NCVET
कौशल गुणवत्ता प्रगति

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C

FICSI
Food Industry Capacity and Skill Initiative

Participant Handbook

Sector
Food Processing

Sub-Sector
Food Grain Milling

Occupation
Processing

Reference ID: **FIC/Q1003, Version 3.0**
NSQF level 3

Grain Mill Operator

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

Shri Narendra Modi
Prime Minister of India

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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: **'Grain Mill Operator'** QP No. **'FIC/Q1003, NSQF Level 3'**

Date of Issuance: September 30th, 2021
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** Valid up to the next review date of the Qualification Pack*

Authorised Signatory
(Food Industry Capacity & Skill Initiative)

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

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

About this book

This book is designed for providing skill training and/or upgrading the knowledge and basic skills to take up the job of 'Grain Mill Operator' 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 Grain Mill Operator.

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each QP consists of National Occupational Standards (NOS). Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS.

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

- FIC/N1007: Prepare and Maintain Work Area and Process Machineries for Operating a Grain Mill
- FIC/N1008: Prepare for Production of Products From Various Grains
- FIC/N1009: Operate a Grain Mill
- FIC/N1010: Complete documentation and record keeping
- FIC/N9001 Food safety, hygiene and sanitation for processing food products
- DGT/VSQ/N0101: Employability Skills

Symbol Used


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1. Introduction

DGT/VSQ/N0101

Key Learning Outcomes

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

1. Explain the purpose of training
2. Discuss the National Occupational Standards and Qualification Pack
3. List the various sectors of the food processing industry
4. Define food processing
5. Describe the various stages of food processing for converting raw materials to food products
6. State the need for food grain milling process
7. State the common methods of milling food grains
8. State the process of milling various types of grains
9. List the terminology used in the milling process
10. State the roles and responsibilities of a grain mill operator

UNIT 1.1: Introduction to the Training Programme

Unit Objectives

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

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

1.1.1 Purpose and Benefits of the Training Programme

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

The training program will enable an individual to:

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

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

Fig. 1.1.1. Skill cards

1.1.2 Introduction to QP and NOS

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

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

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

NOS Code	Major Function/Task
FIC/N1007	Prepare and maintain work area and process machineries for operating a grain mill
FIC/N1008	Prepare for production of products from various grains
FIC/N1009	Operate grain mill
FIC/N1010	Complete documentation and record keeping related to operating a grain mill
FIC/N9001	Food safety, hygiene and sanitation for processing food products
DGT/VSQ/N0101	Employability Skills

UNIT 1.2: Overview of the Food Processing Industry

Unit Objectives

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

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

1.2.1 Food Processing

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

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

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

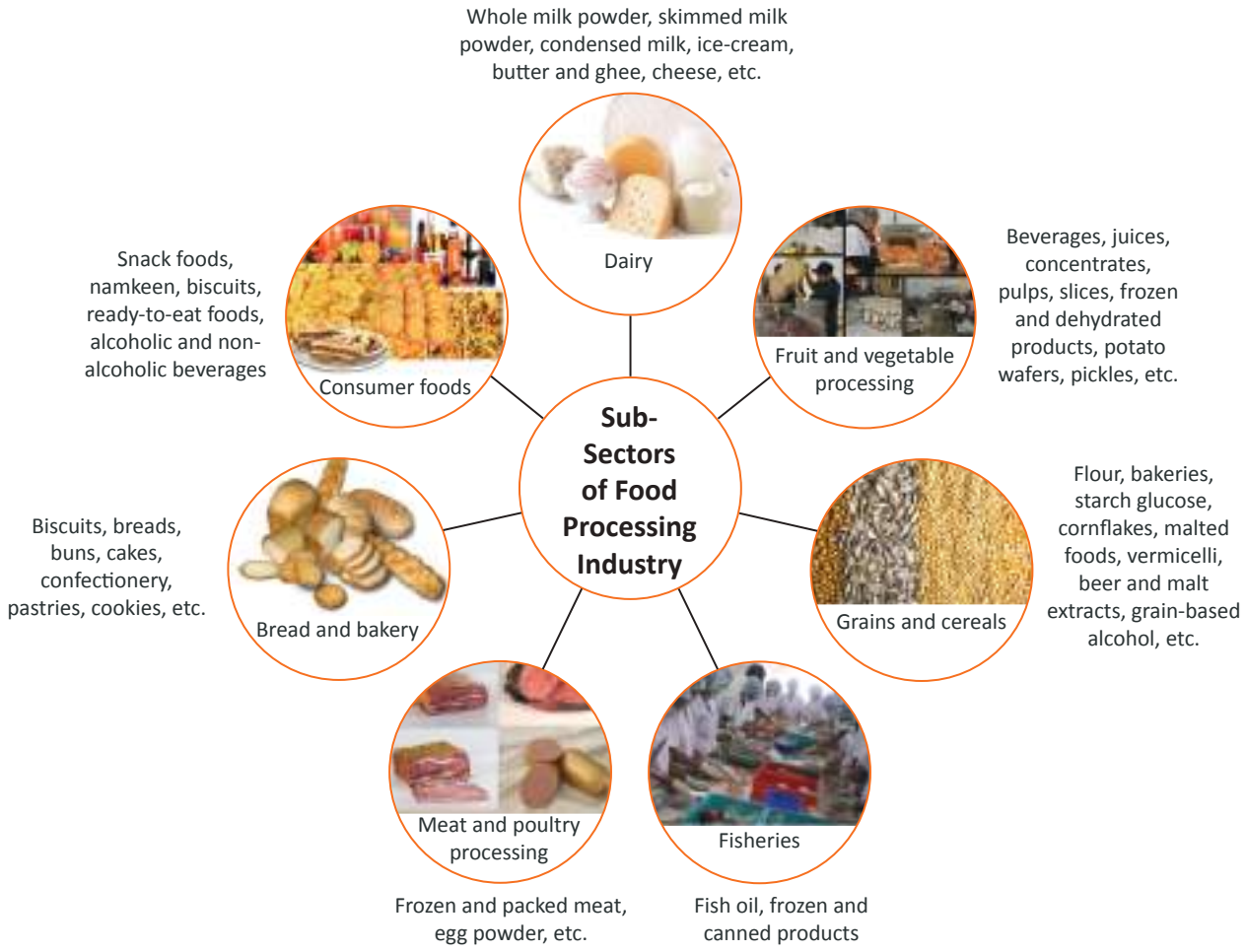


Fig. 1.2.1. Sub-Sectors of food processing industry

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

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

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

1.2.2 Journey of Food from Harvest to Consumer

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

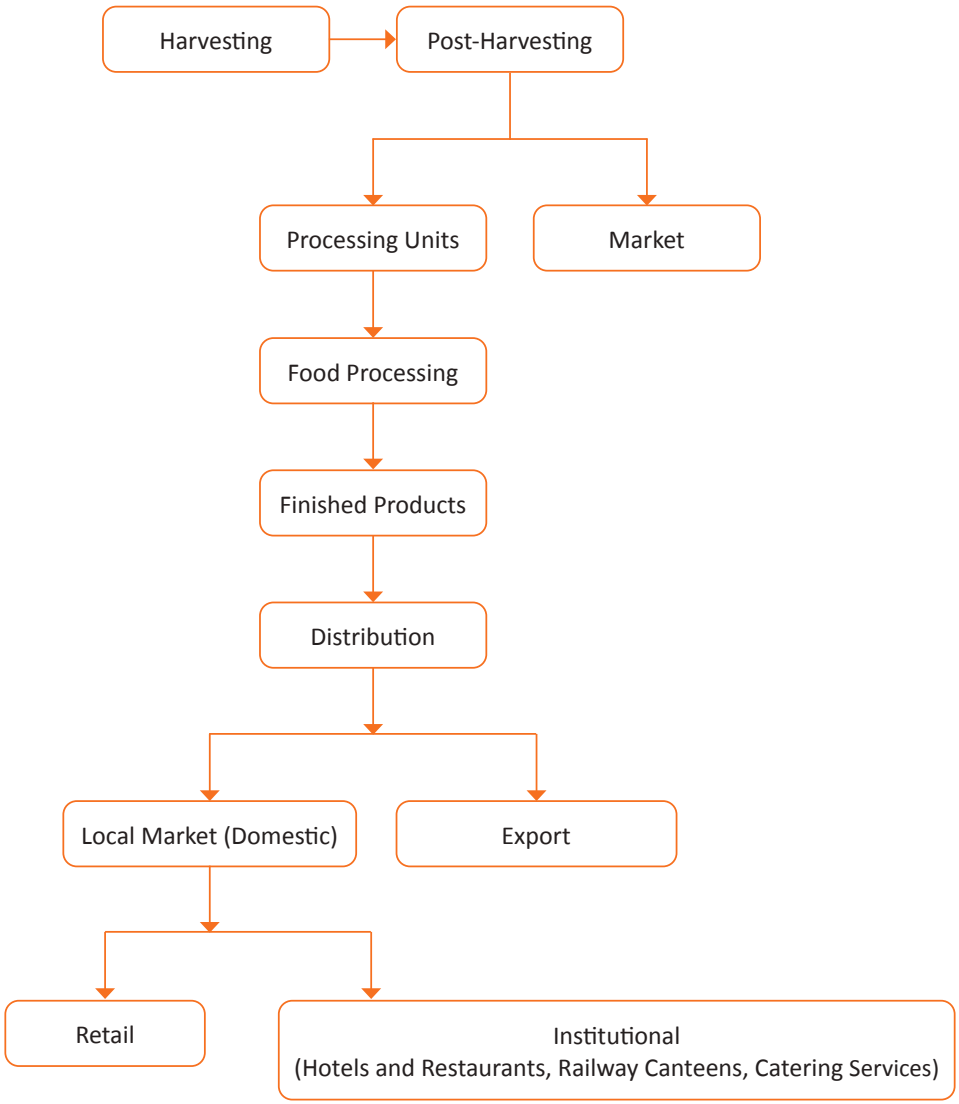


Fig. 1.2.2. Journey of harvested food

Unit 1.3: Introduction to the Food Grain Milling Sector

Unit Objectives

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

1. State the need for food grain milling process
2. State the common methods of milling food grains

1.3.1 Food Grain Milling Sector

Every year, India produces more than 200 million tonnes of different food grains like rice, wheat, maize, barley, and millets like jowar (great millet), bajra (pearl millet), and ragi (finger millet).

Some interesting studies about the grain milling industry state that:

- About 15 % of the annual production of wheat is converted into wheat products.
- The country is self-sufficient in grain production.
- It is the second largest rice producer in the world with a 20 % global share.
- Primary milling of rice, wheat, and pulses is the most important activity in the food grains processing industry.
- Foreign investment takes up a major share in the total investment made in the grain milling sector. This figure is rising with every passing year.
- Branded rice is becoming popular in both the domestic as well as the export market.
- Indian Basmati rice commands a premium position in the international market.
- The food grain milling sub-sector offers opportunities in marketing of branded grains, as well as grains processing.

To sum up, since the food grain milling sector operates primarily in the rural areas, it has the potential to generate employment at low investment.

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

https://youtu.be/aRD2JIAN854

Overview of Food Grain Milling Sub Sector - Food Processing Sector

1.3.2 Food Grain Milling Process

The food grain milling process differs according to the raw material used and the finished product. Following is a general overview of the food grain milling process:

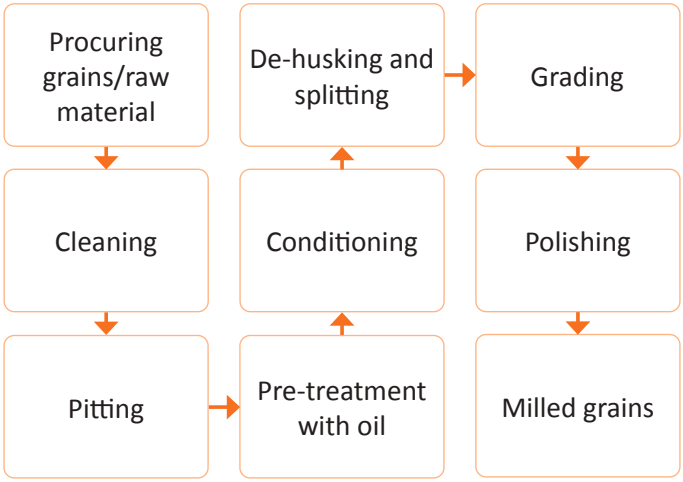


Fig. 1.3.1. Food grain milling process

1.3.3 Terminology Used in the Milling Process

1. **Cleaning and grading**: Cleaning helps in the removal of dust, chaff, dirt, grits, etc. from the pulses. Grading is done to segregate the grain legumes of desired shape and size. It is done by using a reel or rotating screen-type cleaner.
2. **Pitting**: An emery roller machine is used for cracking the husk layer and for scratching clean pulses passing through it. This is done for loosening the husk from sticking to the cotyledons. (Cotyledon is that part within the embryo of the seed, which may later become the first leaves of the new seedling.) Loosening the husk helps to facilitate subsequent oil penetration in the later operations. Gradually, the clearance between the emery roller and cage (housing) is narrowed from inlet to outlet. Cracking and scratching of husk takes place mainly by friction between pulses and emery as the material is passed through the narrowing clearance. During the operation, some of the pulses are de-husked and split by sieving.
3. **Pre-treatment with oil**: Scratched or pitted material passes through a screw conveyer and some edible oil like linseed oil is mixed with it. Linseed oil is used at the rate of 1.5 to 2.5 kg/tonne of pulses. Pulses coming out of the screw conveyer are kept on floors for about 12 hours to diffuse the oil.
4. **Conditioning**: Pulses are conditioned by alternate soaking/wetting, drying, and tempering. Moisture (3.5 %) is added to the pulses after sun drying for a certain period. After this, tempering is performed for about eight hours. The grain is dried in the sun again. Until all pulses are sufficiently conditioned, the whole process of alternate wetting and drying is continued for two to four days. Pulses are finally dried to about 10 to 12 % moisture content prior to de-husking and splitting.
5. **De-husking and splitting**: For de-husking of conditioned pulses, carborundum coated emery rollers are used. In one pass, about 50 % of pulses are de-husked. De-husked pulses are split into two parts. De-husked split pulses are separated by sieving and the husk is aspirated off. Un-split de-husked pulses and tail pulses are again de-husked and milled in a similar way. For complete de-husking and splitting, the whole process is repeated two to three times.

6. **Polishing:** Polishing is completed by treating de-husked and split pulses with a small quantity of oil and/or water.

Fig. 1.3.2. Cleaning and grading

Fig. 1.3.3. Drying process

Fig. 1.3.4. Polisher

Fig. 1.3.5. Conditioning or tempering process

Fig. 1.3.6. Tempering or conditioning

UNIT 1.4: Attributes of Grain Mill Operator

Unit Objectives

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

1. State the roles and responsibilities of a grain mill operator

1.4.1 Roles and Responsibilities

Roles	Responsibilities
Handle raw material from the time of receipt till it reaches the process line	• Check 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	• Optimize 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 • Escalate issues to the supervisor
Plan and execute the production process	• Examine products at different stages of production • Adhere to Good Manufacturing Practices (GMP) • Inspect intermediate as well as finished products • Ensure conformance of quality as per organisational standards
Follow storage and packaging norms	• Ensure safe and proper storage of raw material, packing material, and finished goods

Table 1.4.1: Roles and responsibilities

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. Journey of food from harvest ultimately reaches the _____.

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

c. Grain mill operator is responsible for handling raw material from the time of _____ to process line.

i. post production
ii. harvest
iii. receipt
iv. sorting

d. _____ is the backbone of the Indian economy.

i. Agriculture
ii. Fishing
iii. Mining
iv. Meat and Poultry

e. _____ sub-sector produces juices, jellies, pulps, pickles, jams etc.

i. Dairy
ii. Grains and cereals
iii. Fisheries
iv. Fruit and Vegetable processing

f. A grain mill operator must follow _____ at all times.

i. food spoilage norms
ii. food safety norms
iii. food breakage norms
iv. food control norms

g. India is the _____ largest producer of rice in the world.

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

h. Pitting is done with the help of _____.

i. pitting machine
ii. emery roller machine
iii. milling separator
iv. closed circuit aspirator

Notes

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

https://youtu.be/DUyBvIHt9c0

Grain Mill Operator - Orientation Video

https://www.youtube.com/watch?v=J-2EiMVNtpM&list=PL_mT5DU_smK2gJTTCG7kBWob3EMVEH652&index=7

Overview of Food Processing Industry | FICSI - Food SSC

https://youtu.be/XQ1piYczecU

Introduction to grain milling process - Short Video - Food Processing

https://youtu.be/5ScmdguMoKc

Attributes of Grain Mill Operator - Qualification pack in Food processing

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

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 unit, you 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. State the materials and equipment used in cleaning and maintenance of the work area and machineries
4. State the importance of cleaning, maintaining and monitoring food processing equipment periodically and using them only for specified purposes
5. Follow housekeeping practices by having designated area for all materials/tools and storing them in designated areas
6. Practice maintaining machines
7. Follow the fire safety practices in the work area
8. State the importance of safety, hygiene, and sanitation in the food processing industry
9. Follow the industry standards to maintain a safe and hygiene workplace
10. State the storage and stock rotation norms
11. 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, you 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. State the materials and equipment used in cleaning and maintenance of the work area and machineries
4. State the importance of cleaning, maintaining and monitoring food processing equipment periodically and using them only for specified purposes
5. Follow housekeeping practices by having designated area for all materials/tools and storing them in designated areas
6. Practice maintaining machines

2.1.1 Personal Sanitation

Sanitation and hygiene are the most important aspects to take care of when working in the food processing industry. 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

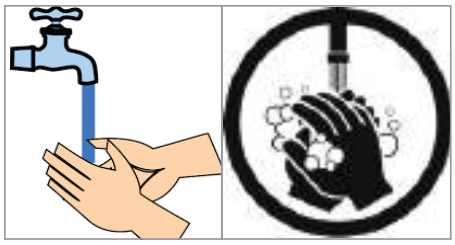


Fig. 2.1.2. Washing hands with soap and water

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

UNIT 2.2: Safety Practices

Unit Objectives

At the end of this unit, you 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

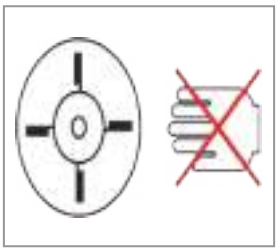
Dangerous Chemicals

Do Not Enter

Danger Scaffolding Incomplete

Beware of Electric Shock

Electric Hazard

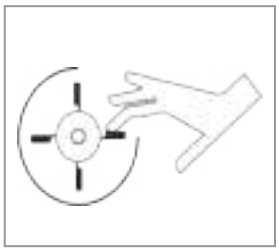


Never put your Hand Inside During the Operation

Highly Flammable

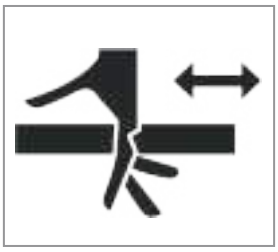
Hot Surface Do Not Touch

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?

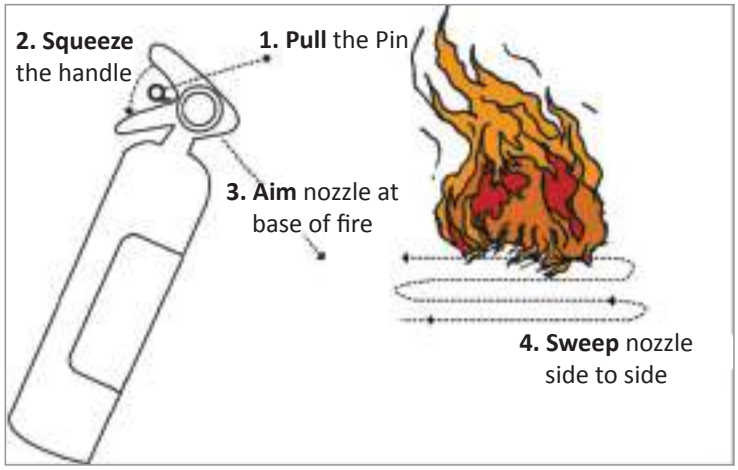


Fig. 2.2.3. Fire extinguisher

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, you 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 hygiene workplace
3. State the storage and stock rotation norms

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.

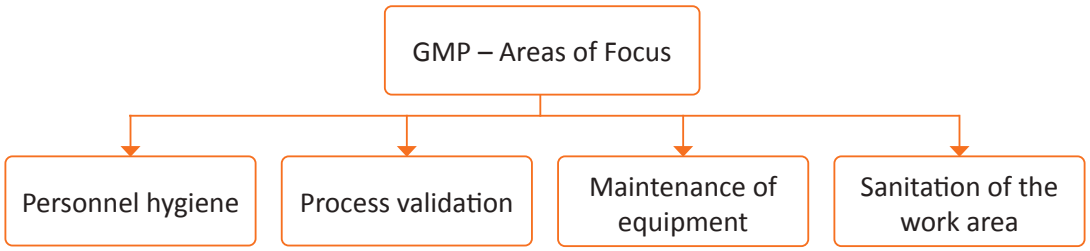


Fig. 2.3.1. Good manufacturing practices (GMP)

Area of focus	GMP
Personnel hygiene  *Fig. 2.3.2. Personnel hygiene*  *Fig. 2.3.3. 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. 2.3.4. Designated area for keeping utensils*  *Fig. 2.3.5. 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. 2.3.6. Equipment maintenance

Fig. 2.3.7. 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

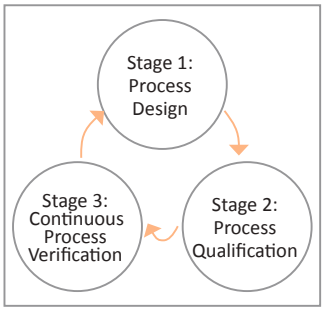


Fig. 2.3.8. Process validation

Fig. 2.3.9. 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

2.3.2 Food Storage

Store the food in such a way that:

- It is protected from the likelihood of contamination; and
- The environmental conditions under which it is stored will not adversely affect the safety and suitability of the food.

When storing potentially hazardous food:

- Store it under temperature control; and
- If it is food that is intended to be stored frozen, ensure the food remains frozen during storage.

2.3.3 Stock Rotation

To rotate stock means to arrange the oldest units in inventory or storage so it gets consumed before the newer units. The reason to rotate stock is to reduce the losses from deterioration and decay.

FIFO

FIFO (First-IN, First-OUT) is a basic rule of product rotation that protects product quality and freshness. Rotate foods so the first products displayed (IN) are the first products sold (OUT) to minimize spoilage and waste. Every product has a code date.

FIFO stock rotation in storage areas

- Find the product's code date and remove out-of-code items.
- Move previously received merchandise forward and/or to the top of the stack.
- Put new items at the back of the row and/or on the bottom of the stack.
- Always position products on the shelf/tray so the oldest products will be used first.

Fig. 2.3.10. FIFO stock rotation

FEFO

FEFO is an acronym of the words First Expired, First Out. Material requirements are serviced in the order of items with the earlier date of consumption regardless of the date of entry or acquisition.

Fig. 2.3.11. FEFO stock rotation

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

Unit Objectives

At the end of this unit, you 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

Fig. 2.4.1. What is HACCP

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. Match the column

Column A	Column B
a. Food preservation	i. Aprons, mouth mask, head cover and face mask
b. Food spoilage	ii. Good and harmful
c. Microorganisms	iii. Original nutritional value, texture, flavours, and the form of food is damaged
d. Personal Protective Equipment	iv. Storing food products for longer periods

2. 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.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐
b. The equipment used for processing foods is protected against contamination from lubricants, metal fragments, fuel, and contaminated water.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐
c. Your processing unit has enough facilities for toilets and wash stations.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐
d. The entire work area follows high standards of cleaning and sanitisation.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐
e. The entire processing unit is well ventilated and has adequate lighting.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐

GMP	Area of Focus	
f. The organisation follows a cleaning and sanitising drill as per daily, weekly, and monthly schedules.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐
g. You are provided training on Good Manufacturing Practices (GMP).	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐
h. You are in sound health condition during working hours.	i. Personnel hygiene ii. Sanitation of the work area iii. Equipment maintenance iv. Process validation	☐ ☐ ☐ ☐

3. 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

Notes

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3. Prepare and Maintain Work Area and Process Machineries for Operating a Grain Mill

Unit 3.1 – Equipment used in the Milling Process

Unit 3.2 – Sanitisation of Work Area

Unit 3.3 – Cleaning Processes

FIC/N1007

Key Learning Outcomes

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

1. Identify the different equipment used in the milling process
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 and process machineries

UNIT 3.1: Equipment used in the Milling Process

Unit Objectives

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

1. Identify the different equipment used in the milling process

3.1.1 Equipment Used in the Milling Process

The equipment used in a commercial milling unit are:

Name of the equipment	Use and operation
Milling separator	• This machine is used for the efficient separation of large coarse material and small fine materials like grit during the cereal cleaning process.
Closed circuit aspirator	• The closed circuit aspirator provides for efficient and controlled separation of light impurities from cereals. • Three inlet options enable a stand-alone application as well as compatibility with a milling separator or a scouring machine. The closed circuit aspirator is either installed at the grain intake point or integrated into the cereal cleaning system.
Gravity selector and de-stoner	• This machine is used for cleaning a wide variety of products such as wheat, maize, rice, nuts, and pulses. • The machine not only gives a de-stoning separation, but also separates heavy and light product streams.
Colour sorter	• Colour sorter is used for optical sorting of food products.
Paddy husker	• The husker removes husk from the paddy. It includes vibratory feeder, timing belt drive, new aspiration system, and a built-in access platform for roll changing.
Paddy separator	• The paddy separator removes paddy from husked paddy, which goes back for husking.
Whitener	• The machine provides a high quality, clean finish to the rice. The milling effect may be enhanced by utilising water polishing, which is an option on this unit. • A built-in turbo fan helps to further improve the appearance of the rice and keep the milling chamber clean under demanding operating conditions.
Polisher	• It gives a translucent appearance to the rice with the application of fine water mist prior to polishing.
Rotary sifter	• This machine can sift milled rice efficiently in many grades.
Thickness / width separator	• This machine is widely used at various large-scale rice mills, seed processing plants, and grains/beans processing plants to produce high quality products because it can separate broken grains and immature grain easily and efficiently.
Length grader	• The length grader is indented cylinder-type machinery that separates one or two kinds of broken or shorter grains from whole grain by length.

Table 3.1.1: equipments used in milling

Fig. 3.1.1. Milling separator

Fig. 3.1.2. Closed circuit aspirator

Fig. 3.1.3. Gravity selector and de-stoner

Fig. 3.1.4. Colour sorter

Fig. 3.1.5. Paddy husker

Fig. 3.1.6. Paddy separator

Fig. 3.1.7. Whitener

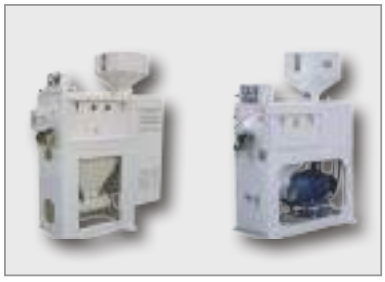

Fig. 3.1.8. Polisher

Fig. 3.1.9. Rotary sifter

Fig. 3.1.10. Thickness/width separator

Fig. 3.1.11. Length grader

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

https://www.youtube.com/watch?v=U8QMThV3Q0c

Machines & Equipment used in Milling Process - Food Grain Milling subsector of Food Processing

UNIT 3.2: Sanitisation of the Work Area

Unit Objectives

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

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

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

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 equipment

Fig. 3.2.4. Cleaning in a 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

Table 3.2.1: Types of cleaning agents and it's use

Storage of Sanitisers and Disinfectants

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

UNIT 3.3: Cleaning Processes

Unit Objectives

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

1. State the cleaning processes used to clean the work area and process machineries

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.

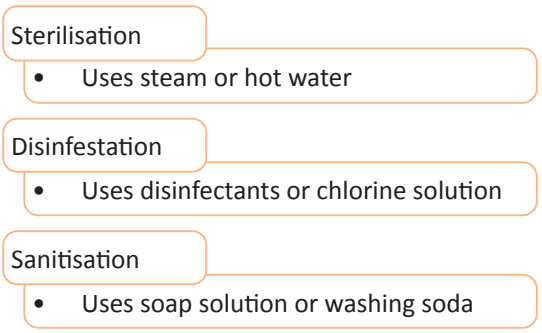

Fig. 3.3.1. Sterilising-In-Place (SIP)

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.

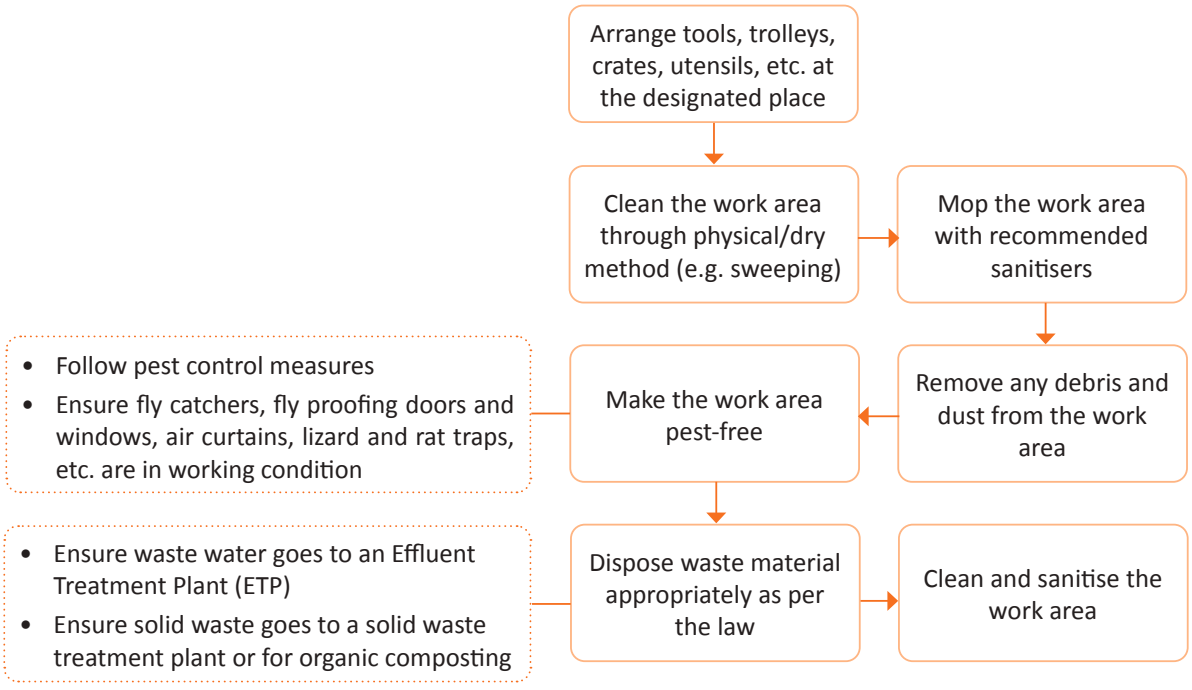

Fig. 3.3.3. Process of cleaning the work area

3.3.6 Process of Cleaning Machineries, Tools and Equipment

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

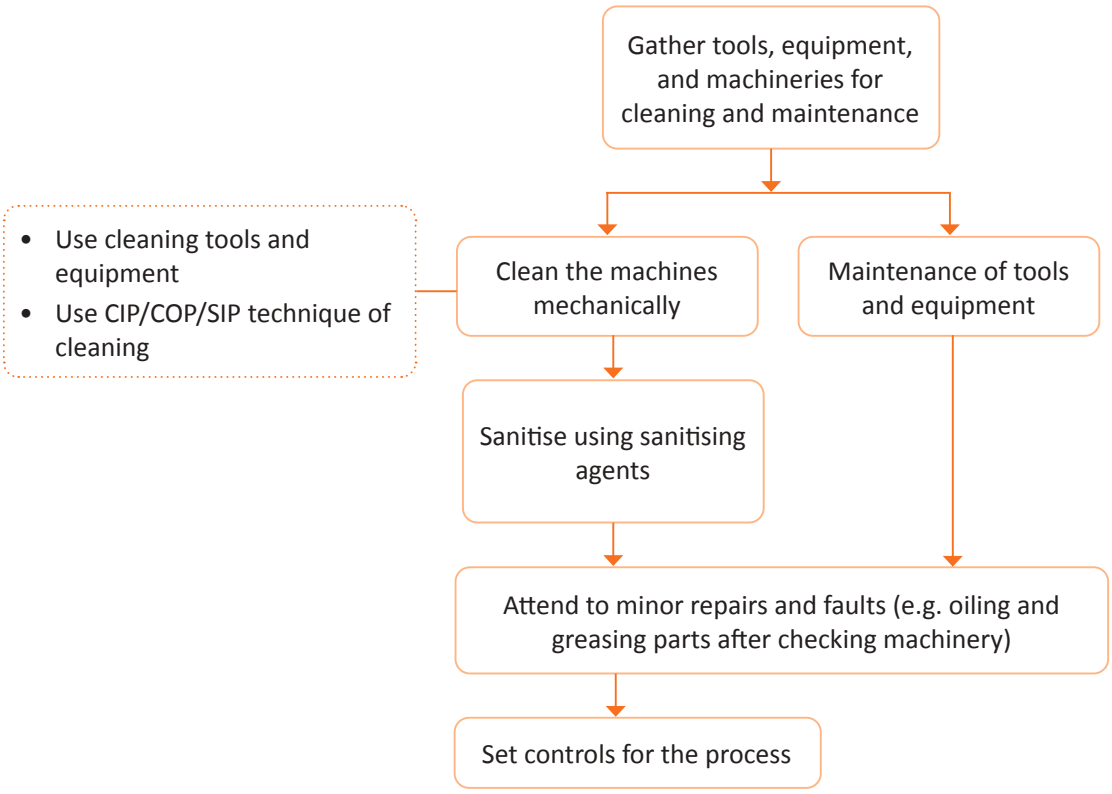

Fig. 3.3.4. Process of cleaning machineries, tools and equipment

Exercise

1. Fill in the blanks with the correct option

a. Hypochlorite may lead to _____.

i. emulsion
ii. corrosion
iii. stabilisation
iv. dehydration

b. _____ is a method of cleaning equipment without dismantling pipes, vessels and fittings.

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

c. _____ is a method used for cleaning fittings, gaskets and valves.

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

d. _____ is used for internal cleaning of stainless steel equipment.

i. Sulphur dioxide
ii. Hydrogen peroxide
iii. Liquid chlorine
iv. Sodium chloride

e. CIP is done with the help of a _____.

i. gel
ii. spray ball
iii. washing cloth
iv. powder

2. Identify the food contact and non-food contact surfaces. Mark a tick against 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	☐ ☐

3. Match the columns

Machine	Usage
a. Paddy husker	i. Used for efficient separation of large coarse material and small fine materials like grit
b. Polisher	ii. Sift milled rice efficiently in many grades
c. Milling separator	iii. Removes paddy from husked paddy, which goes back for husking
d. Rotary sifter	iv. Removes husk from the paddy
e. Whitener	v. Gives translucent appearance to rice with the application of fine water mist prior to polishing
f. Closed circuit aspirator	vi. Provides a high quality, clean finish to the rice
g. Paddy separator	vii. Provides for efficient and controlled separation of light impurities from cereals

4. Prepare for Production of Products from Various Grains

Unit 4.1 – Basic Calculations

Unit 4.2 – Selection of Raw Material

Unit 4.3 – Production Planning Process

FIC/N1008

Key Learning Outcomes

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

1. Use basic mathematics for various calculations in day-to-day processes
2. List the various raw materials used in the milling process
3. Name the various products obtained from raw materials that are milled
4. Select raw materials based on quality parameters
5. Plan the production schedule as per organisational standards and instructions
6. Plan and organise for raw material, manpower, equipment, and machineries for the scheduled production

UNIT 4.1: Basic Calculations

Unit Objectives

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

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

4.1.1 Units of Measurement

In the food processing industry, raw materials, ingredients and chemicals are used in a specified quantity. They are measured in metric units. Some common units of measurements used are:

Particulars	Unit of measurement
Fruits and vegetables	Kilogram(kg) or gram(g)
Chemicals	Volume(oz.), Litre(L) or millilitre (ml)
Temperature	Degree Celsius (°C) or Fahrenheit (°F)
Duration	Time (minutes, hours, seconds)

The requirement of knowledge of basic mathematics in a Grain Mill is significant. The basic principles of mathematics include:

- Addition
- Subtraction
- Multiplication
- Division
- Percentage calculation
- Error judgement

These are required by a Grain Mill Operator so as to calculate the predicted yield and the actual yield. Also, he/she would have to find the difference in the predicted outcome to the actual one. The amount of wasted grains and raw materials also has to be taken into account, therefore, it is necessary to have these mathematics skills.

The following example illustrates the need of mathematics in a milling plant.

The supervisor/manager has got 100 tonnes of grains which he provides to the mill operator. He expects a yield of 98 tonnes flour out of it (without considering wastage). The Grain Mill Operator starts the milling and process and finds out that around 1 ton of raw material is wasted. Now, he needs to report this back to his supervisor/manager. The manager asks him to tell him the percentage loss for the targeted yield. The Grain Mill Operator shall use this formula:

(Loss in tonnes x 100)/98 tonnes

This will give the percentage loss to the Grain Mill Operator. Any sort of loss is to be immediately reported to the supervisor/manager who in turn has to enter the details in the ERP software.

A Grain Mill Operator also needs to make sure that all the machines are being used to their optimum level. A machine which is being run must be run to its full capacity, else it will be a waste of energy.

Also, the amount of raw material to be used should be in sync with the target yield. A Grain Mill Operator must know the calculations to acquire the exact amount of raw material which will give the required outcome. For example, if it is known that 2% of the raw material has to get wasted each time a milling process is conducted, then to achieve a 100 tonne output, one has to use a little over 102 tonnes of raw material. The following equation may be used to calculate this:

Required raw material (in tonnes) = Required yield + Loss% of Required yield

The above given formula can only be used if the Grain Mill Operator knows about the quantity of raw material required for different grains. Every grain must be used

Practical

1. Calculate the machine efficiency using following formula given:
   - Actual operation time: Runtime for a machine or system to produce an output from the moment it has started for operation.
   - Planned Operation Time: Actual run time of the machine removing all the stops operation (for eg: breakdowns, change over, etc.)
   - Machine Ideal Cycle Time: The minimum cycle time that your process can be expected to achieve in optimal circumstances.
   - Overall Equipment Efficiency: Takes into account all losses, resulting in a measure of truly manufacturing time. It gives a picture of how effective the manufacturing process is running.

Formula to calculate machine		
Availability (A) =	$\frac{\text{Actual Operation Time}}{\text{Planned Operation Time}}$	
Performance (P) =	$\frac{(\text{Machine Ideal Cycle Time}) \times (\text{Total Pices Produced})}{(\text{Planned Operation Time})}$	
Quality (Q) =	$\frac{\text{Good Pices Produced}}{\text{Total Pieces Produced}}$	
Overall Equipment Efficiency (OEE) =	$A \times P \times Q$	

2. Calculate manpower utilisation for manual and semi-automatic production line in terms of operators/workers by using following formula:

Type of production line	Formula to calculate	Manpower utilization (M)
Manual	$\frac{\text{Actual Production Output}}{\text{Target Production Output}}$	
Semi-automatic	$\frac{(\text{Machine Ideal Cycle Time}) \times (\text{Total Pices Produced})}{(\text{Actual Operation Time}) - (\text{Machine Ideal Cycle Time}) \times (\text{Total Pices Produced})}$	
	M =	

3. Check that weather preventative maintenance is in place or not.
4. Record all the details in the observation sheet.
5. Record all the details in the observation sheet.

UNIT 4.2: Selection of Raw Material

Unit Objectives

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

1. List the various raw materials used in the milling process
2. Name the various products obtained from raw materials that are milled
3. Select raw materials based on quality parameters

4.2.1 Raw Materials and Produce

The following table lists the various raw materials used in the milling process and the products obtained from them.

Raw materials	Produce
Wheat	Wheat flour
Durum wheat	Durum wheat flour, semolina
Paddy	Rice
Corn	Corn flour
Barley	Flour (either alone or mixed with wheat flour)
Sorghum/jowar	Jowar flour
Bajra	Bajra flour
Ragi	Ragi flour

4.2.2 Quality of Raw Materials

Quality is putting the best possible product together, and doing it consistently. Quality assurance is also an important aspect of your company's marketing activities. Future sales are directly and significantly affected by the level of quality and consistency of your product. Consumers won't want to deal with other companies once you have built a solid reputation for the quality and dependability of your product.

Usually, there is a completely different department for Quality Control and Quality Assurance. This being given, the internal and external audits have to be cleared by this department itself. These audits hold a lot of value in the quality certification of an organisation.

A quality product begins with quality ingredients. You need to work closely with your suppliers to ensure that they all meet your tight standards. These should be created for ordering raw materials, packaging materials and other supplies. There are standard parameters which are involved in selecting grains. The same has been discussed below.

Quality in a product includes:

- Consistency
- Physical appearance
- Nutrition
- Food safety
- Value
- Shelf life

There are several ways to check the quality of raw materials through physical parameters like:

- Weight
- Particle size
- Homogeneity checks
- Presence of foreign objects
- Colour analysis
- Viscosity measures
- Water activity

Sample Testing

Before sample testing, the Grain Mill Operator must ensure that:

- the sample avoids contamination from other sources;
- the sample is representative of the entire batch;
- the sample doesn't lose the characteristic properties during its collection, handling, transport and storage before testing; and
- the sampling utensils and container remain free of extraneous materials.

In general, the sample should confirm the process of quality check. Then, the sample is sent into the laboratories for quality analysis without damaging the sample.

Methods to Select the required Grains

Each grain in a grain mill has different testing techniques. The following is a list of minimum working sample weights:

Grains	Sample weights
Maize (small grain)	200g
Maize (large grain)	250g
Sorghum	25g
Black eyes cowpeas	150g
Wheat	25g
Bulrush millet	10g
Paddy	15g

The number of bags of raw material to be tested are also selected in a standard way.

Number of bags in consignment	Number of bags to be sampled
Up to 10	Every bag
11 to 100	10, drawn at random
More than 100	Square root of total number of bags

UNIT 4.3: Production Planning Process

Unit Objectives

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

1. Plan the production schedule as per organisational standards and instructions
2. Plan and organise for raw material, manpower, equipment, and machineries for the scheduled production

4.3.1 Production Plan

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

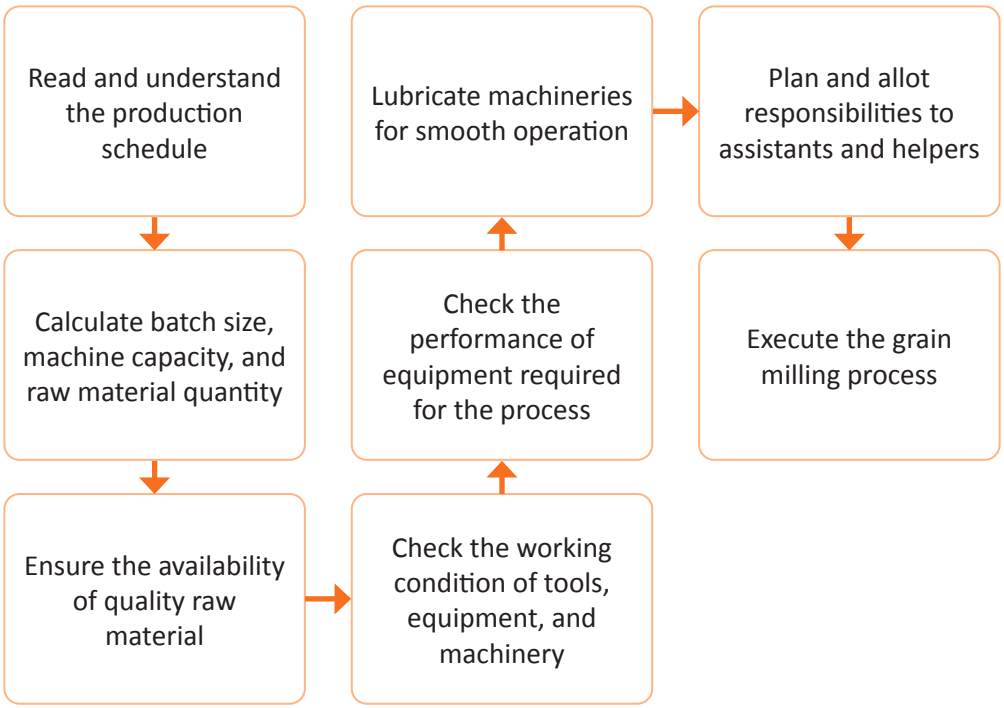

Fig. 4.3.1. Production plan

Exercise

1. Fill in the blanks with the correct option

a. Durum wheat is used to produce _____.

i. corn flour
ii. semolina
iii. ragi flour
iv. bajra flour

b. The unit of measurement for chemicals is _____.

i. volume
ii. centimetre
iii. gram
iv. inches

c. Paddy is used to produce _____.

i. wheat
ii. rice
iii. corn flour
iv. semolina

d. It is important to check the quality of raw materials before taking them for _____.

i. manufacturing
ii. costing
iii. production
iv. packing

e. _____ must be selected only if they meet the required quality parameters.

i. Finished products
ii. Raw materials
iii. Final product
iv. Stock

2. Arrange the production sequence in the right order

Production sequence	Order the steps (as 1, 2, 3, 4, 5, 6, 7 and 8)
a. Execute the grain milling process	
b. Ensure the availability of quality raw material	
c. Plan and allot responsibilities to assistants and helpers	
d. Lubricate machineries for smooth operation	
e. Calculate batch size, machine capacity, and raw material quantity	
f. Check the working condition of tools, equipment, and machinery	
g. Check the performance of equipment required for the process	
h. Read and understand the production schedule	

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5. Operate Grain Mill

Unit 5.1 – Milling Grains

Unit 5.2 – Packing, Labelling and Storage

Unit 5.3 – Post Production Cleaning and Maintenance

FIC/N1009

Key Learning Outcomes

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

1. State the process of canning
2. State the production process used for canning fruits and vegetables
3. List the types of containers used for packing canned products
4. State the method of storing cans
5. Demonstrate the process of cleaning and maintenance of work area after production
6. State the method of managing waste

UNIT 5.1: Milling Grains

Unit Objectives

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

1. Execute the grain milling process

5.1.1 Food Grain Milling Process

raw material used and the finished product. Following is a general overview of the food grain milling process:

Fig. 5.1.1. Food grain milling process

Terminology Used in the Milling Process

1. **Cleaning and grading**

   Cleaning helps in the removal of dust, chaff, dirt, grits, etc. from the pulses. Grading is done to segregate the grain legumes of desired shape and size. It is done by using a reel or rotating screen type cleaner.

2. **Pitting**

   An emery roller machine is used for cracking the husk layer and for scratching clean pulses passing through it. This is done for loosening the husk from sticking to the cotyledons. (Cotyledon is that part within the embryo of the seed, which may later become the first leaves of the new seedling.) Loosening the husk helps to facilitate subsequent oil penetration in the later operations. Gradually, the clearance between the emery roller and cage (housing) is narrowed from inlet to outlet. Cracking and scratching of husk takes place mainly by friction between pulses and emery as the material is passed through the narrowing clearance. During the operation, some of the pulses are de-husked and split by sieving.

3. **Pre-treatment with oil**

   Scratched or pitted material passes through a screw conveyer and some edible oil like linseed oil is mixed with it. Linseed oil is used at the rate of 1.5 to 2.5 kg/tonne of pulses. Pulses coming out of the screw conveyer are kept on floors for about 12 hours to diffuse the oil.

4. **Conditioning**

   Pulses are conditioned by alternate soaking/wetting, drying, and tempering. Moisture (3.5 %) is added to the pulses after sun drying for a certain period. After this, tempering is performed for about eight hours. The grain is dried in the sun again. Until all pulses are sufficiently conditioned, the whole process of alternate wetting and drying is continued for two to four days. Pulses are finally dried to about 10 to 12 % moisture content prior to de-husking and splitting.

5. **De-husking and splitting**

   For de-husking of conditioned pulses, carborundum coated emery rollers are used. In one pass, about 50 % of pulses are de-husked. De-husked pulses are split into two parts. De-husked split pulses are separated by sieving and the husk is aspirated off. Un-split de-husked pulses and tail pulses are again de-husked and milled in a similar way. For complete de-husking and splitting, the whole process is repeated two to three times.

6. **Polishing**

   Polishing is completed by treating de-husked and split pulses with a small quantity of oil and/or water.

Flour preparation

1. Select raw materials which meet quality parameters.

Quality parameters	Range(%)
Immature and shriveled grain % by mass (Not more than)	8.0
Other edible grains percent by mass, (Not more than)	2.0
Ash (percent on dry matter basis)	0.8 to 1.0
Protein percent by mass on a dry basis, (Not less than)	8.0

2. Prioritise the lot which has to be delivered urgently as per the SOP and stock rotation system
3. (FIFO and FEFO) as applicable.
4. Weigh the raw materials taken for flour preparation.
5. Wash the grains to clean it completely.
6. Use magnet to remove any metal elements from the selected raw materials.
7. After washing the grains dry the grains use a mechanical drier or dry by natural sun drying process.
8. Do gristing (mixing of the grains as per the desired final products as per the SOP like multi grains flour).
9. Transfer the grist to emery roller rotating at different speeds.
10. Set the speed rolls so that the milling process retains the outer skins of the grains.
11. Remove the flour when the desired consistency is achieved.
12. Identify the packaging materials required as per the SOP. Once the product is ready, send it for packaging and storage.
13. Pack the flour in the specified packaging.
14. Label the packing and send for storage.

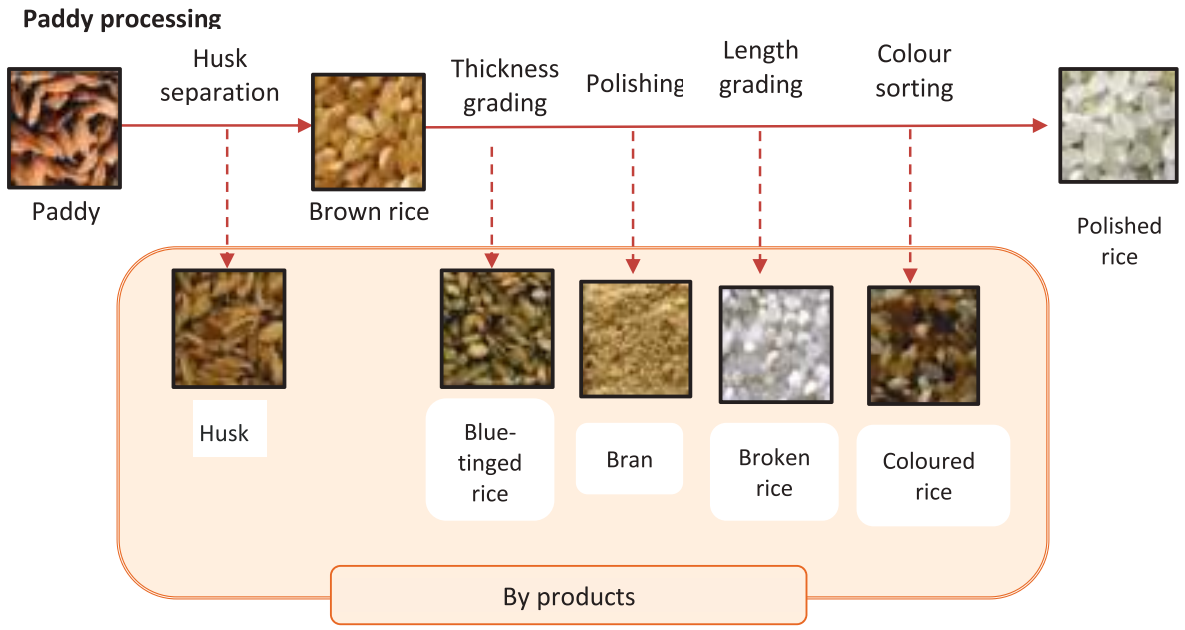

Fig. 5.1.2: Paddy processing

Wheat Flour

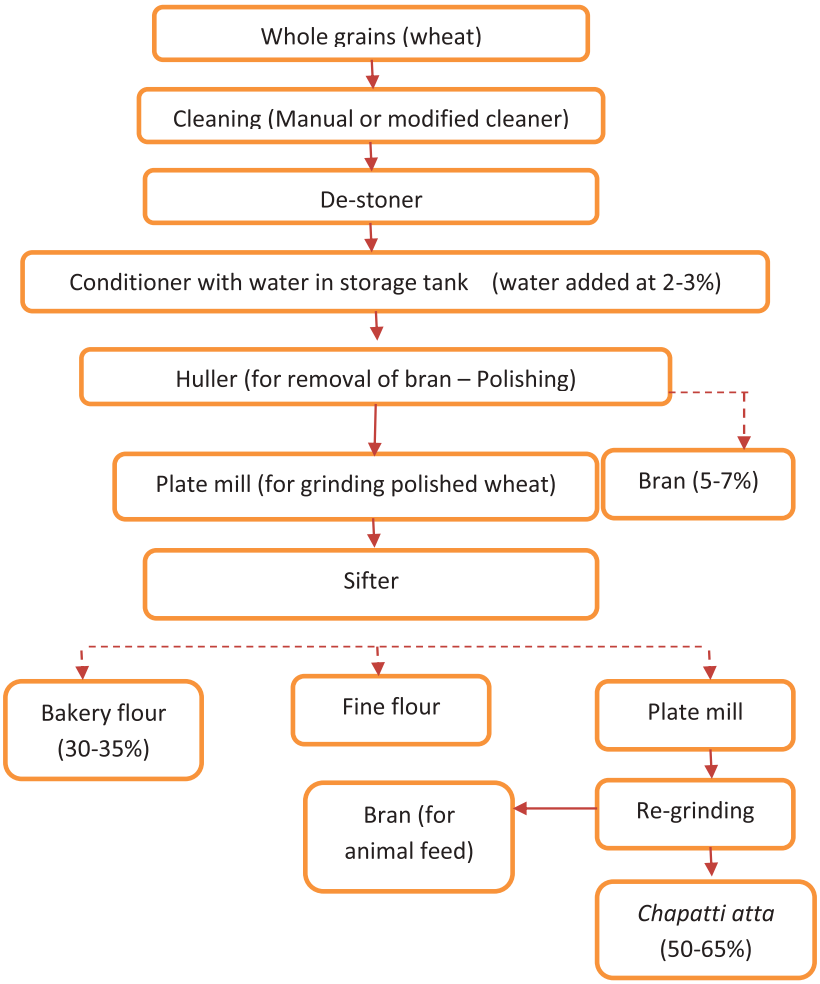

Fig. 5.1.3: Wheat flour (dry) process

Preparation of sorghum flour

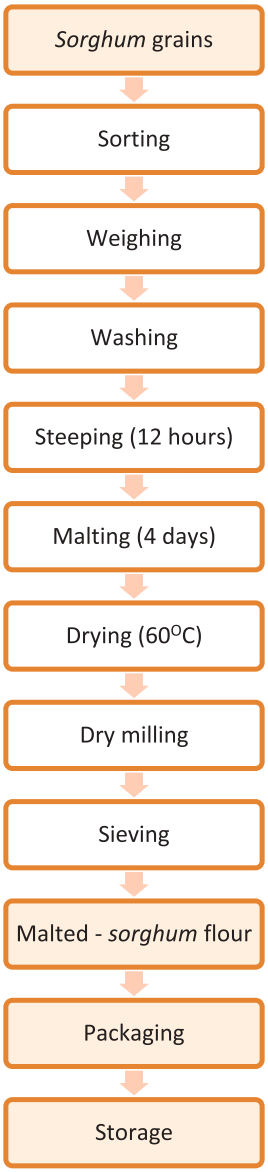

Fig. 5.1.4: Process of making shorgum flour

Preparation of soybean flour

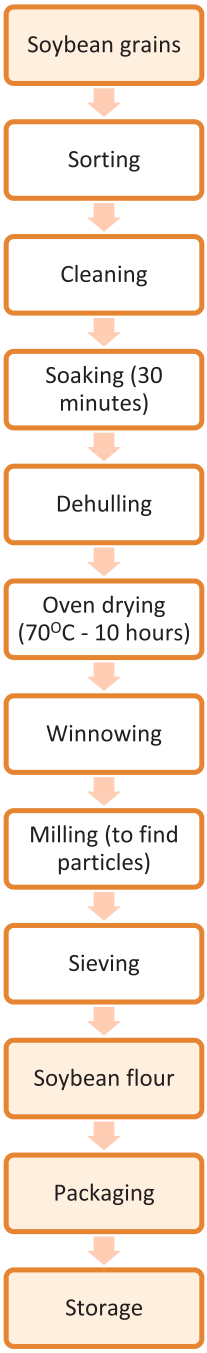

Fig. 5.1.5: Process of making soybean flour

Fig.4.1.7. Colour sorter

Colour sorter is used for optical sorting of food grains

Fig.4.1.8.Paddy husker

The husker removes husk from the paddy, it includes vibratory feeder, timing belt drive, new aspiration system, and a built-in access platform for roll changing

Fig.4.1.9.Whitener

The machine provides a high quality, clean finish to the rice

Fig.4.1.10.Thickness/width separator

This machine is widely used at various large-scale rice mills, seed processing plants, and grains/beans processing plants to produce high quality products because it can separate broken grains and immature grain easily and efficiently

UNIT 5.2: Packing and Storage

Unit Objectives

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

1. List the various types and categories of packaging materials used in the milling industry;
2. Explain the storage procedures followed for raw materials, packaging material and finished products.

5.2.1 Packaging Materials

Before packaging, a product is inspected to ensure safe and healthy batch of flour. The final product is packed in big jute bags. Controls of the packaging machine are set to pack the required quantity of milled produce. Simultaneously, the machine labels the date on the finished product. The date has to be set every day in the machine.

- Woven sacks
- Food grain bags
- Natural bags
- Polymer bags
- Perforated bags
- Jute bags
- Laminated bags
- Valve type bags
- Box type bags

Fig. 5.2.1: Jute bags

Fig. 5.2.2: Wovensacks

Fig. 5.2.3: Laminatedbags

Fig. 5.2.4: Baxtype bags

Fig. 5.2.5: Polymerbags

5.2.2 Storage Procedures

Storage Procedures in Grain Mills

The major construction materials for storage structures in rural areas are mud, bamboo, stones, and plant materials. They are neither rodent-proof, nor secure from fungal and insect attack. On average, out of a total 6% loss of food grain in such storage structures, about half is due to rodents, and half to insects and fungi. Some of the major considerations in building a storage structure to minimise losses are:

- the structure should be elevated and away from moist places in the house;
- as far as possible, the structure should be airtight, even at loading and unloading ports;
- rodent-proof materials should be used for construction of rural storages;
- the area surrounding the structure should be clean to minimise insect breeding; and
- the structure should be plastered with an impervious clay layer to avoid termite attack, or attack by other insects.

Various research and development organisations in India have identified some proven, age-old structures from certain areas of the country and based on these, some improvised storage structures have also been developed and recommended for use at farmer level.

Fig. 5.2.6: Grain storage

Fig. 5.2.7 Grain storage silos

UNIT 5.3: Post Production Cleaning and Maintenance

Unit Objectives

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

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

5.3.1 Post Production Cleaning Method

This chart explains the method of cleaning the work area after production.

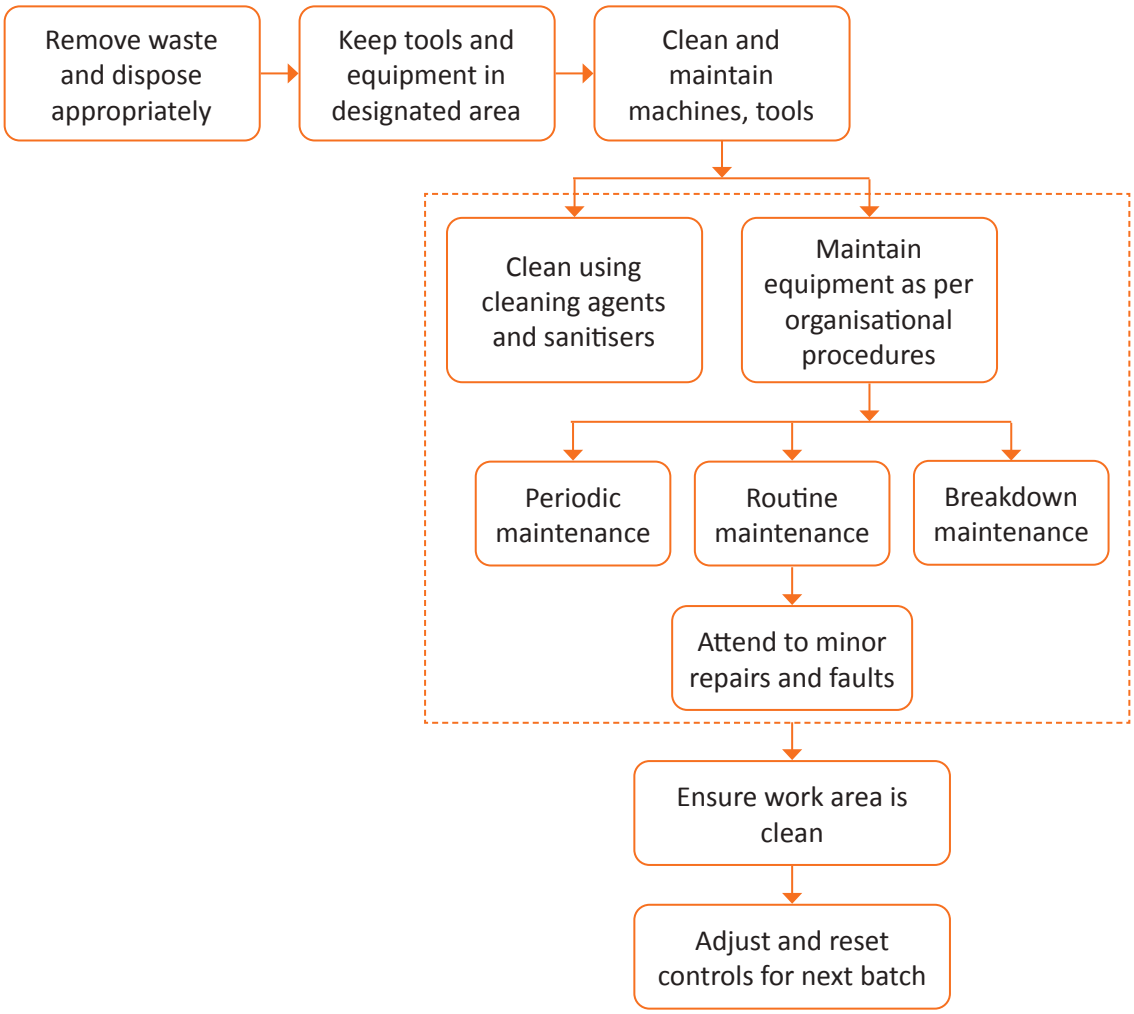

Fig. 5.3.1. Post production cleaning method

Exercise

1. Fill in the blanks with the correct option

a. Packaging materials and finished products are stored in a less humid place as it can degrade the _____ of the final product.

i. amount
ii. production
iii. quantity
iv. quality

b. During storage, all goods are clearly labelled with _____ name of contents and quantity.

i. date
ii. month
iii. year
iv. day

c. Chemicals or sanitisers used for cleaning or for production are kept in a designated area, away from the _____ unit.

i. production
ii. processing
iii. manufacturing
iv. storage

d. The _____ has to be set every day in the machine during the packaging and labelling process.

i. date
ii. name of contents
iii. quantity
iv. specification

e. _____ is stock rotation method for dispatching finished product, depending on the order in which it is produced.

i. JLT
ii. JIT
iii. FEFO
iv. FIFO

2. Arrange the steps for post-production cleaning in the right sequence

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

3. Match the column

Steps in milling grains	Usage
a. Milling	i. Grain is washed and then dried
b. Cleaning	ii. Grain is mixed with other grains to get the desired product
c. Gristing	iii. Last step of the milling process
d. Packing	iv. Passing through a series of fluted 'break' rolls rotating at different speeds

Notes

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

https://youtu.be/XQ1piYczecU

Introduction to grain milling process - Short Video - Food Processing

https://www.youtube.com/watch?v=T8BEf4x4MJU

Packaging and Storage in milling Process | Food Processing Unit

6. Complete Documentation and Record Keeping Related to Operating a Grain Mill

Unit 6.1 – Documentation and Record Keeping

Unit 6.2 – Field Visit

FIC/N1010

Key Learning Outcomes

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

1. State the need for documenting and maintaining records of raw materials, process, and finished products;
2. State the method of documenting and recording the details of raw material to final finished product;
3. Observe the various facilities, machineries in the food processing industry.

UNIT 6.1: Documentation and Record Keeping

Unit Objectives

At the end of this unit, you 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

6.1.1 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.

6.1.2 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

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

https://www.youtube.com/watch?v=HesWbNFSQS4

Documentation and Record Keeping in Food Processing Unit

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

Notes

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8. Annexure

Unit 8.1 - List of QR Codes Used in Book

Unit 8.1: List of QR Codes Used in Book

Module No.	Unit No.	Topic Name	Page No.	URL	QR Code (s)
1. Introduction	UNIT 1.1: Introduction to the Training Programme	1.1.1 Purpose and Benefits of the Training Programme	7	https://youtu.be/DUyBvI-Ht9c0	Grain Mill Operator - Orientation Video
	UNIT 1.2: Overview of the Food Processing Industry	1.2.1 Food Processing	7	https://www.youtube.com/watch?v=J-2EiMVNtpM&list=PL_mT-5DU_smK2gJTTCG7kBWob3EMVEH652&index=7	Overview of Food Processing Industry | FICSI - Food SSC
	Unit 1.3: Introduction to the Food Grain Milling Sector	1.3.1 Food Grain Milling Sector	12	https://youtu.be/aRD2JI-AN854	Overview of Food Grain Milling Sub Sector - Food Processing Sector
	UNIT 1.4: Introduction to the Food Grain Milling Process	1.4.1 Food Grain Milling Process	12	https://youtu.be/XQ1piYczecU	Introduction to grain milling process - Short Video - Food Processing
	UNIT 1.5: Attributes of Grain Mill Operator	1.5.1 Roles and Responsibilities	12	https://youtu.be/5ScmdguMoKc	Attributes of Grain Mill Operator - Qualification pack in Food processing

Module No.	Unit No.	Topic Name	Page No.	URL	QR Code (s)
3. Prepare and Maintain Work Area and Process Machineries for Operating a Grain Mill	UNIT 3.1: Equipment used in the Milling Process	3.1.1 Equipment Used in the Milling Process	30	https://www.youtube.com/watch?v=U8QMThV3Q0c	Machines & Equipment used in Milling Process - Food Grain Milling subsector of Food Processing
5. Operate Grain Mill	UNIT 5.1: Milling Grains	5.1.1 Milling Grains	59	https://youtu.be/XQ1piYczecU	Introduction to grain milling process - Short Video - Food Processing
	UNIT 5.2: Packing, Labelling and Storage	5.2.1 Packaging and Labelling Process	59	https://www.youtube.com/watch?v=T8BEf4x4MJU	Packaging and Storage in milling Process | Food Processing Unit
6. Complete Documentation and Record Keeping Related to Operating a Grain Mill	UNIT 6.1: Documentation and Record Keeping	6.1.2 How to Keep Records?	64	https://www.youtube.com/watch?v=HesWbNFSQS4	Documentation and Record Keeping in Food Processing Unit

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