and non-contact zones in a production area

Equipment, Chemicals, and Sanitisers Used for Cleaning

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

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

Fig. 3.2.2. Cleaning knives and spoons

Fig. 3.2.3. Cleaning agents and equipments

Fig. 3.2.4. Cleaning in washing tanks

Fig. 3.2.5. Cleaning floors of production area

Fig. 3.2.6. Cleaning equipment parts

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

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

Tab;e 3.2.2: cleaners and sanitising agents to clean the food contact and non-food contact surfaces

Storage of Sanitisers and Disinfectants

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

UNIT 3.3: Cleaning Processes

Unit Objectives

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

1. State the cleaning processes used to clean the work area.

3.3.1 Clean-In-Place (CIP)

CIP is a method used for internal cleaning of machineries. 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 removal of bacteria and chemical residues.

Tips to conduct an effective CIP process:

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

3.3.2 Clean-Out-Of-Place (COP)

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

Tips to conduct an effective COP process:

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

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

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

3.3.3 Sterilising-In-Place (SIP)

SIP is the process by which food processing equipment is sanitised after the CIP process. It helps to eliminate any residual microbiological contamination.

SIP is a combination of three processes viz. sterilisation, disinfestation, and sanitisation.

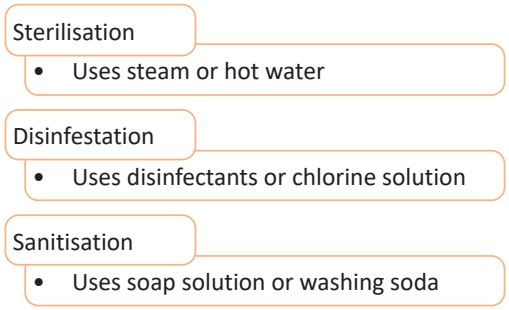


Fig. 3.3.1: Sterilising-In-Place (SIP)

3.3.4 Air-Pressure Cleaning

The food processing industry follows the air-pressure cleaning method to ensure cleanliness of regularly used equipment. The following chart explains the process in detail:

Fig. 3.3.2: Air-pressure cleaning

3.3.5 Process of Cleaning the Work Area

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

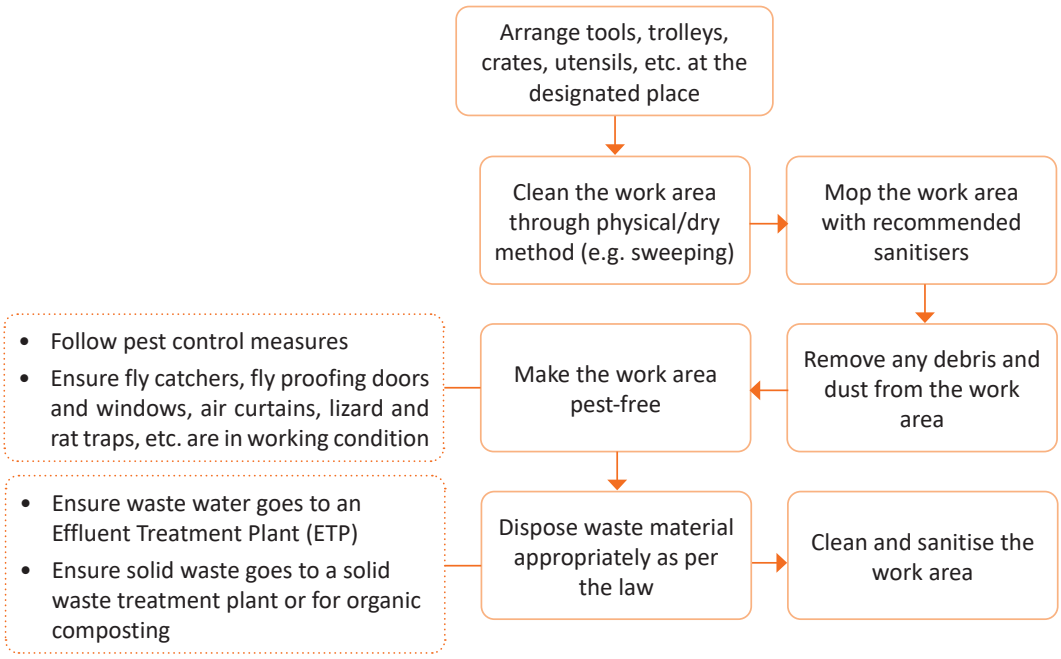


Fig. 3.3.3: Process of cleaning the work area

3.3.6 Process of Cleaning Machineries, Tools and Equipment

The chart explains cleaning of machineries, tools, and equipment used in the fish and sea food processing industry. The dotted chart states the techniques used for mechanical cleaning of equipment.

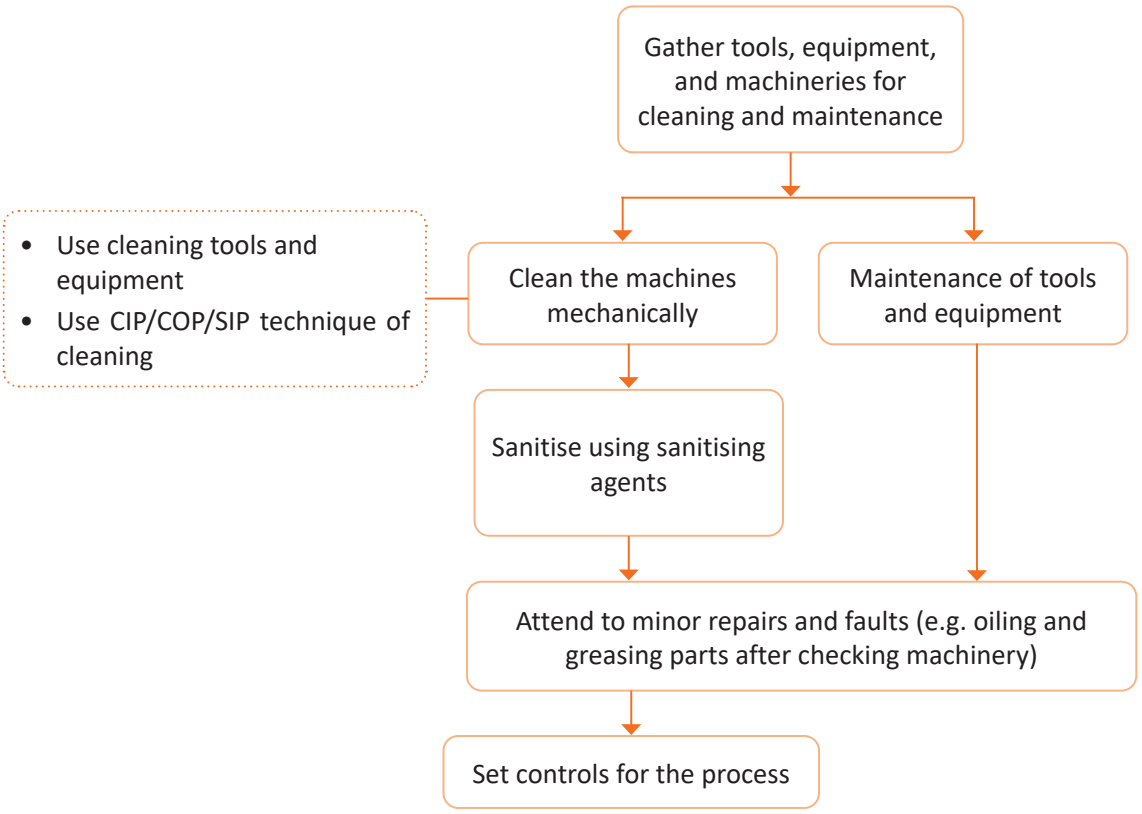


Fig. 3.3.4. Process of cleaning machineries, tools and equipments

UNIT 3.4: Disposal of Waste Materials

Unit Objectives

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

1. Describe how to dispose waste as per organisational standards.

3.4.1 Why Waste Disposal?

Waste disposal is critical in the food processing industry to keep processed food safe at every point. It is very important to maintain a safe and clean work area so that at no point food gets contaminated directly or indirectly.

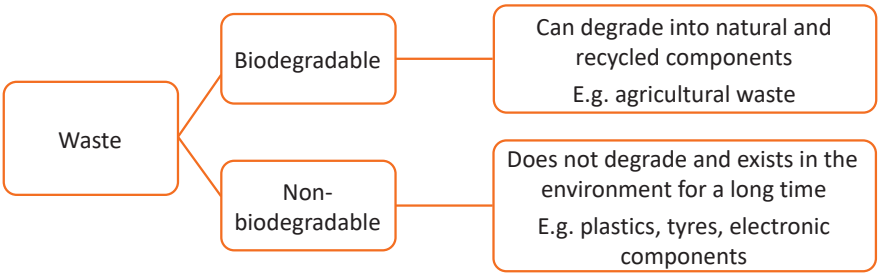


Fig. 3.4.1: Disposal of Waste

3.4.2 Solid Waste

Solid wastes are non-liquid, non-soluble materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances.

Solid wastes also include sewage sludge, agricultural refuse, demolition waste, and mining residues.

Solid waste in fish and sea food processing are mainly in the form organic (biodegradable) wastes generated in the production processes. Sea food processing activities generate potentially large quantities of organic waste and by-products. Waste generation depends on the species and the process.

Sea food waste:

- Consists of fish shells and heads from the sea food processing
- Only 25-50 % of the raw material is utilised for primary products
- Remaining 50-75 % of the raw material is considered processing waste and is utilised for low-valued products or disposed

There are ways to dispose solid waste like offal. Some of them include:

- Fit and use floor drains and collection channels with grids and screens and/or traps to reduce the amount of solids entering the wastewater
- Equip the outlets of wastewater channels with screens and fat traps to recover and reduce the concentration of coarse material and fat in the combined wastewater stream
- Avoid submersion of open products (e.g. fillets) in water as soluble protein may leak out and enter the wastewater effluent stream
- Ensure that tanks are effectively bunded and provide overfilling protection on bulk storage tanks
- Choose cleaning agents that do not have adverse impact on the environment or on wastewater treatment processes

3.4.3 Sludge Treatment and Disposal

The following measures reduce the volume of disposable waste generated from waste and wastewater treatment processes:

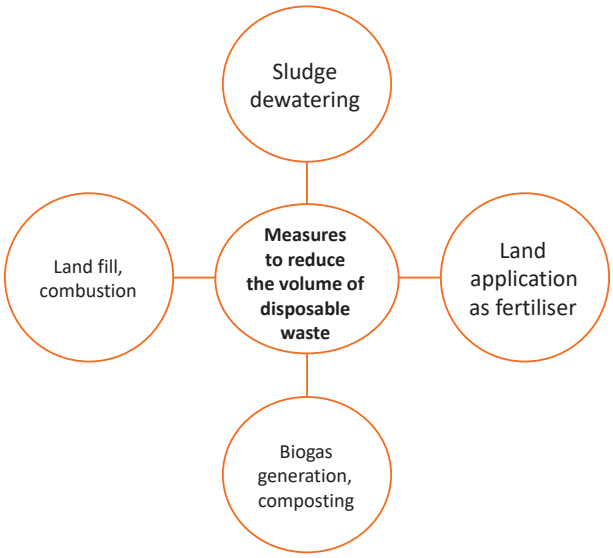


Fig. 3.4.2: Measures to reduce the volume of the disposal waste

3.4.4 Solid Waste Management

Fish waste is a rich source of essential amino acids and others products. Thus, all inedible fish waste should be utilised rather than disposed. Options for using fish wastes are listed below:

- Extract biochemical and other pharmaceuticals
- Extract colour additives
- Produce gelatine from skin and bones
- Use solid waste in fishmeal and oil production
- Use solid waste in silage production, compost production, directly as fertilizer, fish bait or chum or animal feed

Exercise

1. Fill in the blanks with the correct option

a.	Work tables	Food contact surface Non-food contact surface	☐ ☐
b.	Overhead structures	Food contact surface Non-food contact surface	☐ ☐
c.	Utensils	Food contact surface Non-food contact surface	☐ ☐
d.	Air conditioner	Food contact surface Non-food contact surface	☐ ☐

e.	Ventilating systems	Food contact surface Non-food contact surface	☐ ☐
f.	Lighting equipment	Food contact surface Non-food contact surface	☐ ☐
g.	Refrigeration equipment	Food contact surface Non-food contact surface	☐ ☐
h.	Walls and ceilings	Food contact surface Non-food contact surface	☐ ☐
i.	Tools like knives	Food contact surface Non-food contact surface	☐ ☐
j.	Machines that process food	Food contact surface Non-food contact surface	☐ ☐

2. Choose the correct option

a. _____ has strong odour and is used to kill bacterial spores, pathogens and other microorganisms.

i. Hydrogen sulphide
ii. Hydrogen peroxide
iii. Hydrogen oxide
iv. Hydrogen

b. The work area is cleaned _____.

i. to avoid bacterial growth
ii. to avoid customer complaints
iii. packed materials can be laid on the work area for counting
iv. none of the above

c. The full form of PPE is _____ .

i. Pure and Perfect Equipment
ii. Perfect and Pure Equipment
iii. Personal and Pure Equipment
iv. Personal Protective Equipment

d. SIP is used for _____ purpose.

i. shining
ii. clearing
iii. purifying
iv. sanitisation

e. The cleaning process used for internal cleaning of machineries without dismantling pipes is _____.

i. CIP
ii. COP
iii. SIP
iv. Sanitisation

Notes

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

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

The most important tools for your fish and seafood processing business

https://www.youtube.com/watch?v=QWpU7DAfNcs

Cleaning and Sanitation

4. Prepare for Execution of Fish and Sea Food Processing

FICSI
Food Industry Capacity and Skill Initiative

FIC/N4002

Key Learning Outcomes

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

1. List the different varieties of fish and sea food that are processed
2. State the quality parameters for raw materials to be processed
3. Describe the quality assessment methods based on the physical parameters
4. State the various units of measurement used in the food processing industry
5. Calculate the requirement of raw materials for desired quantity of finished product
6. Plan the production schedule as per organisational standards and instructions
7. Support in planning production sequence
8. Organise for raw material, packaging materials, manpower, equipment, and machineries for the scheduled production.

UNIT 4.1: Types of Fish and Sea Food

Unit Objectives

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

1. List the different varieties of fish and sea food that are processed.

4.1.1 Groups of Freshwater Species

Indian freshwater fish species are grouped into:

- Indigenous major carps
- Exotic carps
- Common-type carps
- Hill stream fishes
- Air-breathing fishes
- Ornamental fishes

The table below gives details of various types of fishes and the group they belong to:

Group	Variety of Fish in the Category
Elasmobranchs	Sharks, Skates, Rays
Eels	Eels
Catfishes	Catfishes
Clupeids	Wolf Herrings, Oil Sardine, Hilsa Shad, Anchovies, Colia, Setipinna, Thrissina
Bombay Duck	Bombay Duck
Lizardfishes	Lizardfishes
Goatfishes	Goatfishes
Threadfins	Threadfins
Croakers	Croakers
Silverbellies (Pony Fishes)	Silverbellies (Pony Fishes)
Flatfishes	Halibut, Flounders, Soles
Big Jawed Jumper	Big Jawed Jumper
Drift Fishes	Indian Drift Fish
Barracudas	Barracudas
Pomfrets	Silver Pomfret, Chinese Pomfret, Black Pomfret
Shrimps (Littoral)	Penaeid
Lobsters (Littoral)	Rock Lobsters
Other Crustaceans	Crabs
Cephalopods	Cuttle Fish, Octopus, Squids

Table 4.1.1: Various types of fishes and the group they belong to

UNIT 4.2: Quality Parameters

Unit Objectives

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

1. State the quality parameters for raw materials to be processed
2. Describe the quality assessment methods based on the physical parameters.

4.2.1 Quality Assessment of Fresh Fish

Quality Parameters/Characteristics	Quality Score (Ice/Seawater)
General appearance	
Skin	0: Bright, shining 1: Bright 2: Dull
Bloodspot on gill cover	0: None 1: Small, 10-30 % 2: Big, 30-50 % 3: Very big, 50-100 %
Stiffness	0: Stiff, in rigor mortis 1: Elastic 2: Firm 3: Soft
Belly	0: Firm 1: Soft 2: Belly burst
Smell	0: Fresh, seaweed/metallic 1: Neutral 2: Musty/sour 3: Stale meat/rancid
Eyes	
Clarity	0: Clear 1: Cloudy
Shape	0: Normal 1: Plain 2: Sunken
Gills	
Colour	0: Characteristic, red 1: Faded, discoloured
Smell	0: Fresh, seaweed/metallic 1: Neutral 2: Sweaty/slightly, rancid 3: Sour stink/stale, rancid
Sum of scores	**(Min = 0 and Max = 20)**
Good fish score	0
Poor fish score	20

Table 4.2.1: Quality assessment of a fresh fish.

UNIT 4.3: Basic Calculations

Unit Objectives

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

1. State the various units of measurement used in the food processing industry
2. Calculate the requirement of raw materials for desired quantity of finished product.

4.3.1 Measuring Units

Unit (Symbol)	Quantity	Examples	Uses
millilitre (ml)	Smaller volumes	About the volume of a kidney bean	For measuring most liquids. Not used very often for non-liquids. For quantities larger than about 1000 ml, litre is normally used.
litre (l)	Large volumes	Slightly more than 1 quart	For measuring larger amounts of liquids or the volume of pots, mixing bowls, etc. Litres are not usually used for measuring dry ingredients. Note that one litre is the same as 1000 ml.
gram (g)	Smaller weights	About the weight of a kidney bean	For measuring majority of non-liquid ingredients including flour, sugar, meats, cheeses, butter, etc. For quantities larger than 1000 g, kilogram is usually used.
kilogram (kg)	Large weights	A bunch of grapes or a large loaf of bread	For measuring larger quantities of non-liquid ingredients including meats, fruits, and vegetables. Note that 1 kg is the same as 1000 g.
centimetre (cm)	Length	About the width of the nail on your little finger	Any time a traditional American recipe gives something in inches, the metric recipe will probably specify centimetres.
millimetre (mm)	Length	About the thickness of uncooked angel hair pasta	In the kitchen, millimetres are most likely to be used for measuring very small lengths. Note that 10 mm are the same as 1 cm.

Table 4.3.1: Measuring units

4.3.2 Temperature

Temperature in the metric system is usually measured in degrees Celsius (°C). Here is a table with some common temperatures in °C.

Temperature	Description
0° C	Water freezes
21° C	Room temperature
37° C	Body temperature
100° C	Water boils
200° C	A hot oven

Table 4.3.2: Common temperatures in degree celsius

4.3.3 Calculating the Cost of Raw Materials

The amount of usable food after raw materials are prepared for processing is known as the 'yield' and is calculated as follows:

$$\text{Yield (\%)} = \frac{\text{Weight of raw material actually used in the process}}{\text{Weight of raw material that is bought}} \text{ X } 100$$

The true cost of raw materials depends on the yield and can be calculated as below:

$$\text{True raw material cost} = \frac{\text{Supplier cost}}{\text{\% yield}} \text{ X } 100$$

UNIT 4.4: Introduction to Food Microbiology, Food Spoilage and Food Preservation

Unit Objectives

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

1. State the types of food microbes
2. State the causes for food spoilage
3. State the process for food spoilage
4. State the criteria to check food spoilage
5. State the need for food preservation
6. State the different types of food preservation processes.

4.4.1 What is Food Microbiology?

Food microbiology is the study of microorganisms found in food products. Microorganisms are classified as:

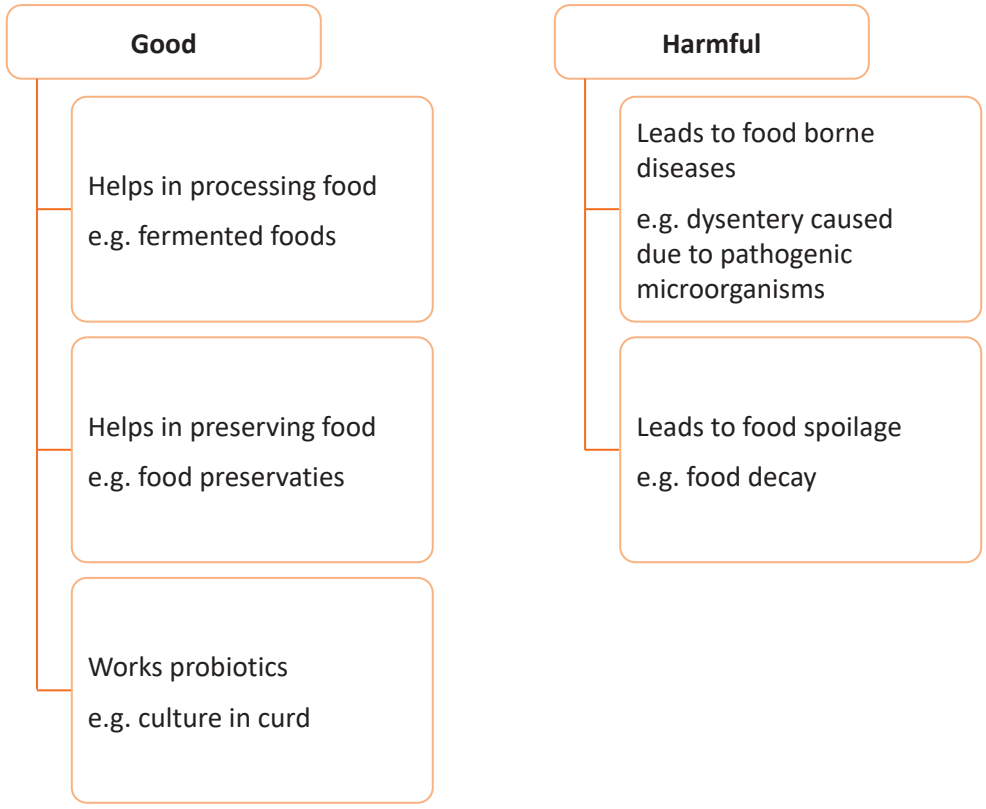


Fig 4.4.1: Classification of microorganisms

4.4.2 Types of Food Contaminants

Food spoilage is the process by which the original nutritional value, texture, flavours, and the form of food is damaged. The food then becomes harmful and unsuitable for human consumption.

Some types of contaminants in foods are:

Types of contaminants	Examples
Microbial	Bacteria, moulds, yeasts, viruses, etc.
Biological	Hair, excreta, bone splinters, etc.
Chemical	Pesticide residues, detergents, etc.
Physical	Bolts from machinery, stones, glass, etc.

Fig. 4.4.2. Microbial Contaminants

Fig. 4.4.3. Microbial Contaminants

Fig. 4.4.4. Biological Contaminants

Fig. 4.4.5. Biological Contaminants

Fig. 4.4.6. Chemical Contaminants

Fig. 4.4.7. Chemical Contaminants

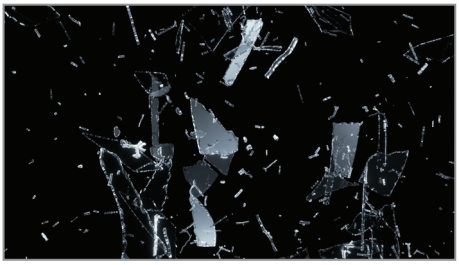


Fig. 4.4.8. Physical Contaminants

Fig. 4.4.9. Physical Contaminants

Process of Food Spoilage

The following process chart shows how food spoilage takes place:

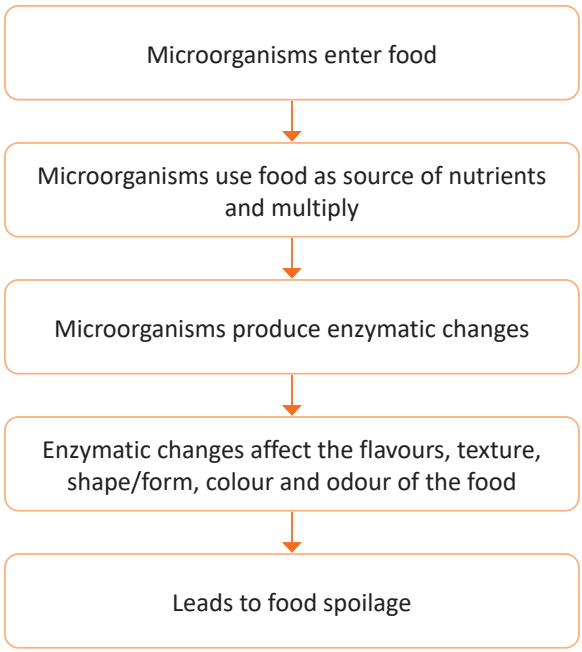


Fig. 4.4.12 Process of food spoilage

Fig. 4.4.10. Microbial spoilage of food

Fig. 4.4.11. Moulds on fruits

Classification of Food Based on Spoilage

The following table shows how food is classified based on spoilage:

Non-perishable foods	Semi-perishable foods	Perishable foods
Does not spoil unless handled carelessly E.g.: Sugar	Spoils only if handled carelessly or stored improperly E.g.: Potatoes	Spoils readily and needs to be stored with special preservatives/processes E.g.: Milk

Table 4.4.1: Classification of food based on spoilage.

Parameters to Check Food Spoilage

Following parameters will help you to check food spoilage:

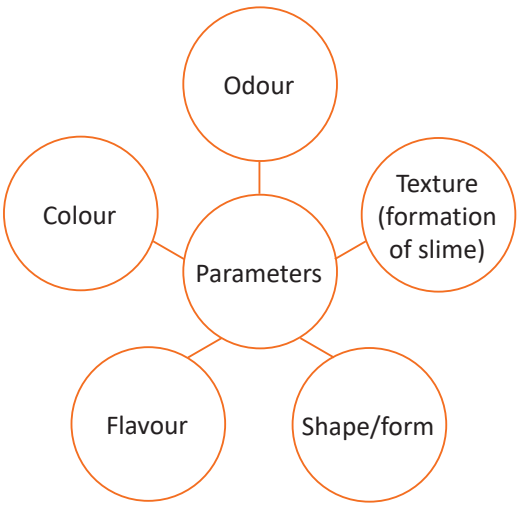


Fig. 4.4.13: Parameters to check food spoilage.

4.4.3 What is Food Preservation?

Food preservation is the process by which processed and unprocessed food is protected against microbes, spoiling agents, and contaminants. The objective of preserving processed food is to:

- Retain the original nutritive value
- Retain the original colour
- Retain the original flavour
- Retain the original texture of the food
- Extend the shelf life of the food
- Ensure year-round availability
- Prevent or delay spoilage

Common Methods of Food Preservation

The most commonly followed methods of food preservation are:

- Fresh storage
- Cold storage
- Freezing
- Drying/ dehydration
- Concentration
- Chemical preservation
- Preservation with sugar
- Pasteurisation
- Sterilisation
- Filtration
- Irradiation
- Curing
- Fermentation
- Salting

UNIT 4.5: Food Safety Practices

Unit Objectives

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

1. State the storage requirements for raw materials and finished products
2. Determine the quality of food and intake measures to prevent spoilage
3. Follow stock rotation based on FIFO/FEFO.

4.5.1 Spoilage

Spoilage is a complex process caused by enzymes present in the flesh and by microbes that enter the flesh after death. Microorganisms can come from the marine environment, water pollution or contamination caused by improper handling. These microbes increase the rate of spoilage. Some can even cause illness.

For many sea food products, increasing the storage temperature from 32°F to 40°F can double the rate of spoilage. Factors such as size, post mortem pH, fat content, and skin properties can all impact the spoilage rate of fish stored in ice.

The fact that post mortem pH is usually higher in fish than warm-blooded animals may account for its higher perishability. In addition to bacteria and enzymes, the highly unsaturated fat in fish goes bad causing rancid or other off odours or flavours.

4.5.2 Selecting, Handling and Preparing Sea Food Safely

- **Food allergies** is a safety consideration that individuals should be aware of before selecting sea food products.
- **Proper cooking** is the most common and effective way to ensure food safety. This removes concerns from bacteria, viruses and/or parasites that could be present in sea food and other raw foods.
- **Heat stable toxins** can be a concern in sea food and other foods that are contaminated or temperature abused.
    - Proper cooking cannot be relied upon as an absolute control for these food safety hazards.
    - Improper handling could lead to formation of heat-stable microbial toxins or biogenic amines that cannot be removed with cooking.
    - When certain types of fish like tuna, mahi-mahi, and mackerel are temperature abused, biogenic amines like histamine can be formed which cannot be eliminated by cooking.
    - Value-added products liked stuffed, breaded, and battered items that are temperature abused could also contain heat stable toxins.
- **Temperature control is the key to ensure complete safety for these products**. All sea food products should be kept at refrigeration temperatures as close to 32°F as possible to prevent the growth of microbial pathogens and prevent toxin formation.

4.5.3 Specific Guidelines for Using Sea Food

- Purchase sea food products from a reputable establishment and avoid any products that an individual may be allergic to.
- Keep sea food cold (as close to 32°F as possible) from the time of purchase or harvest until you are ready to cook or prepare it.
- Store it on ice during transport and in the refrigerator
- Keep preparation areas clean
- Practice good personal hygiene
- Sea food is perishable use it quickly
- Cook sea food properly (145°F for 15 seconds or until flaky and opaque – no longer translucent)
- Store leftovers properly at refrigerated temperatures (less than 40°F)

4.5.4 Stock Rotation System

- FIFO (First-In-First-Out) is a stock rotation system that dispatches processed food depending on the order in which it is produced.

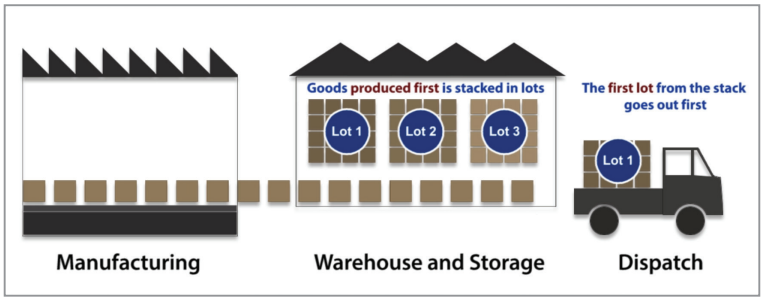


Fig. 4.5.1. FIFO stock rotation

- FEFO (First-Expired-First-Out) is a stock rotation system wherein products that need to be consumed earlier are shipped first.

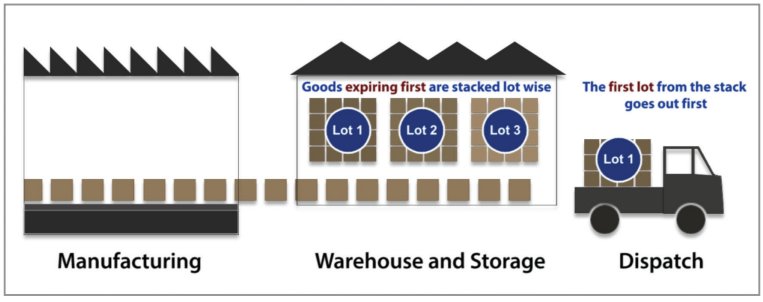


Fig. 4.5.2. FEFO stock rotation

- JIT (Just-In-Time): A system where finished product is dispatched to the distributor, retail industry or institution as soon as the product is ready. A carton of processed food can be stored for a maximum of 2 days in the storehouse.

UNIT 4.6: Plan Production Sequence

Unit Objectives

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

1. Plan the production schedule as per organisational standards and instructions
2. Support in planning production sequence
3. Organise for raw material, packaging materials, manpower, equipment, and machineries for the scheduled production.

4.6.1 Production Plan

The following chart provides an overview of the production planning process:

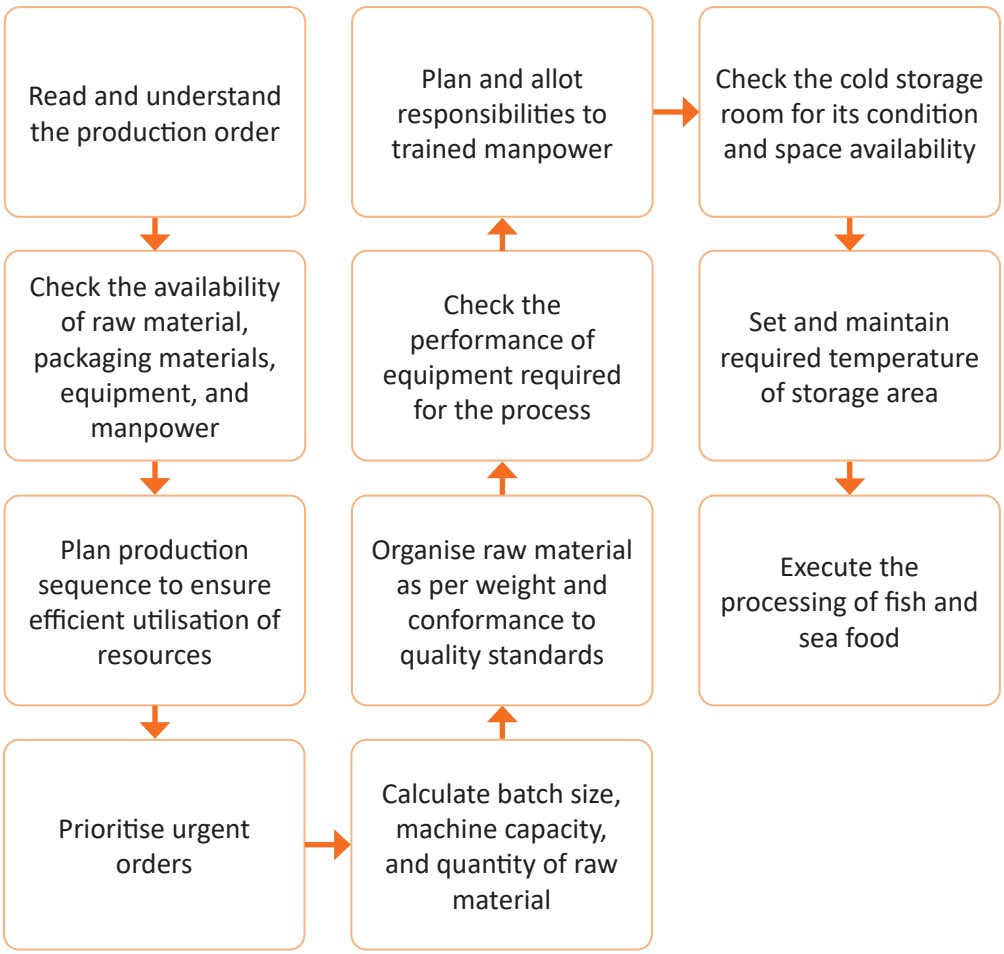


Fig. 4.6.1: Production planning process

Exercise

1. Match the column

Group	Types of fishes
a. Cephalopods	i. Halibut, Flounders, Soles
b. Elasmobranchs	ii. Wolf Herrings, Oil Sardine,Hilsa Shad, Anchovies
c. Flatfishes	iii. Crabs
d. Clupeids	iv. Cuttle Fish, Octopus, Squids
e. Other Crustaceans	v. Sharks, Skates, Rays

2. Choose the correct option

a. Freezing point of water is _____ .

i. 4^0C ii. 0^0C

iii. 2^0C iv. 1^0C

b. Boiling point of water is _____ .

i. 100^0C ii. 200^0C

iii. 50^0C iv. 101^0C

c. Temperature of hot oven is _____ .

i. 75^0C ii. 200^0C

iii. 150^0C iv. 100^0C

d. Normal body temperature of human being is _____ .

i. 39^0C ii. 37^0C

iii. 38^0C iv. 35^0C

e. Normal room temperature is _____ .

i. 21^0C ii. 23^0C

iii. 22^0C iv. 24^0C

Practical

Objective

1. Q2) Conduct a practical to demonstrate the storage procedures for raw materials and processed foods.

Observation:

Sr. No.	Name of process	Activity Performed
1		
2		
3		
4		
5		

Conclusion:

Sr. No.	Conclusion
1	
2	
3	
4	
5	

Notes

5. Execution of Fish and Sea Food Processing

Unit 5.1 - Handling Grading and Sorting of Raw Material

Unit 5.2 - Pre-Processing and Processing of Fish and Sea Food

Unit 5.3 - Methods of Fish and Sea Food Processing

FIC/N4003

Key Learning Outcomes

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

1. Describe the process of receiving and handling raw materials
2. State the process of grading and sorting varieties of fish and sea food
3. State the methods of pre-processing fish and sea food
4. Explain the different methods of fish and sea food processing
5. List the types and categories of packaging materials used for processed fish and sea food
6. State the laws and regulations related to product packaging and labelling
7. Describe the refrigeration and cold storage facility used for fish and sea food processing
8. Describe the storage conditions for all varieties of fish and sea food
9. Dtate the storage procedures for raw materials and processed food
10. State the documenting procedures for packaging and storing
11. Demonstrate the process of cleaning the work area and machineries after production.

UNIT 5.1: Handling Grading and Sorting of Raw Material

Unit Objectives

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

1. Describe the process of receiving and handling raw materials
2. State the process of grading and sorting varieties of fish and sea food.

5.1.1 Handling Raw Materials

There are certain rules to follow while handling raw materials. Some of them are:

- Release or discard species identified as protected, naturally dangerous or prohibited, and dispose diseased or environmentally spoiled sea food
- Grade and separate sea food according to species and size grade
- Keep sea food cold from the time of capture or harvest. Sea food spoils twice as fast if it is kept at more than 0˚C.
- Pack and stack sea food effectively
- Separate shark and ray meat from other lean finfish. When shark deteriorates, it smells of ammonia. This can contaminate the exposed flesh of other fish
- Separate damaged sea food from undamaged sea food
- Cooked sea food should not be packed with uncooked sea food

5.1.2 Grading

Grading fish into groups of similar species and sizes is a common management practice in fish farming.

Advantages of grading

- Reducing fish losses
- Improves supplementary feeding efficiency through adequate food ration
- Increases the accuracy of stock estimates for monitoring

Grades

Grade	Description
A+	Premium quality
A	Good quality; slightly less than premium quality
B	Acceptable quality with slight to moderate imperfections
C	Greater level of imperfections; lesser customer satisfaction

Table 5.1.1: different Grades given to fishes

Sorting

- Fish sorting usually involves separating a mixed group of fish into different species, male and female, immature and mature, diseased and clean, and other such categories. This is often done at the same time as grading and usually needs more skilled people.
- The sorting of fish into groups of the same species occurs only when different species of fish are farmed together. At harvest, either for stocking as juveniles or for marketing as food fish, the fish are first sorted by species before being graded, if necessary, by size.
- Fish may also be sorted according to sex. This happens for various reasons like when stocking fattening ponds for monosex culture of tilapia males or when stocking breeding ponds with a specific ratio of males to females.

Sr. No.	Accepted	Not accepted
1	**Appearance**	
	Eyes • Bright, bulging • Clear cornea • Shining black pupil **Gills** • Glossy, bright red or pink • Clear mucus if present **Skin** • Colours distinct and particular to species • Glossy • Scales adhering tightly • Clear mucus, if present	**Eyes** • Dull, sunken • Cornea opaque • Pupil cloudy **Gills** • Brown to greyish • Thick discoloured bacterial mucus **Skin** • Colours dull and faded • Scales detaching • Thick discoloured mucus
2	**Texture**	
	• Firm and elastic to touch • Springs back into place when pressed with finger • Skin feels smooth to touch	• Soft • Holds finger indentation • Skin feels gritty • Scales easily rubbed off
3	**Smell**	
	• Inoffensive • Slight sea smell	• Offensive smell • Ammonia/putrid

Table 5.1.2: Quality parameters for the selected whole/gutted fishes

UNIT 5.2: Pre-Processing and Processing of Fish and Sea Food

Unit Objectives

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

1. State the methods of pre-processing fish and sea food
2. Explain the methods of processing fish and sea food.

5.2.1 Handling During Pre-processing and Processing

- Handling the fish on land during pre-processing and processing affects the quality of the final product.
- Every stage, beginning from capture to handling to processing, and eventually to sale and to the consumer will lead to some loss of quality.
- Raw material specifications are different for each product.
- For example, chilled fish for immediate sale on the local market may not be perfectly fresh, but may still be acceptable to the consumer. But in the case of frozen fillets, fresh raw material will be required. This is because it will have to withstand the rigors of the freezing process and extended cold storage before it reaches the consumer. Hence, during pre-processing stage, raw material is graded according to the suitability for various processing methods. Handling the fish (raw material) during processing varies with type of the fish, the processing methods, and the intended final product.

5.2.1 Good Practices

- As far as possible, every precaution should be taken to avoid warming of fish as this will favour the action of enzymes and bacteria.
- Avoid mishandling the fish. This will damage the skin and flesh, and accelerate the process of bacterial contamination and enzymatic action.
- Cool the fish as quickly as possible by any convenient method. Whatever be the method, it is important to cool the entire fish.
- Fish, which are caught at different times, have to be kept apart since they will be at different stages of spoilage.
- Small fishes have to be kept separately from large fishes as they tend to spoil more rapidly.
- Soft-bellied fishes should be kept separately and if the guts are being removed or the belly has burst, the body cavity has to be washed to remove any traces of the gut.
- The containers used for transportation of fish should be cleaned after every use. Chlorinated water should be used, whenever possible, for every fish washing operation.
- Do not put fish on the ground. It can be kept on simple concrete/wooden platforms, which, if frequently cleaned, will reduce contamination.
- Fish handlers at every pre-processing and processing stage should learn and adopt good hygienic practices.

UNIT 5.3: Methods of Fish and Sea Food Processing

Unit Objectives

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

1. Explain the different methods of fish and sea food processing.

5.3.1 Salting

Salting is the process that lowers the moisture or water content in fish and other fishery products. Salt partially dehydrates the fish, kills the bacteria, and thus prevents microorganisms to live and grow. It also improves fish texture because it firms up the fish.

Three basic methods of applying salt to preserved fish		
Pickle Salting	**Brine Salting**	**Dry Salting**
• Fish covered with salt, packed in layers in watertight containers • Form of pickle as the saturated brine solution covers the fish completely	• Fish is immersed in saturated salt solution of 25 part salt and 100 part water • Temporary way to preserve fish before they are dried, smoked or processed	• Granular salt is applied over the fish • The proportion of salt to fish varies from 10 % to 35 % of the fish weight

Table 5.3.1: Methods of Salting.

Process of Salting

Fig. 5.3.1 Salting process

5.3.2 Smoking

This method combines with salting, pre-cooking, and drying. Smoking dehydrates the fish further. The smoke gives colour and flavour to the fish.

Method of Smoking

Fig. 5.3.2: Method of Smoking

5.3.3 Drying

This method is also known as natural dehydration. Like salting, it lowers the water content of the fish to a point where microorganisms, bacteria, enzymes, and yeasts cannot grow and multiply. The most popular fish preservation method is solar drying. It is done using salting method. Fish dried under the sun looks and tastes better.

Method of Drying

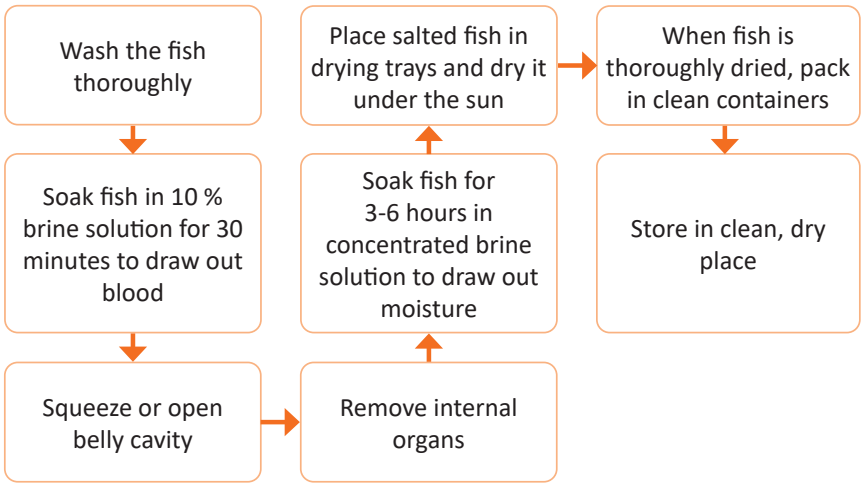


Fig. 5.3.3: Method of Drying

Curing

This method uses chemical preservatives (including vinegar and salt), smoke, and other factors to reduce the moisture or water content in the fish. Cured fish or fishery products possess flavour and texture completely different from those of the fresh fish.

Dehydration

Dehydration is an artificial process of drying because it is done with the use of mechanical devices such as oven that produce artificial heat for drying.

Pickling

Pickling is a method of preserving food in brine or vinegar. It can be done with or without bacterial fermentation.

Cooking

Cooking is the best way to prevent wastage or spoilage of fish. Cooking fish with vinegar, like in paksiw, prolongs the period of preservation.

5.3.4 Canning

Canning is the packing of fish in airtight containers such as tin cans and glass jars, which prevent air and microorganisms from entering. Through heat processing, microbes inside the can are destroyed. This prevents spoilage under normal condition and allows fish to be stored for longer periods. Sardines and salmon are the most commonly canned fish in the market.

Method of Canning

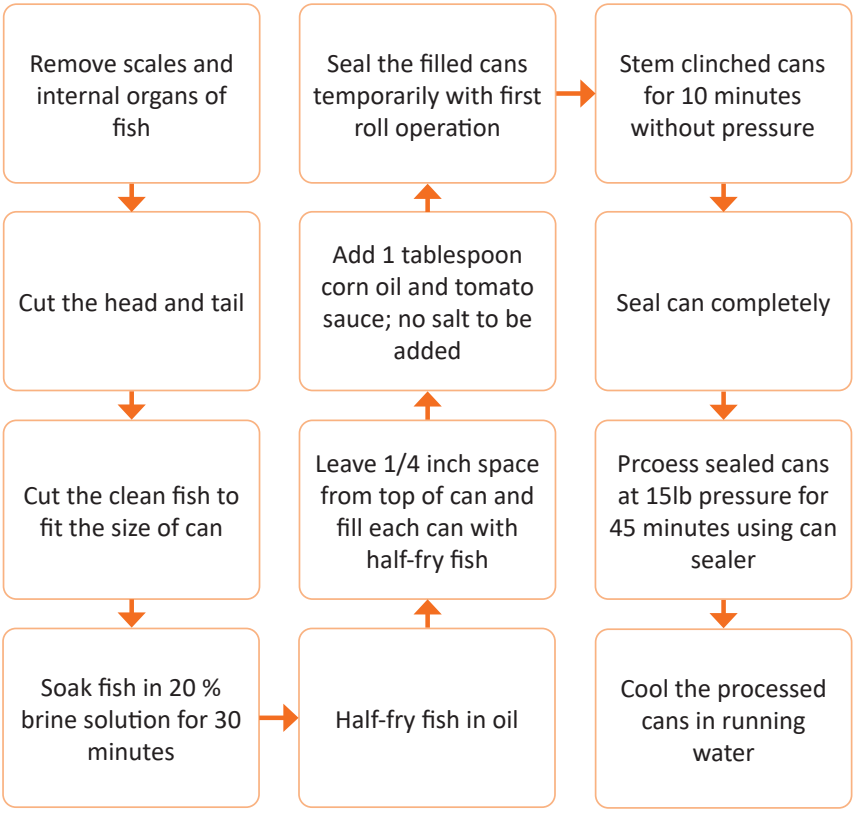


Fig. 5.3.4: Method of Canning

5.3.5 Fermentation

Fermentation is a fish preservation method in which fish in brine solution undergo chemical reaction.

Method of Fermentation

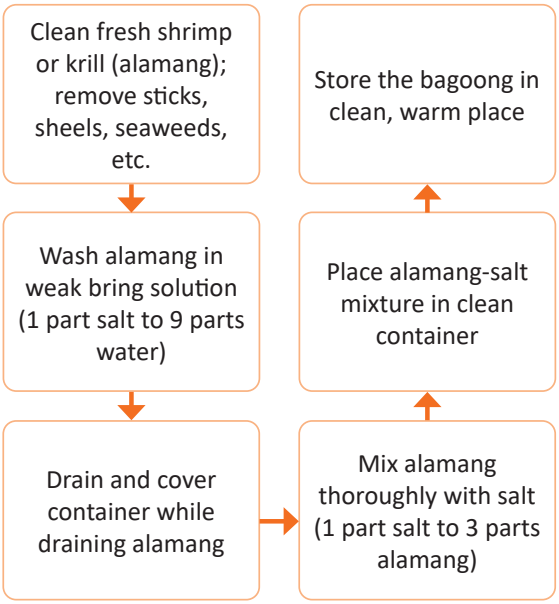


Fig. 5.3.5: Method of Fermentation

Exercise

1. Choose the correct option

a. The storage facility should be capable of maintaining the temperature of fish _____ .

i. between 0^0C and $+24^0$C
ii. between 0^0C and $+30^0$C
iii. between 0^0C and $+12^0$C
iv. between 0^0C and $+4^0$C

b. Freezing is a common method used for _____ .

i. layering
ii. smoothening
iii. preservation
iv. curing

c. _____ refers to checking and resolving any fault in the machinery if they breakdown.

i. Breakdown maintenance
ii. Breakdown maintenance
iii. Periodic maintenance
iv. Yearly maintenance

2. Arrange the right sequence of Post Production Cleaning and Maintenance of Work Area

Procedure/ Steps	Order the steps (as 1, 2, 3, 4, 5,6 and 7)
a. Keep tools and equipment in designated area	
b. Remove waste and dispose appropriately	
c. Clean and maintain machines, tools	
d. Maintain equipment as per organisational procedures	
e. Clean using cleaning agents and sanitisers	
f. Adjust and reset controls for next batch	
g. Ensure work area is clean	

Practical

Objective

1. Demonstrate the process of grading and sorting fish and seafood

Method:

2. Grading: grouping fish or seafood of similar sizes.
3. Sorting: separating a mixed group of fish into different species, males and females, imma-ture and mature fish, diseased and clean fish, etc.
   - Set up the sorting table close to the harvesting site, if possible in the shade.
   - Wet the surface of the sorting table well with clean water.
   - Under each opening of the table, place a container with clean, fresh water, such as buckets, plastic basins or half metal drums which can be used to transport the fish.
   - Transfer a small batch of fish gently on to the top of the sorting table.
   - Start sorting the large fishes first, placing them directly in a dip net and into water.

- Then sort the smaller fishes by sliding them and grouping them towards the corners which opens into a container with water.
- Once a batch is sorted and graded, rinse the table well, with plenty of clean water.
- Place another batch of clean fish on the table and continue sorting or grading by repeating the steps 6, 7 and 8.
- Move the sorted fish as soon as possible to the processing area.
- Once the lots are done, clean the table and dry it well.
- Store the table in the designated place.
- Note down your observations in the observation table.

Observation:

Sr. No.	Batch size	No. of types/size graded or sorted	Table cleaned for every operation (Yes/No)
1			
2			
3			
4			
5			

Conclusion:

Sr. No.	Conclusion
1	
2	
3	
4	
5	

Practical

Objective

1. Q1) Conduct a practical to demonstrate the procedure of:
   a. Salting
   b. Canning
   c. Packaging
   d. Fermentation

Practical

Objective

1. Demonstrate the process of pre-processing of fish and seafood

Method:

2. Pre-processing is the process of receiving, handling, grading, sorting and butchering of a fish or seafood (raw material) to make them ready for processing.
3. Fish can be pre-processed as whole fish or filleted fish.
4. In case of whole fish, the losses of body mass are up to 30% while in case of filleted fish it can go up to 70%.
   - Lay the fish on its side to remove the head.
   - Using the chef's knife or boning knife, make an incision just past the gills and pectoral fins until you hit the spine.
   - Apply some pressure with the knife to cut through the bone.
   - Finish cutting through until the head is off.
   - Now you can see the spine of the fish. At this point you can either make some crosscut steaks or filet the entire fish.
5. To make steaks:
   - Cut through the fish about an inch and a half thick.
6. To filet:
   - Start at the head end of the fish, and run your boning knife along the spine just above the dorsal fin, all the way to the tail.
   - The depth of the tip of the knife should be just beyond the spine.
   - Now run the knife along the ribs and the filet should be off the bone.
   - Set the filet aside and turn the fish over and repeat the steps on this side.
7. Trim the belly fat.
8. Next pluck the pin bones by hand or using large tweezers or pass it through pin bone removal machine.
   - If you run your finger along the middle of the filet from the head end down, you'll feel a line of tiny bones (pin bones) which end about two thirds of the way down

Precautions:

- Sanitise your hands properly.
- Wear the required PPE before starting the process.
- Clean and sanitise the tools to be used for pre-processing fish and sea food.
- Ensure hygiene and cleanliness throughout the process.

Observation:

Sr. No.	Raw material	Pre-processed as whole fish/ filleted fish	Final Quantity
1			
2			
3			
4			
5			

Conclusion:

Sr. No.	Pre-processed as whole fish/filleted fish	Removed Parts
1		
2		
3		
4		
5		

Notes

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

https://www.youtube.com/watch?v=e5wfjR3WYVc

Fish and Seafood Processing Technician

https://www.youtube.com/watch?v=x5v7QwWxQi4

Fish processing

https://www.youtube.com/watch?v=bn8mCcMg5lQ

Frozen fish processing

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

6. Post Production Activities

Unit 6.1 - Packaging

Unit 6.2 - Refrigeration and Cold Storage Facility

Unit 6.3 - Post Production Cleaning and Maintenance

FIC/N4002

Key Learning Outcomes

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

1. List the types of packaging and categories of packaging materials used for proce3ssed fish and seafood.
2. State the rules and regulations relating to product packaging and labelling.
3. Explain the refrigeration and Cols storage facilities used in the processing of fish and seafood.
4. State the storage conditions for all the varieties of fish and seafood.
5. Describe documentation procedures related to packaging and storage
6. Provide the process of cleaning work area and machines after production.

UNIT 6.1: Packaging

Unit Objectives

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

1. List the types and categories of packaging materials used for processed fish and sea food
2. State the laws and regulations related to product packaging and labelling.

6.1.1 What is Packaging?

Packaging means enclosing or protecting products for distribution, storage, sale, and use. Packaging includes designing and producing the container of the product.

Types of packaging

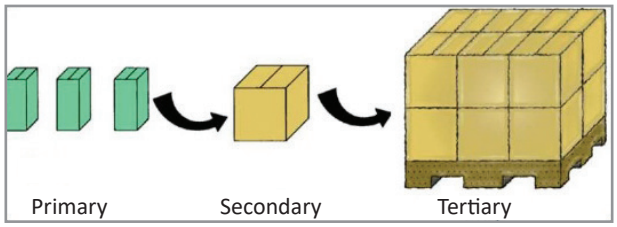


Fig. 6.1.1. Types of packaging

1. **Primary Packaging:** It is the material that first envelops the product and holds it. This usually is the smallest unit of distribution or use. It is in direct contact with the contents.

Meaning

- Comes in direct contact with the food and holds the product and features labeling

Packaging Materials

- Plastic Laminated Pouch
- Plastic Trays/ Pouches
- Tinplated cans
- Thermoformed trays (Hallow tray of moulded pulp, foam polystyrene or clear polystyrene)
- PVC, PET, PP and OPP films for overwraps
- EPS trays integrated with cellulose pads (drip absorber)
- Insulated polystyrene trays/boxes (frozen fish)
- PVDC polymers , EVOH-Packaging (Gas Barrier)
- PVDC, coated OPP and HDPE- Packaging (Water Vapour Barrier)
- LDPE, EVA and PP (Heat Seal Layer laminate for fresh fish)

Products Packed

- Fish and fish products can be grouped into fresh fish, frozen fish, canned fish, dried fish and other value added fish products.

- Fresh fishes include prawns, shrimps, tuna, cuttlefish, squids, octopus, red snappers, ribbon fish, mackerel, lobsters, catfish and a number of other varieties.
- Fish products include Minced fish sausages, cakes, cutlets, fillets, pastes, surimi, texturised products and dry fish.
- Fish and fish products can be grouped into fresh fish, frozen fish, canned fish, dried fish and other value added fish products.
- Fresh fishes include prawns, shrimps, tuna, cuttlefish, squids, octopus, red snappers, ribbon fish, mackerel, lobsters, catfish and a number of other varieties.
- Fish products include Minced fish sausages, cakes, cutlets, fillets, pastes, surimi, texturised products and dry fish.

2. **Secondary Packaging**: Secondary packaging is outside primary packaging. It may be used to group primary packages together.

Meaning

- Creates ease of manual movement of products

Packaging Materials

- Plastic Laminated Cartons/Cardboard box
- Double walled insulated moulded plastic containers
- Thermoformed boxes/cartons

Products Packed

- All products

3. **Tertiary packaging:** Tertiary packaging is used for bulk handling, warehouse storage, and transport shipping.

Meaning

- Used for long distance transportation and distribution

Packaging Materials

- Plastic Laminated large Cartons/Cardboard box
- Double walled insulated moulded plastic containers
- Thermoformed boxes/cartons

Products Packed

- All products

Packaging materials

The most common material used for manufacturing containers are:

- Tin plate
- Aluminium alloys
- Lacquered steel plate
- Retortable
- Tin Free Steel (TFS)
- Enamel coatings
- Glass jars
- Pouches

6.1.2 Acts and Regulations

Processing Element	Regulations
Minimum acceptable product quality	Fish Inspection Regulations: Sets a minimum standard that fish shall not be tainted, decomposed or unwholesome. This regulation is interpreted through fish product standards for many common species.
Input materials	(1) (a) and Section 7, Fish Inspection Regulations; Food and Drugs Act and Regulations. All packaging material must be new, sound, and clean. Packaging material and ingredients must be acceptable for food use.
Labelling	Fish Inspection Regulations: All sections relating to labels. Labels must be accurate, legible, and not misleading or deceptive.

Table 6.1.1: Acts and Regulations for packaging and labelling

UNIT 6.2: Refrigeration and Cold Storage Facility

Unit Objectives

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

1. Describe the refrigeration and cold storage facility used for fish and sea food processing
2. Describe the storage conditions for all varieties of fish and sea food
3. Dtate the storage procedures for raw materials and processed food
4. Dtate the documenting procedures for packaging and storing.

6.2.1 Chilled Storage (Technical Guidance)

- Fish should be moved to the chilled storage facility without undue delay.
- The facility should be capable of maintaining the temperature of fish between 0^0C and $+4^0$C.
- The chill room should be equipped with a calibrated indicating thermometer.
- Fitting of a recording thermometer is strongly recommended.
- Stock rotation plans should ensure proper utilisation of the fish.
- Fish should be stored in shallow layers and surrounded by sufficient, finely divided ice or with a mixture of ice and water before processing.
- Fish should be stored such that damage from over stacking or overfilling of boxes will be prevented.

Freezing

- The time/temperature parameters developed should ensure rapid freezing of product and should take into consideration the type of freezing equipment, capacity, size and shape of the product, and production volume. Production should be geared to the freezing capacity of the processing facility.
- If freezing is used as a control point for parasites, then the time/temperature parameters need to be established to ensure that the parasites are no longer viable. The product temperature should be monitored regularly to ensure completeness of the freezing operation. This relates to the core temperature. Adequate records should be kept for all freezing and frozen storage operations.

Activity	Product	Temperature
Storage	Fresh or wet sea food	-1^0C – $+5^0$C
	Frozen sea food	-25^0C or below
Freezing	Fresh sea food	-25^0C or below, as quickly as possible
Transporting	Fresh or wet sea food	-1^0C – $+5^0$C
	Frozen sea food	-18^0C or below

Table 6.2.1: storage temperature for different seafoood

Storing Sea Food

Following are the steps to maintain the quality of sea food:

- Chill sea food to 0^0C before packing, taking care not to go below -1^0C or higher than 5^0C.
- Cover the bottom of the box with about 6cm of ice. Place uncooked chilled sea food in plastic bags or cover with plastic sheeting before further ice is added to the product. This prevents leaching of skin colour, grey gills and cloudy eyes caused by melted ice water coming into contact with the fish.

- Use small soft flakes of ice when packing to avoid physical damage (e.g. bruising) to the fish. Soft, small ice (like flake ice) tends to pack easier and melt faster which is where the actual "cooling power" of ice comes from. Gel packs are not designed to cool like ice because the melted water is locked inside the pack. Therefore, if using gel packs, ensure that the product is chilled to the lower limits of the product specifications given in this guide before packing i.e. 0^0C.
- If fish are gutted, fill the cavity with ice and place belly down in the crate so the cavity drains. When doing this, ensure plastic sheeting is used (rather than plastic bags) and there are holes in the bottom of the container to allow ice water to drain.
- To reduce the risk of cross contamination never stack uncooked product on top of cooked sea food.
- Use plastic liners to encase cooked sea food and fillets to reduce the risk of cross contamination.
- Iced product should be placed in a cool room where the temperature is kept constant.
- Vessels without mechanical refrigeration should use a well-insulated box with polyurethane foam about 100 – 200mm thick. This is ideal because it provides effective insulation as well as being moisture and rot proof. The box should:
    - be lined with a suitable impervious material and internal corners should be rounded to facilitate cleaning
    - have provision for drainage and disposal of melt-water
- Upper layers of product should be supported to prevent crushing of fish beneath. Similarly, boxed product should be stacked so that the weight of upper boxes is supported by the structure of the boxes below. Boxes should not be overfilled.

Fig. 6.2.2: Blast freezer

This type of freezer storage is used to very rapidly bring down the temperature of foodstuffs or fresh produce, freezing them very quickly

Fig. 6.2.3: Cold storage

A facility with refrigeration for storing perishable items as they prolong the life and help prevent spoilage of foods

Fig. 6.2.4: Freezer van

A refrigerated van used for transportation of food stuff with cooling equipment

UNIT 6.3: Post Production Cleaning and Maintenance

Unit Objectives

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

1. Demonstrate the process of cleaning the work area and machineries after production.

6.3.1 Method of Post Production Cleaning

The chart below shows how to clean and maintain the work area after production. The cleaning and maintaining process has been detailed inside the dotted box.

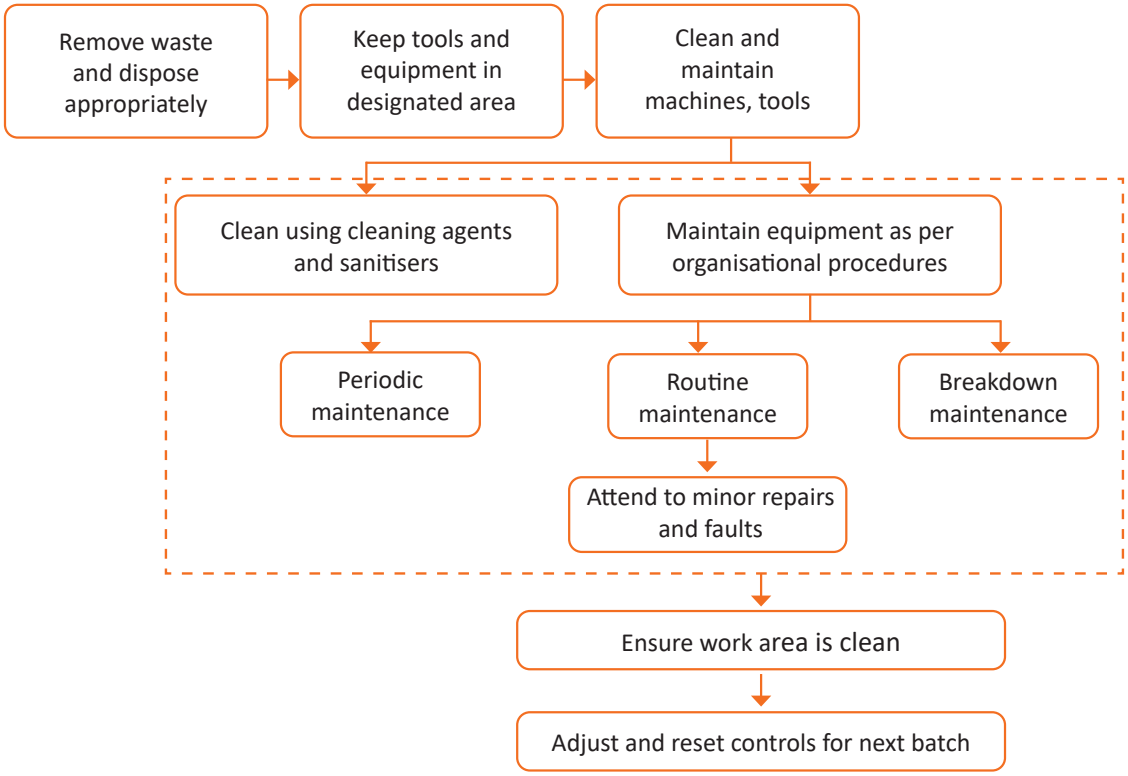


Fig. 6.3.1: Method of Post production cleaning

Types of Maintenance

After the production process is over, all food-handling equipment and tools are cleaned. Machineries are also checked for smooth and efficient functioning. The maintenance process of machineries can be classified as:

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

Table no.6.3.1" Types of maintenance

Exercise

1. Choose the correct option

a. Fresh or wet sea food should be transported at _____ .

i. $-1^0C - +5^0C$ ii. 0^0C

iii. -20^0C iv. 30^0C

b. Sea food should be chilled at _____ .

i. 5^0C ii. 10^0C

iii. 0^0C iv. 20^0C

c. _____ refers to checking and resolving any fault in the machinery which includes regular maintenance and upkeep of the machine.

i. Breakdown maintenance ii. Routine maintenance

iii. Periodic maintenance iv. Yearly maintenance

Notes

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

https://www.youtube.com/watch?v=kIhpTcSVX-U

Packaging and Storage of Fish and Seafood Products

7. Complete Documentation and Record Keeping Related to Processing of Fish and Sea Food

Unit 7.1 - Documentation and Record Keeping

FIC/N4004

Key Learning Outcomes

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

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

UNIT 7.1: Documentation and Record Keeping

Unit Objectives

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

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

7.1.1 Need for Documentation

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

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

7.1.2 How to Keep Records?

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

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

Product quality can be maintained only when:

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

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

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

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

Example of a stock control book:

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

Table 7.1.1: Example of a stock control book

Exercise

1. Tick the correct options

a. What is the need for documentation?

i. It gives detailed knowledge about the running of a business. ☐

ii. It helps to control product quality. ☐

iii. It helps to keep track of the money invested in the business. ☐

iv. It helps to identify the separate costs of raw material or product ingredients. ☐

v. It helps to identify the production cost of a particular process. ☐

vi. It helps in raw material storage. ☐

vii. It helps to ensure that quality assurance procedures are followed. ☐

viii. It helps to ensure that the production unit is running smoothly/effectively. ☐

ix. It works as an evidence for legal procedures. ☐

x. It helps to clean the food handling equipment and machineries. ☐

xi. It helps in sending the produce to the market. ☐

xii. It helps to set an appropriate product price. ☐

xiii. It helps to take corrective measures at the right time. ☐

b. Production records keep a log of _____ .

i. the quantity and type of raw materials. ☐

ii. the amount of finished products stored. ☐

iii. the quantity and type of ingredients used. ☐

iv. the processing conditions in which production took place (e.g. the temperature set or the air pressure applied). ☐

v. the product quality. ☐

2. Match the columns

Column A	Column B
a. Every production process completed is given a number	i. Stock control books
b. The details of raw material procurement is noted	ii. Batch number
c. The details of production process is noted	iii. Quality procedures are followed
d. The details of product sales is recorded	iv. Legal evidence
e. Records serve as	v. Processing log books
f. Properly maintained records help to identify whether	vi. Sales and distribution log

3. Complete the process of documentation and maintaining records of production and finished products. Fill in the blanks with the correct options given below.

a. Document and maintain the records of _____.

b. Document the finished products details _____.

c. Maintain the record of _____ related to finished products.

d. Verify the documents and _____ in case of quality concerns and for quality management system audit.

e. Document process details such as type of raw material used, process parameters (temperature, time, etc. as applicable) for entire process handled _____ for all products produced.

Options:

1. in process chart or production log
2. as per company standards
3. finished products
4. track from finished product to raw materials
5. observations or deviations (if any)

Notes

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

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

Documentation & Record Keeping

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

8. Employability Skills

DGT/VSQ/N0101

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

https://www.skillindiadigital.gov.in/content/list

Employability Skills

NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

9. Annexure

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
1. Introduction	UNIT 1.1: Introduction to the Training Programme	1.1.1 Purpose and Benefits of the Training Programme	14	https://www.youtube.com/watch?v=wMu0EpUgCd4	Overview of the Food Processing Industry
	UNIT 1.2: Introduction to the Food Processing Industry	1.2.1 Food Processing	14	https://www.youtube.com/watch?v=NiK1yeDtLPI	Overview of Fish and SeaFood Industry
	UNIT 1.3: Introduction to the Fish and Sea food Processing	1.3.1 Fish and Sea Food Processing in India	14	https://www.youtube.com/watch?v=5HdXvLo16Ws	Orientation Video of Fish and Seafood Processing Industry
	UNIT 1.4: Fish and Sea Food Processing	1.4.1 Types of Fish and Sea Food Products	14	https://www.youtube.com/watch?v=GeJip5dK2Ns	Types of Seafood product
	UNIT 1.5: Attributes of a Fish and Sea Food Processing Technician	1.5.1 Roles and Responsibilities of a Fish and Sea Food Processing Technician	14	https://www.youtube.com/watch?v=2G1uq6k6tVw	Roles and Responsibility of Fish and Seafood Processing Technician

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
2. Food Safety, Hygiene and Sanitation for Processing Food Products	UNIT 2.3: Good Manufacturing Practices (GMP)	2.3.1 Good Manufacturing Practices (GMP)	28	https://www.youtube.com/watch?v=RS4A-uczS6E	Lecture on GMP, GHP and FSMS
3. Prepare and Maintain Work Area and Process Machineries for Processing of Fish and Sea Food	UNIT 3.1: Equipment used for Fish and Sea food Processing	3.1.1 Fish and Sea Food Processing Equipment	44	https://www.youtube.com/watch?v=QwiwIzX_Asg	The most important tools for your fish and seafood processing business
			44	https://www.youtube.com/watch?v=QWpU7DAfNcs	Cleaning and Sanitation
5. Execution of Fish and Sea Food Processing	UNIT 5.1: Handling Grading and Sorting of Raw Material	5.1.1 Handling Raw Materials	74	https://www.youtube.com/watch?v=e5wfjR3WYVc	Fish and Seafood Processing Technician
	UNIT 5.2: Pre-Processing and Processing of Fish and Sea Food	5.2.1 Handling During Pre-processing and Processing	74	https://www.youtube.com/watch?v=x5v7QwWxQi4	Fish processing

Module No.	Unit No.	Topic Name	Page No	Link for QR Code (s)	QR code (s)
		5.2.1 Good Practices	74	https://www.youtube.com/watch?v=bn8mCcMg5lQ	Frozen fish processing
6. Post Production Activities	UNIT 6.1: Packaging	6.1.1 What is Packaging?	84	https://www.youtube.com/watch?v=kIhpTcSVX-U	Packaging and Storage of Fish and Seafood Products
7. Complete Documentation and Record Keeping Related to Processing of Fish and Sea Food	UNIT 7.1: Documentation and Record Keeping	7.1.1 Need for Documentation	91	https://www.youtube.com/watch?v=kcpGlHBpphA	Documentation & Record Keeping
Employability Skills (30 Hrs)				https://www.skillindiadigital.gov.in/content/list	

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

NCVET
कौशल गुणवत्ता प्रगति

N·S·D·C
RE IMAGINE FUTURE

FICSI
Food Industry Capacity and Skill Initiative

Address: **Food Industry Capacity and Skill Initiative**
Shriram Bharatiya Kala Kendra, 3rd floor, 1
Copernicus Marg, Mandi House, New Delhi-110001
Email: admin@ficsi.in
Web: www.ficsi.in
Phone: +91-9711260230, +91-9711260240

Price: ₹