



कौशल गुणवत्ता प्रगति



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GOVERNMENT OF INDIA  
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& ENTREPRENEURSHIP



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**FICSI**  
Food Industry Capacity and Skill Initiative

# Participant Handbook

Customized Courses under PMKVY (210 Hrs)

Sector

**Food Processing**

Sub-Sector

**Bread and Bakery**

Occupation

**Processing**

Reference ID: FIC/Q5007, Version 1.0

**NSQF level 2.5**



**Baking Assistant**

## Published by

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**Shri Narendra Modi**  
Prime Minister of India

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



## 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: **'Baking Assistant'**

**QP Code: 'FIC/Q5007 NSQF Level 2.5'**

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Authorised Signatory  
(Food Industry Capacity & Skill Initiative)



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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 for providing skill training and/or upgrading the knowledge and basic skills to take up the job of 'Baking Technician/Operative' 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 an Ice Cream 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/N5017 / FIC/N9026: Prepare and maintain work area and machineries for baking products in The oven (FIC/Q5007)
- FIC/N5018 / FIC/N9026: Prepare for baking products in the oven (FIC/Q5007)
- FIC/N5019: Bake bakery products in the oven (FIC/Q5007)
- FIC/N5020: Complete documentation and record keeping related to baking products in the oven
- FIC/N9001 / FIC/N9901: Ensure Food safety, hygiene and sanitation for processing food products (FIC/Q5007)
- DGT/VSQ/N0101: Employability Skills

## Symbols Used



Key Learning  
Outcomes



Unit  
Objectives



Exercise



Notes




Practical

## Table of Contents

| S.No      | Modules and Units  | Page No   |
|-----------|--|-----------|
| <b>1.</b> | <b>Introduction (FIC/N5017) (FIC/N9026) (FIC/Q5007)</b>  | <b>1</b>  |
|           | Unit 1.1 - Overview of the Food Processing Industry  | 3         |
|           | Unit 1.2 - Overview of the Baking Process  | 5         |
|           | Unit 1.3 - Roles and Responsibilities of Baking Technician / Operative                             | 8         |
| <b>2.</b> | <b>Prepare and Maintain Work Area and Equipment for Baking (FIC/N5017) (FIC/N9026) (FIC/Q5007)</b> | <b>11</b> |
|           | Unit 2.1 - Equipment Used in bakery  | 13        |
|           | Unit 2.2 - Cleaning and Maintenance  | 19        |
|           | Unit 2.2 - Cleaning Processes  | 21        |
| <b>3.</b> | <b>Prepare for Baking Products in Oven (FIC/N5018) (FIC/N9026) (FIC/Q5007)</b>                     | <b>27</b> |
|           | Unit 3.1 - Production Order  | 29        |
|           | Unit 3.2 - Production Sequence   | 32        |
| <b>4.</b> | <b>Bake Bakery Products in the Oven (FIC/N5019) (FIC/Q5007)</b>                                    | <b>39</b> |
|           | Unit 4.1 - Baker's Math  | 41        |
|           | Unit 4.2 - Overview of Baking Ingredients  | 43        |
|           | Unit 4.3 - Production Processes  | 46        |
|           | Unit 4.4 - Proofing  | 49        |
|           | Unit 4.5 - Bread Making  | 52        |
|           | Unit 4.6 - Quality Check of Baked Products   | 57        |
|           | Unit 4.7 - Packaging of Baked Products   | 62        |
|           | Unit 4.8 - Storage of Materials  | 64        |
|           | Unit 4.9 - Post-Production Cleaning and Maintenance  | 65        |
| <b>5.</b> | <b>Complete Documentation and Record Keeping Related to Bakery Products (FIC/N2016)</b>            | <b>71</b> |
|           | Unit 5.1 - Documentation and Record Keeping  | 73        |



| S.No | Modules and Units   | Page No |
|------|---|---------|
| 6.   | <b>Food Safety, Hygiene and Sanitation for Bakery Products (FIC/N2016) (FIC/N9901) (FIC/Q5007) 79</b>   |         |
|      | Unit 6.1 - Good Manufacturing Practices (GMP)   | 81      |
|      | Unit 6.2 - Hazard Analysis and Critical Control Point (HACCP)   | 83      |
|      | Unit 6.3 - Safety Practices   | 85      |
| 8.   | <b>Employability Skills 91</b>  |         |
|      | The book on New Employability Skills is available at the following location:<br><a href="https://eskillindia.org/NewEmployability">https://eskillindia.org/NewEmployability</a><br>Scan the QR code below to access the eBook |         |
|      |    |         |
| 8.   | <b>Annexure 93</b>  |         |





# 1. Introduction

Unit 1.1 - Overview of the Food Processing Industry

Unit 1.2 - Overview of the Baking Process

Unit 1.3 - Roles and Responsibilities of Baking Technician / Operative



## Key Learning Outcomes



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

1. List the various sub-sectors of food processing industry
2. Define food processing
3. List the various products of the bread and bakery sub-sector
4. List the various types of industries within the bakery sub-sector
5. Explain the baking process
6. State the roles and responsibilities of a baking technician/ operative

## UNIT 1.1: Overview of the Food Processing Industry

### Unit Objectives



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

1. List the various sub-sectors of food processing industry
2. Define food processing
3. State why food processing is important for agriculture and economy
4. Understand the demand for skilled labour in food processing sector

### 1.1.1 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.

### 1.1.2 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.

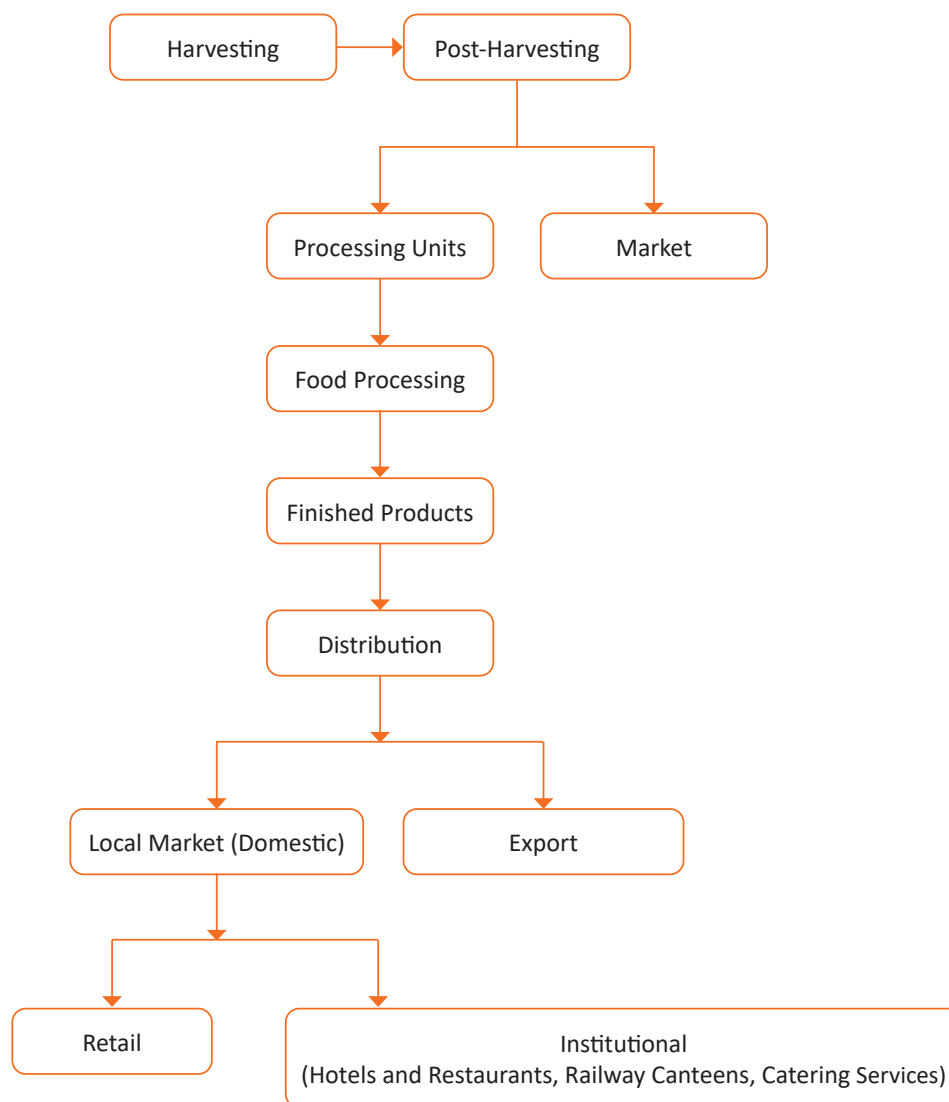


Fig. 1.2.2. Journey of harvested food

## UNIT 1.2: Overview of the Baking Process

### Unit Objectives



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

1. Explain the baking process
2. Explain different forms of heat used in baking industry

### 1.2.1 Overview of the Process of Baking

#### Bakery

A bakery is an establishment that produces and sells flour-based food baked in an oven such as, bread, cookies, cakes, pastries, and pies. Some retail bakeries convert into cafés, serving coffee and tea to customers who wish to consume the baked goods on the premises.

#### Different types of bakery products

A craft baker bakes different types of products in a bakery. Generally, there are three varieties of baked products - doughs, batters and pastes.

A "leavening agent", also known as a "raising agent" is usually added to these products to make lighter and softer, and a wide variety of products can be made with additions and decorations.

Some of the baked products prepared in a bakery are listed below:

- Breads
- Buns
- Cakes
- Croissants
- Cookies
- Crackers
- Biscuits
- Pizza base
- Pastries
- Other local products (like rusk, matthi etc.)

#### Production size:

Production size in terms of quantity depends on the nature of the production unit. Bakeries can be divided into the following categories:

- Large production unit
- Medium production unit
- Small production unit

Size of bakery units is determined by daily flour consumption, equipment's availability, total area and production staff. A small size bakery unit has 3-5 persons whereas a medium size unit can have 6 or more individuals and a large size unit usually has 20 or more production staff. Daily flour consumption can vary from 10 sacks to 100 sacks depending on the size of bakery unit.

**Artisan bakery:**

An artisan bakery functions by the thinking and innovation of a baker. Baker uses his/her skills often manually to prepare products. An artisan baker is a craftsperson who is trained to the highest ability to mix, ferment, shape and bake hand crafted items. Artisan bakeries get business from consumers due to the following reasons:

- Consumers prefer specific products prepared in an artisan bakery.
- Artisan bakery products are hand crafted with a specific taste.
- Artisan bakery products are believed to be fresher with higher nutritional value.
- Artisan bakery products are made with natural products and do not have chemicals and preservatives that are often found in industrial bakery products, therefore considered to be healthier
- Products are prepared by long fermentation process to add specific taste and texture.

**Different bakery products**

A baker's creativity and innovation is not bound by boundaries or limits. There is an immense variety of products that are made in a bakery on a daily basis.

Here are some of the products that are consumed on a large scale by customers:



Bagles



Tortillas



Buns



Doughnuts



Pizzas



Muffins



Rusks



Pastries



Brownies



Pies



Pretzels

## UNIT 1.3: Roles and Responsibilities of Baking Technician / Operative

### Unit Objectives

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

1. State the roles and responsibilities of a baking technician/ operative

### 1.3.1 Roles and Responsibilities

Define a career progression for yourself

The following table provides detailed information about the roles and responsibilities of a baking technician/ operative.

| Roles   | Responsibilities  |
|---|---|
| Handle banking ingredients from storage to the process line | <ul style="list-style-type: none"> <li>• Check the baking ingredients for quality</li> <li>• Ensure baking ingredients are free from dirt, debris, foreign matter, glass, and insects</li> <li>• Ensure minimum loss of baking ingredients</li> </ul>   |
| Record-keeping and documentation                            | <ul style="list-style-type: none"> <li>• Document and maintain records of baking ingredients</li> <li>• Document and maintain records of production schedule and process</li> <li>• Document and maintain records of finished products</li> </ul>   |
| Hygiene and sanitisation maintenance                        | <ul style="list-style-type: none"> <li>• Adopt safety and sanitization-related measures</li> <li>• Follow food safety norms and practices</li> <li>• Inspect work area for cleanliness</li> </ul>   |
| Inspect machines and troubleshoot issues                    | <ul style="list-style-type: none"> <li>• Ensure smooth operation of machinery to complete production line</li> <li>• Optimise the use of machinery</li> <li>• Attend to minor repairs of tools and machinery as required</li> <li>• Ensure the safety rules and regulations are observed</li> <li>• Prevent accidents</li> <li>• Escalate issues to the supervisor</li> </ul> |
| Plan and execute the banking process                        | <ul style="list-style-type: none"> <li>• Examine products at different stages of baking</li> <li>• Adhere to Good Manufacturing Practices (GMP)</li> <li>• Ensure the products meet the quality standards set by the organization</li> </ul>  |
| Inspect intermediate as well as finished products           | <ul style="list-style-type: none"> <li>• Check proofing and finished products for quantity</li> <li>• Ensure conformance of quality as per organisational standards</li> </ul>  |
| Follow storage and packaging norms                          | <ul style="list-style-type: none"> <li>• Ensure safe and proper storage of ingredients, packing materials, and finished goods</li> </ul>  |

## Exercise



1. What is food processing?
2. What are different subsectors of food processing?
3. What are the important steps of food chain from production to consumer?
4. Why is it important to process food
  - a. To increase its shelf life
  - b. To increase the income of farm sector
  - c. To increase the accessibility of consumers
  - d. All of the above
5. Is cattle rearing a part of food processing industry (yes or no)
6. Enlist different roles and responsibilities of baking technician

## Notes




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



<https://www.youtube.com/watch?v=J-2EiMVNtpM&t=11s>

Overview of Food processing industry



[https://www.youtube.com/watch?v=waGm1\\_tUUA0](https://www.youtube.com/watch?v=waGm1_tUUA0)

Overview of Baking process



<https://www.youtube.com/watch?v=DNyzXSb5NcY>

Orientation video



<https://www.youtube.com/watch?v=Yy4gqDdt0Gg>

Roles and Responsibilities of baking technician





## 2. Prepare and Maintain Work Area and Equipment for Baking



- Unit 2.1 - Equipment Used in bakery
- Unit 2.2 - Cleaning and Maintenance
- Unit 2.2 - Cleaning Processes



FIC/N5017  
(Part of - FIC/Q5007)

## Key Learning Outcomes



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

1. State the standard operating procedures in the baking industry
2. State the personal hygiene and sanitation guidelines
3. State the food safety hygiene standards to follow in a work environment
4. Identify the different equipment used in the baking process
5. State the materials and equipment used in cleaning and maintenance of the work area and machineries
6. State the cleaning processes used to clean the work area and process machineries

## UNIT 2.1: Equipment Used in bakery

### Unit Objectives

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

1. State factors to be considered while selecting the equipment
2. Classify bakery equipment
3. Select right kind of equipment for production

### 2.1.1 Bakery Equipment

A Craft Baker uses different equipment to prepare bakery products. Usage of equipment depends on the type, size and quantity of products. However, several factors have to be considered while selecting the equipment:

- Working performance
- Purpose
- Maintenance
- Skill to use
- Handling
- Cost and storage

Bakery equipment can be classified into:

**Large equipment Examples:** Spiral Dough Mixer, flour mixer, Proofing cabinet or box, bun divider / rounder, flour sheeter and / or bench sheeter, Rotary oven with roll in racks, Other ovens (gas fired, electronically controlled convection ovens), etc.

**Small equipment Examples:** Baker's scale, measuring cups and spoons, Flour sifters, Strainers, Rolling baker's racks, sheet pans, Stainless Steel bowls, Bread molds, loaf pans, muffin tins.

**Utensils:** Examples: Baker's Dough Knife, Knives (paring knife, palette knife (offset handle type), bread knife, carving knife, large chopping knife, filleting knife, etc.), Brushes (round, rectangular), Pastry bags, Tubes and Nozzles (open star tips, closed star tips, fluted tips, plain tips), stainless steel whip or whisk, 6-wheel adjustable dough divider, Roller Docker, Pastry wheel, Bench brush.

The tools and equipment used in the process of breaking are:

| Roles  | Responsibilities   |
|--------|--|
| Sifter | <ul style="list-style-type: none"> <li>• It is used to separate coarse drains and find particles of floor using flat sieves</li> <li>• The main parts of a shifting machine are the drive mechanism and the set of sieves</li> <li>• The flood is separated from the grains by horizontal or inclined sieve and sifted into three to six groups as per particle sizes</li> </ul> |

|                   |   |
|-------------------|---|
| Mixers            | <ul style="list-style-type: none"> <li>• It is used to mix cake batter and make whipped cream, dough, icing, and fillings</li> <li>• There are two types of bakery mixtures: planetary and spiral</li> <li>• A planetary mixer's mixing arm is set in a planetary motion without motion of the bowl and is used for all products</li> <li>• In spiral mixer, the bowl of the mixture rotates and the hook spins at the same time while spinning and kneading the dough in spiral manner</li> <li>• It is used to knead and make store for bread, bagels and pizza crusts</li> </ul> |
| Divider/rounder   | <ul style="list-style-type: none"> <li>• It is used to divide dough into equal proportions. This motor driven machine is usually used for bread dough</li> </ul>  |
| Door sheeter      | <ul style="list-style-type: none"> <li>• It is used to roll out dough into a (consistent) sheet with the desired thickness.</li> <li>• Dough is compressed between two or more rotating rollers to produce a consistent sheet</li> <li>• This equipment is used especially for pastries and biscuits</li> </ul>   |
| Dough moulder     | <ul style="list-style-type: none"> <li>• It is used to give uniform shape to the dough at high speed</li> <li>• It is highly efficient in terms of fuel and energy consumption</li> <li>• It is used to get the desired shape of biscuit, cookie or cake</li> </ul>   |
| Proof box/proofer | <ul style="list-style-type: none"> <li>• It is a sealed space that provides the right environment and encourages fermentation of dough by yeast</li> <li>• This is done by providing warm temperature and controlled humidity</li> </ul>  |
| Laminator         | <ul style="list-style-type: none"> <li>• It is used to make sheets liner, giving bite and text to biscuits.</li> </ul>  |

### Bakery Equipment and Use

Mixers



Fig. 4.1.1: Planetary mixer

Dough sheeter



Fig. 4.1.2: Dough sheeter

Bakery Equipment and Use

Dough moulder



Fig. 4.1.3: Dough moulder

Sifter



Fig. 4.1.4: Sifter

Divider or rounder



Fig. 4.1.5: Divider

Proof box or proofers



Fig. 4.1.6: Proofers

Baking oven



Fig. 4.1.8: Baking oven

Depositors



Fig. 4.1.9: Depositors

Dusters



Fig. 4.1.10: Dusters

Cooling conveyor



Fig. 4.1.11: Cooling conveyor

Bakery Equipment and Use

Paint brush



Fig. 4.1.22: Paint brush

Tart pan



Fig. 4.1.23: Tart pan

Loaf pan



Fig. 4.1.24: Loaf pan

Whisk



Fig. 4.1.25: Whisk

Piping bag and nozzles



Fig. 4.1.26: Piping bag and nozzles

Cooling rack



Fig. 4.1.27: Cooling rack

Baking trays



Fig. 4.1.28: Baking tray

## 2.1.2 Equipment Used in the Process of Baking

A Craft Baker uses different equipment to prepare bakery products. Usage of equipment depends on the type, size and quantity of products. However, several factors have to be considered while selecting the equipment:

- Working performance
- Purpose
- Maintenance
- Skill to use
- Handling
- Cost and storage

Bakery equipment can be classified into:

**Large equipment Examples:** Spiral Dough Mixer, flour mixer, Proofing cabinet or box, bun divider / rounder, flour sheeter and / or bench sheeter, Rotary oven with roll in racks, Other ovens (gas fired, electronically controlled convection ovens), etc.

**Small equipment Examples:** Baker's scale, measuring cups and spoons, Flour sifters, Strainers, Rolling baker's racks, sheet pans, Stainless Steel bowls, Bread molds, loaf pans, muffin tins.

**Utensils:** Examples: Baker's Dough Knife, Knives (paring knife, palette knife (offset handle type), bread knife, carving knife, large chopping knife, filleting knife, etc.), Brushes (round, rectangular), Pastry bags, Tubes and Nozzles (open star tips, closed star tips, fluted tips, plain tips), stainless steel whip or whisk, 6-wheel adjustable dough divider, Roller Docker, Pastry wheel, Bench brush.

The tools and equipment used in the process of breaking are:

|                     |   |
|---------------------|---|
| Gauge roll stand    | <ul style="list-style-type: none"> <li>• It is used to make dough thin and roll them</li> </ul>   |
| Begin oven          | <ul style="list-style-type: none"> <li>• It is used to bake or roast food in an enclosed compartment or receptacle</li> </ul>                                     |
| Depositors          | <ul style="list-style-type: none"> <li>• It is used to deposit accurate portions or better</li> </ul>   |
| Rotary cutter       | <ul style="list-style-type: none"> <li>• It is a pair of rulers with various shapes used for cutting the dough as per the desired shape of the biscuit</li> </ul> |
| Sprayers/coaters    | <ul style="list-style-type: none"> <li>• It is used for coating or spraying ingredients on baked products to give them a glazed look</li> </ul>                   |
| Dusters             | <ul style="list-style-type: none"> <li>• They are used for testing sugar and/or salt on biscuits</li> </ul>   |
| Cooling conveyor    | <ul style="list-style-type: none"> <li>• It is used for cooling baked products</li> </ul>   |
| Packaging machinery | <ul style="list-style-type: none"> <li>• It is used for packaging finished products</li> </ul>  |

### Types of Ovens:

Ovens are the most important equipment required in the baking process. Different types of baking products require different baking processes. Hence, different types of ovens are used. The following are the ovens used in the baking industry.



| Cabinet type  | Mechanical  | Masonry  |
|---|---|--|
| Rack ovens and deck convection ovens  | Reel oven and continuous tunnel convection  | Wood fire ovens<br>Used in private shops and cafes<br>Optimum temperature of 450°C is maintained   |
| Large sheet pans can be wheeled for baking in various heights   | The product moves on a conveyor belt inside the oven.<br>Useful for uniform baking of biscuit | <b>Black ovens:</b> <ul style="list-style-type: none"> <li>• Heated by burning wood in chamber</li> <li>• The product is cooked in the same chamber</li> </ul> |
| Small and medium size bakeries use rack, deck, and reel ovens for baking.<br>Large bakeries use continuous convection ovens as they are economical. |   | <b>White ovens:</b> <ul style="list-style-type: none"> <li>• Heated by heat transfer</li> <li>• The product is baked in a different chamber</li> </ul>         |

#### Precautions and safety measures

- Avoid direct spillage of water on electrical components.
- Clean the tools and equipment before and after each operation.
- Ensure regular maintenance of 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.
- Regularly check machines like ovens for efficiency of valves.
- Ensure the build-up of heat for such machines is always under control.
- Ensure all controls of all the machines are set to prescribed limits.

## UNIT 2.2: Cleaning and Maintenance

### 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. explain the importance of cleaning and sanitation in baking industry

### 2.2.1 Cleaning and Sanitization

Cleaning and sanitization 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 baking 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                       | Refrigeration equipment                          |
| Machines that process foods | Air conditioning, heating or ventilating systems |

#### Equipment, Chemicals, and Sanitizers Used for Cleaning

Every organization in the baking 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 sanitizing agents
- Cleaning brushes and scrubbers
- High spray nozzle jets

## 2.2.2 Cleaning and Sanitization

Some common types of cleaners and sanitizing 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                                       |

## UNIT 2.2: 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

### 2.3.1 Clean-In-Place

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 sanitizing 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 sanitizing solutions
- Ensure correct flow rate
- Ensure all connections are clean
- Monitor and verify the entire process

### 2.3.2 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

### 2.3.3 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.

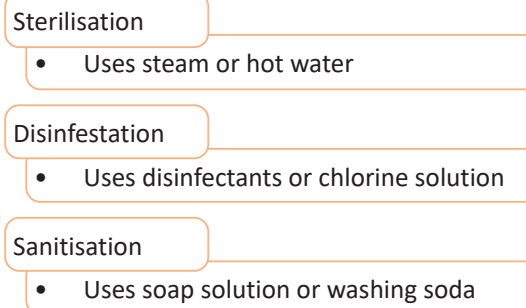


Fig. 3.3.2. Sterilising-In-Place (SIP)

#### Air-Pressure Cleaning

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

#### Air-Pressure Cleaning

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



### 2.3.4 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.

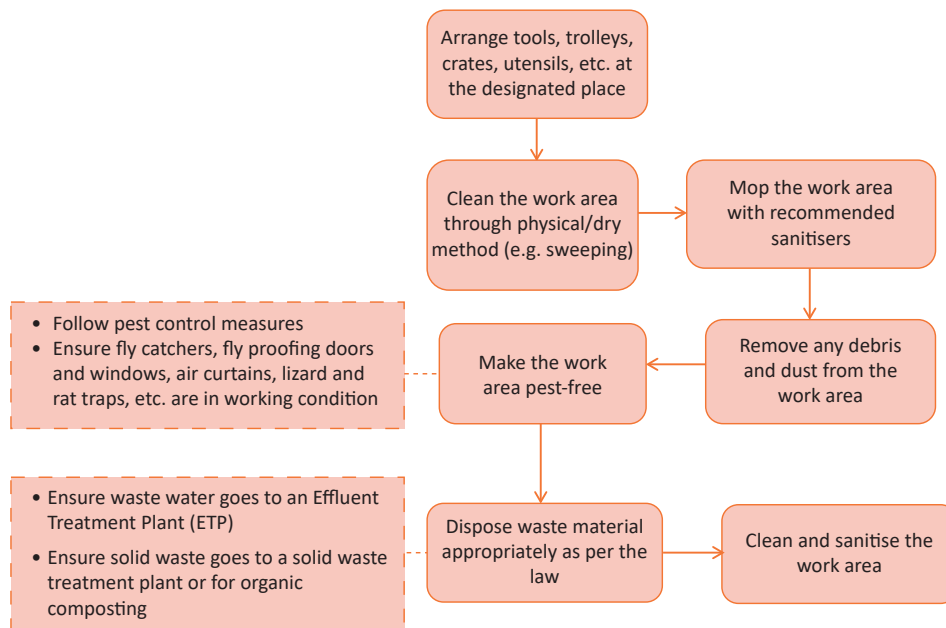


Fig. 3.3.3. Process of cleaning the work area

### 2.3.5 Process of Cleaning Machineries, Tools and Equipment

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

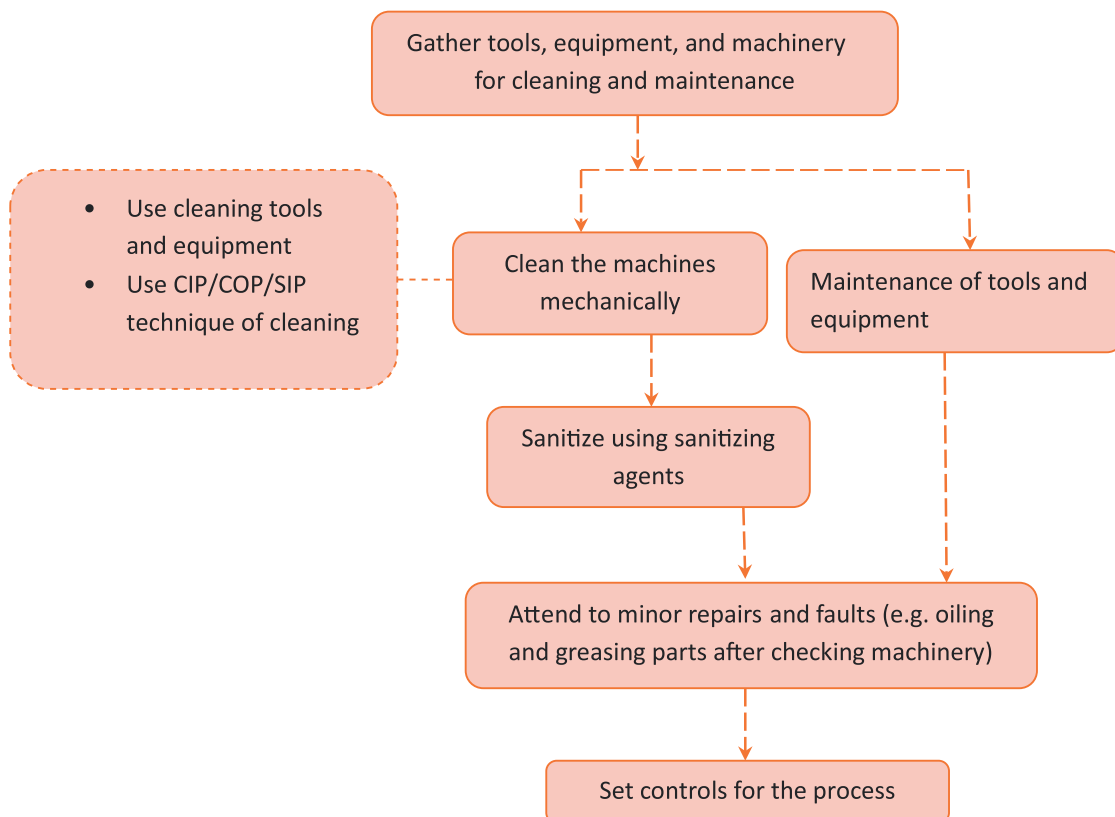


Fig. 3.3.4. Process of cleaning machineries, tools and equipment

## Exercise

1. Which of the following step ensures that workplace is safe and clean for use?
  - a. Wipe the equipment with a dry cloth and sweep the floor
  - b. Use a steam cleaner to clean the equipment and work top of grease and then use a steam vacuum cleaner to clean the floor of oil and grime
  - c. Dust the work tops and sweep the floor
  - d. Wipe the equipment and work top with a wet cloth and then mop the floor
  
2. Which of the following steps is not relevant in keeping the work bench tops clean and hygienic?
  - c. Sanitize with sanitizer and allow to air dry
  - d. Spray with a disinfectant
  - a. Scrape the top and sides with metal scraper
  - b. Wash with hot water and detergent
  
3. Which amongst the following steps should be followed to keep the work area clean
  - a. 1, 2, 3 and 4
  - b. 1, 3 and 4
  - c. 1,2and4
  - d. 1, 2 and 3
  
3. Which of the element is not relevant for check the working of oven to prior to baking?
  - d. Bake element
  - e. Thermostat
  - f. Control panel
  - g. Humidifier



## Notes




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



<https://www.youtube.com/watch?v=QWpU7DAfNcs&t=38s>

Cleaning and sanitation



<https://www.youtube.com/watch?v=zNArOSLoTiY&t=1s>

Tools and Equipments used in baking process





## 3. Prepare for Baking Products in Oven

Unit 3.1 - Production Order

Unit 3.2 - Production Sequence



FIC/N5018  
(Part of - FIC/Q5007)

## Key Learning Outcomes



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

## UNIT 3.1: Production Order

### Unit Objectives



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

1. Plan production in terms of resources including material, time and manpower for achieving objectives
2. Plan production tasks and sequence of activities for efficient production

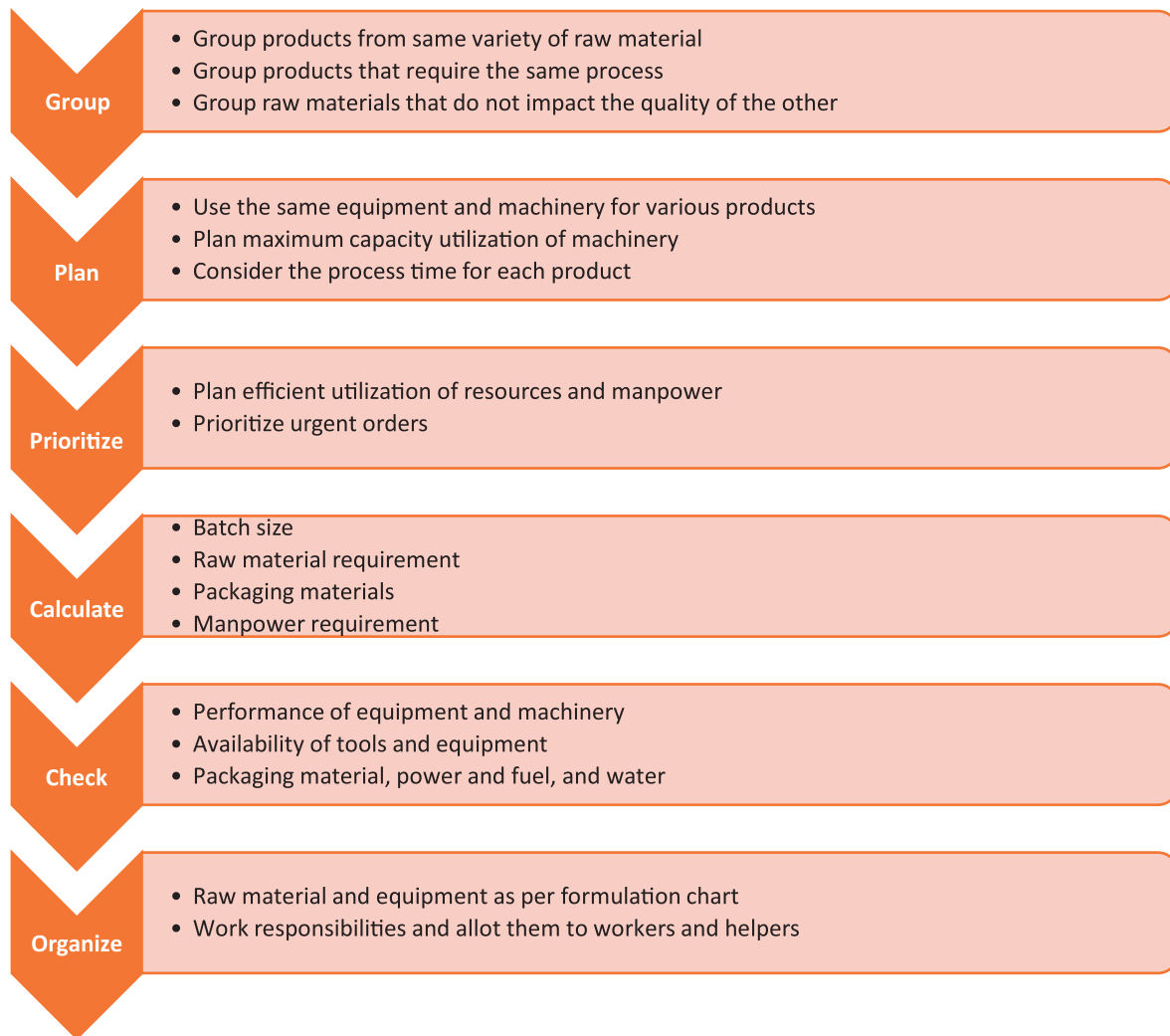
### 3.1.1 Production and Planning

Production Planning is an essential part in any food processing operation including processing of bakery products.

- Planning has to be done at all stages to meet with production quantity and quality in time.
- Pre-production planning is as important as actual production, and a craft baker should possess the necessary skills and knowledge to prepare a plan and execute the same to achieve production targets.
- Production planning starts after receiving production order or once the production target is known.

After the production order is known, an appropriate or designated team calculates quantities, duration and dates to meet the timeline as mentioned in the order.

Sector like bakery can't afford over production due to perishability of products, production budget of owner/ entrepreneur and of the consumer. Production should be exactly as per the order received from owner/ supervisor or as per sales forecast. A plan is required in such situations.



### Importance of production order

- Demand of bakery products is not uniform. It varies every day. Therefore, a production order provides:
- projection to meet daily sales and market demand
- estimated quantity of raw materials
- skilled manpower in the bakery based on the demand indicated in production orders

Traditional bakeries do not receive production order because their production and sales takes place in the same premises.

### 3.1.2 Post Production Order Activities

Once a baking technician receives production order, he/she needs to perform the following tasks:

- Check the availability of raw materials, packaging materials, equipment and manpower.
- Plan production sequence.
- Calculate batch size, requirement for raw material, packaging material and manpower for completing the order.
- Estimate machine/ equipment production capacity.

## UNIT 3.2: Production Sequence

### Unit Objectives



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

1. Explain production sequence
2. Calculate batch size
3. Calculate requirement for raw materials

### 3.2.1 Production Sequence

Production sequencing helps a baker to carry out his/her responsibilities perfectly in time to meet the production target.

Production sequencing includes:

- Calculate product output requirements as per production order.
- Select quality raw materials for production.
- Calculate production time for every part of process to meet daily demand(s).
- Determine the start and end time for production on a day.
- Assign responsibility to support staff to meet demand(s).
- Prioritise production as per the urgency of an order.

### 3.2.2 Batch (or lot)

In simple terms, batch is a specific quantity of product(s) produced in a given time.

#### Batch size

The production order and machine capacity are considered to decide batch size. It can be defined by two ways:

1. **Fixed quantity:** Fixed quantity can be understood by the following example:

Let's assume a production unit produces 100 kg bakery products in a day. So, the batch size is 100 kg or it can be divided (100 kg) in parts to form smaller batch sizes, like 20, 25, 50, etc.

2. **Fixed time:** Fixed time can be understood by the following example:

Let's assume a production unit produces 100 kg bakery products in 8 hours. So, the batch size for 8 hours is 100 kg or time can be divided to reduce the batch size, like batch of 25 in 2 hours, 50 in 4 hours, etc.



### 3.2.3 Types of Production Process in a Bakery

Two types of production process are followed in a bakery i.e. continuous production and batch production.

The table given below explains the difference between continuous and batch production process:

| Continuous Production   | Batch Production                               |
|---|--|
| A mechanical process which runs continuous till production is complete    | A process which is carried out step by step    |
| Automatic machines are used   | Semi-automatic machines are used               |
| No manual labour is involved. Saves labour cost.                          | Manual labour is involved                      |
| Proofing is done in a flow as a part of production.                       | Proofing is done in groups of intervals.       |
| Machine controls are set in the beginning of the entire production cycle. | Machine setting is required for each batch.    |
| Biscuits, cookies, etc. are baked using this production process           | Bread, cake, etc. are baked using this process |

#### Production rate

Production rate refers to the number of items labour/ machine can produce in a specific time period.

### 3.2.4 Raw Material and Manpower Requirement

Once the total volume of production is decided as per the order, a baker then needs to calculate the quantity of ingredients required to bake a particular product(s).

The following points have to be considered to decide the quantity of raw materials:

- Recipe of product
- Possible size of waste and losses during production process

#### Manpower/staff

The number and types of workers needed to operate a baking unit depend on the amount of production and on the degree of mechanisation of the process. However, a baker needs to carefully consider the skills required for production, availability of total number of people and their requirement at different stages of production.

#### Ways to use manpower efficiently:

- Train workers as and when required.
- Allocate different jobs to each worker.
- Prepare activity chart for workers.
- Update the chart regularly.

**Example: Calculation of raw materials (based on assumption)**

Order received to produce 50 kg bread.

Recipe

|                            |              |
|----------------------------|--------------|
| Flour                      | 1000 g (1kg) |
| Salt                       | 100 g        |
| Sugar                      | 250 g        |
| Margarine                  | 100 g        |
| Water                      | 250 ml/Kg    |
| Total amount of ingredient | 1700 g       |



We need to make 50 kg bread so the total amount of each ingredient's proportion will be calculated using the formula:

$$\frac{\text{Ingredient's volume used in recipe}}{\text{Production target}} \times \frac{\text{Total}}{\text{Total volume ingredients used in recipe}}$$

As per the above formula, following volume of ingredients will be required to produce 50 kg bread:

|             |             |   |       |   |          |
|-------------|-------------|---|-------|---|----------|
| Wheat flour | (1000/1700) | x | 50 kg | = | 29.42 kg |
| Salt        | (100/1700)  | x | 50 kg | = | 2.94 kg  |
| Sugar       | (250/1700)  | x | 50 kg | = | 7.35 kg  |
| Margarine   | (100/1700)  | x | 50 kg | = | 2.94 kg  |
| Water       | (250/1700)  | x | 50 kg | = | 7.35 kg  |

Total - 50 kg

### 3.2.5 Packaging Material Calculation

Packaging for foodstuff comes in different forms based on technical requirements throughout the supply chain as well as marketing needs (like brand identity or consumer information) and other criteria. The layer that is in direct contact with food is called 'food contact material'. Three layers of packaging are required to pack bakery products or any other processed food, which are:

- **First layer or Primary packaging:** It is seen at the point of sale. It needs to contain and protect food product(s) as well as display it and provide information.
- **Second layer or Secondary packaging:** It is the middle layer of packaging. For e.g., a cardboard box with a number of identical products inside. Third layer or
- **Tertiary packaging:** It is the outer container that allows easy handling during transit between factory, distribution centres and retailers.

#### Materials required to complete three layers of packaging

Three layers of packaging is completed with the help of paper sheet, plastic bags, silver foil made pouches, etc. The requirement of raw materials for packaging always depends on the quantity of production and size of packet(s) as per the order. Packaging can be done for small (grams) to large (kilograms) sizes.

Requirement of raw materials can be calculated as explained in the following example:

#### Example:

A baking unit produces 50 kg bread per day.

As per the order, 100 g bags have to be packed with 50 packs in each cardboard distribution box.

- Total 100 gram bags required - 500 bags
- Total number of cardboard distribution box required - 10 boxes (50 bags in each)

**Packaging:** Packaging material should be airtight in order to avoid moisture and strong/ rigid to protect flakes from breaking. Opaque packaging materials are recommended.

### 3.2.6 Performance of Equipment

Equipment used in a bakery should be effective in order to carry out production as per standards and fixed production deadlines. Before executing any production order a baker must ensure that equipment is properly oiled, lubricated and rechecked as per the checking schedule. A technician should always initiate preventive maintenance of equipment.

Steps to ensure effective performance

1. Initiate preventive measures to ensure proper working of equipment and machinery.
2. Follow maintenance schedule strictly.
3. Regularly check physical condition of equipment and machineries.
4. Maintain a record of production capacity of each and every equipment and machinery.
5. Communicate to the designated authority/ person, staff about status of machinery and its production capacity.
6. Keep an alternative plan ready in case of breakdown in production process.

It is required to ensure optimum utilisation of machines and equipment to avoid financial loss during production by calculating the process time

Equipment and machines are used in every stages of pickling. Process stages for pickling can be divided into four categories:

- Shorting
- Cleaning
- Processing
- Packaging

### 3.2.7 Process Time in Bakery

Machines and manpower are required for the above mentioned stages hence calculation of process time for all stages will help to determine the production target on hour/ daily basis.

#### Example:

To calculate process time for effective utilisation, assume the following:

- First - Baker has got a job to produce 50 kg bread through production order. (For production of said quantity, baker needs to ensure sorting, cleaning, processing and packaging process. Each process will require time to complete, but proper management of process and manpower will ensure effective utilisation of machines and equipment.)
- Second – One hour will be required to carry out sorting for raw materials for 10 kg. Total number of hours required - 5 hours (assume 8 working hours in a day). (Capacity of sorting machine is 10 hours)
- Third - 30 mins will be required to clean the sorted raw materials for 5 kg bread. For 50 kg, total number of hours required - 5 hours (assume 8 working hours in a day). (Capacity of cleaning machine is 10 hours)
- Fourth – One hour will be required to carry out processing of sorted and cleaned raw materials to produce 50 kg bread. Total number of hours required - 10 hours to produce 50 kg bread. (Capacity of processing machine is 10 hours)
- Fifth – One hour required to pack 10 kg processed bread in appropriate sizes. For 50 kg bread, total number of working hours required - 5 hours (assume 8 working hours in a day).

After considering the machines' capacity, working hours, deadline to meet the production target and quantity of product, baker should make a plan for production and determine the batch size of production.

## Exercise



1. What is the significance of planning and production?
2. What are the importance of production sequence in the job role of a baker?
3. How a batch size can be determined?
4. State different production processes in a bakery?
5. What Raw Material and Manpower are required in bakery to bake their products?
6. Why it is important to calculate packaging material?
7. How to check the performances of the equipments?
8. How the Process Time in Bakery is estimated?





## 4. Bake Bakery Products in the Oven



Unit 4.1 - Baker's Math

Unit 4.2 - Overview of Baking Ingredients

Unit 4.3 - Production Processes

Unit 4.4 - Proofing

Unit 4.5 - Bread Making

Unit 4.6 - Quality Check of Baked Products

Unit 4.7 - Packaging of Baked Products

Unit 4.8 - Storage of Materials

Unit 4.9 - Post-Production Cleaning and Maintenance



**FIC/N5019**  
**(Part of - FIC/Q5007)**

## Key Learning Outcomes



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

1. Plan the production sequence to maximise capacity utilization of resources, manpower, and machineries
2. Calculate the batch size based on the production schedule and machine capacity
3. Prioritize urgent orders based on the production schedule
4. Check the conformance of baking ingredients quality to company standards
5. State the units of measurement used in the food processing industry
6. Identify the baking ingredients required for production as per production schedule and formation
7. Organize quality baking ingredients as per production process and company standards
8. Identify the various fuels used in the baking industry
9. State the various production processes followed in the baking industry
10. State the different mixing methods used for baking
11. State the process of proofing
12. Demonstrate the process of proofing in the baking industry
13. Demonstrate the process of baking products in an oven
14. Identify if the final product meets the quality parameters
15. State the process of cooling baked products
16. State the process of packaging baked products
17. State the method of storing baking ingredients
18. State the method of storing finished products
19. Demonstrate the process of cleaning the work area and machineries after production



## UNIT 4.1: Baker's Math

### Unit Objectives



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

1. State the units of measurement used in the food processing industry

### 4.1.1 Baker's Mathematics

Baker's mathematics is a method of breaking down ingredients into proportions as per requirements by scaling up or down. In baker's math, every ingredient is expressed in terms of the flour weight, which is always expressed as 100 percent.

For example: A typical formula for bread:

- Flour: 100%
- Water: 70%
- Salt: 2%
- Instant yeast: 1% Total: 173%

**To make bread with 200 grams of flour**, the weight of the other ingredients is

- Water:  $200 * 70\% = 140$  grams
- Salt:  $200 * 2\% = 4$  grams
- Instant yeast:  $200 * 1\% = 2$  grams

To make 1 kilogram of dough, divide the total of all the ingredient percentages added up {173% = 1.73} into the total weight of the dough:

- 1 kg = 1000 gms
- $1000 \text{ grams} / 1.73 = 578$  grams of flour (rounded to nearest gram).
- Now the flour weight is= 578 gms, the weight of other ingredients will be:
- Water=  $578 * 70\% = 404$  grams (rounded)
- Salt=  $.02 * 578 = 12$  grams (rounded)
- Instant yeast=  $578 * 1\% = 6$  grams (rounded)

## 4.1.2 Baker's Mathematics

### Formulas:

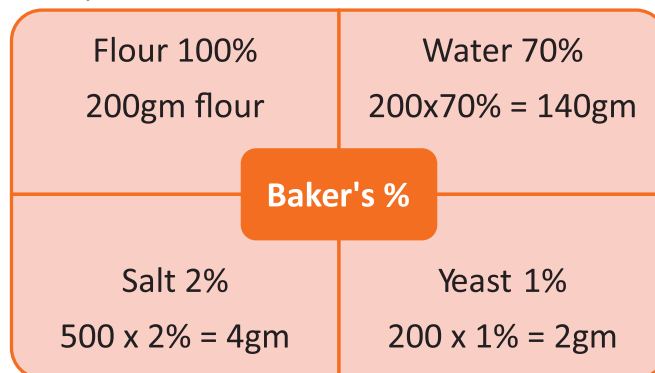
- To find out what percentage each ingredient is:  $\text{Ingredient Percentage} = \frac{\text{Ingredient Weight}}{\text{Total Flour}} \times 100$
- To find out what the required weight of each ingredient is needed:  $\text{Ingredient Weight} = \text{Ingredient Percentage} \times \text{Total Flour Weight}$
- The total flour weight is given by:

$\text{Total Flour Weight} = \frac{\text{Total Weight of the dough}}{\text{Total Percentage of all the ingredients}}$

Baker's percentage is a baker's notation method indicating the flour-relative proportion of an ingredient used when making breads, cakes, muffins, and other pastries.

Baker's percentages enable the user to:

- Compare recipes more easily (i.e., which are drier, saltier, sweeter, etc.)
- Spot a bad recipe, or predict its baked characteristics
- Alter or add a single-ingredient percentage without changing the other ingredients' percentages
- Measure uniformly an ingredient where the quantity per unit may vary (as with eggs)
- Scale accurately and easily for different batch sizes



Baking Ingredients used in the food processing industry are selected in specific quantity. They are measured in metric units (kg, g, ml etc).

Some common units of measurements used are:

| Ingredient      | Unit of measurement  |
|-----------------|--|
| Dry ingredients | Kilogram(kg) or gram(g), teaspoon (tsp), tablespoon (tblsp), Ounce (oz), tea cups (c), pound |
| Liquid volume   | Litre(L) or millilitre (ml), Ounce (oz)  |
| Temperature     | Degree Celsius (°C) or Fahrenheit (°F)   |
| Duration        | Time (minutes, hours, seconds)   |

## UNIT 4.2: Overview of Baking Ingredients

### Unit Objectives

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

1. Identify the baking ingredients required for production as per production schedule and formation
2. Organize quality baking ingredients as per production process and company standards

### 4.2.1 Ingredients Used in the Baking Industry

The main ingredient used for baking is flour. The most commonly used flour is wheat flour. Flours are graded into strong and soft by the type of milling. Strong flours are flours with hard high protein varieties. Soft flours are flours with low protein varieties.

Ingredients used in the baking industry are divided into groups as per their roles. The following table explains this classification.

| Role  | Types of baking ingredients                             | Function   |
|---|---|--|
| <b>Structure builder</b><br>Materials that form the base and act as the binder in a product | Flour   | <ul style="list-style-type: none"> <li>• Hold other ingredients for uniform dough mixing to make dough</li> <li>• Produce gases during fermentation and retain them during baking</li> </ul> |
|   | Egg   | <ul style="list-style-type: none"> <li>• Whipped egg forms foam which acts as a leavening agent</li> <li>• Provides colour and flavour</li> </ul>  |
|   | Milk powder   | <ul style="list-style-type: none"> <li>• Provides enrichment</li> <li>• Provides wholesome flavour, colour, and taste</li> </ul>   |
| <b>Tenderiser</b><br>Materials that give softness/fluffiness/crunchiness to the product     | Sugar   | <ul style="list-style-type: none"> <li>• Imparts sweet taste</li> <li>• Softens gluten</li> <li>• Gives colour</li> <li>• Imparts texture</li> </ul>   |
|   | Salt  | <ul style="list-style-type: none"> <li>• Strengthens and tightens the dough</li> <li>• Compacts the gluten protein to hold carbon dioxide</li> <li>• Gives taste to product</li> </ul>       |
|   | Shortening (fats like butter, margarine, vegetable oil) | <ul style="list-style-type: none"> <li>• Imparts shortening effect to the dough</li> <li>• Makes the dough more extensible</li> <li>• Improves the taste</li> </ul>                          |
|   | Baking chemicals like baking powder                     | <ul style="list-style-type: none"> <li>• Aerates products to make them porous and crisp</li> </ul>   |

|   |  |   |
|---|--|---|
| <b>Moisteners</b><br>Material that gives slight wetness to the product                    | Water  | <ul style="list-style-type: none"> <li>• Helps to mix the ingredients to make uniform dough</li> <li>• Helps in gluten development during mixing</li> <li>• Helps in airing of product</li> </ul> |
|   | Antioxidants   | <ul style="list-style-type: none"> <li>• Helps to check rancidity of products, keeping them fresh</li> </ul>  |
|   | Liquid part of milk  | <ul style="list-style-type: none"> <li>• Helps in the development of gluten</li> </ul>  |
|   | Egg  | <ul style="list-style-type: none"> <li>• Provides nutritive value</li> </ul>  |
| <b>Flavouring agents</b><br>Materials that enhance the taste                              | Flavour and colour (synthetic or natural)  | <ul style="list-style-type: none"> <li>• Imparts and improves specific flavour and colour to the products</li> </ul>  |
|   | Chocolate and cocoa products   | <ul style="list-style-type: none"> <li>• Provides a characteristic aroma and taste</li> </ul>   |
|   | Fruits and nuts  | <ul style="list-style-type: none"> <li>• Adds a specific taste to the products</li> </ul>   |
|   | Other cereal flours and starches   | <ul style="list-style-type: none"> <li>• Dilutes the effect of strong flours</li> <li>• Imparts specific taste and flavour to the product</li> </ul>  |
| <b>Emulsifiers/additives</b><br>Materials which help in mixing flavouring agents and fats | GMS (Glycerol Monostearate) lecithin, SSL (Sodium Stearoyllactylate) are commonly used | <ul style="list-style-type: none"> <li>• Helps in uniform dispersion of fats and fat soluble colours and flavours in water.</li> </ul>  |

### Quality Parameters

While selecting ingredients for the baking process, certain quality parameters have to be met. They are:

| Baking ingredient  | Bread   | Biscuits/cookies  | Cake  |
|--|---|---|---|
| Flour (clean, characteristic taste and smell, free from insects, fungus infection, rodent contamination and dirt, dusted bran particle, and other foreign matter)                  | High protein, strong flour, good water absorption (60-65 %), high starch, bit granulated (medium) | Soft flour, water absorption of 55 %, fine flour; certain biscuits require strong flour | Soft flour, low water absorption of 50 %, fine flour  |
| Sugar (according to different particle size used are: granular sugar (6-30 mesh), castor sugar (30-80 mesh), pulverized sugar (80-120 mesh), and icing sugar (120 mesh and above)) | Powdered sugar if required, sugar acts as the substitute for honey or molasses                    | Fine powdered sugar or glucose, malt extract fructose, honey                            | Fine powdered sugar/sugar syrup which is de-odorized by passing through activated charcoal and is clear in colour is used |
| Milk/milk products   | Dry milk, which has very less fat content but high water absorption                               | Milk powder in water  | Toned milk  |
| Fat  | Oil with low viscosity  | Hydrogenated vegetable oil (dalda)  | Butter  |
| Yeast  | Dry yeast as it mixes faster when added through water   | Certain biscuits/cookies require yeast, to some extent                                  | Not applicable  |
| Egg  | Not applicable  | Fresh eggs used (if required)   | Fresh eggs used   |

## UNIT 4.3: Production Processes

### Unit Objectives

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

1. State the various production processes followed in the baking industry
2. Enlist different control points in baking industry

### 4.3.1 Purpose of Baking

Baking is a crucial step to get the desired product. In baking the dough undergoes physical and chemical changes. The purpose of baking can be stated as follows:

1. Physical changes: crust formation, oven spring formations takes place
2. Chemical changes: the blended effect of all the baking ingredients to give a quality product.

#### Control Points for Baking

While baking following points have to be noted, as if each is not maintained then the product quality is tampered.

- Optimum temperature: 2080 to 2100F;
- Time: 25-30 minutes

#### Production Processes Used in the Baking Industry

In the baking industry, there are two ways to process baked products. They are: Continuous and Batch process. The following table explains these processes in detail.

| Continuous   | Batch   |
|--|---|
| <ul style="list-style-type: none"> <li>• A mechanical process which runs non-stop till the process is complete</li> <li>• An automatic machine is used</li> <li>• No manual labour involved</li> <li>• Proofing is done in a flow as a part of process</li> <li>• It saves labour cost</li> <li>• Machine controls are set only once at the start of the entire process</li> <li>• Biscuits, cookies, etc. are baked using this process</li> </ul> | <ul style="list-style-type: none"> <li>• A process which is done step wise</li> <li>• Semi-automatic machines used</li> <li>• Manual labour is involved</li> <li>• Proofing is done in groups of intervals</li> <li>• For each batch, machine setting is required</li> <li>• Bread, cake, etc. is baked using this process</li> </ul> |

## 4.3.2 Mixing Methods Used in the Baking Industry

### Purpose of Mixing

The baking process for any baked good begins with mixing the dough. This stage determines the development of the dough and its temperature. If any of these variables are not met, it will have an effect on the quality of the final product. Hence, mixing is considered as the most important component of the baking process. The purpose of mixing can be stated as follows:

- to ensure uniform distribution of ingredients
- to ensure minimum loss of the leavening agent
- to hydrate dry ingredients
- to ensure perfect blending of ingredients
- to ensure prevention or development of gluten (depending upon the final product)

### Control Points for Mixing

Mixing, being the most important stage of the baking process, having proper control over each of the components of the mixing process is extremely important. The following table explains the control points for mixing that one must pay attention to. Also mentioned in the table are the possible effects that may show up, if these control points are overlooked.

### Purpose of Mixing

| Control Point     | Effect  |
|-------------------|---|
| 1. Scaling        | If the quantity of any of the ingredients is miscalculated, it will lead to faulty bread.   |
| 2. Mixing         | If the dough is under mixed or over mixed, it will affect the handling properties of the dough.   |
| 3. Temperature    | If the ideal temperature is not maintained, it will affect the rate of fermentation. This will, then, affect volume of the bread and the colour of the crust. |
| 4. Time           | If the mixing time is not maintained as per defined norms, it will affect the texture and the grain of the bread crumbs.                                      |
| 5. RPM of machine | If the RPM is not maintained, it will affect the dough quality and consequently, the quality of the final product.  |

## Types of Mixing

Mixing is a crucial step as it gives uniformity to dough which enhances the quality of the end product. Hence, the method in which mixing is done is important for the end product. There are three different ways of mixing which are explained below in the chart:

| Creaming mixing method   | All-in-one mixing method   | Fermented dough  |
|--|--|--|
| <ul style="list-style-type: none"> <li>• It is done in two or three stages</li> <li>• In the first stage, sugar and fats are mixed together.</li> <li>• In the second stage, chemicals are mixed followed by addition of salt and flour to the cream mixture.</li> <li>• This method helps in coarse, crumbly soft dough, ideal for biscuits.</li> </ul> | <ul style="list-style-type: none"> <li>• It is one stage mixing method.</li> <li>• Salt, leavening chemicals, colour, flavour, and milk powder are sieved in a tub with flour, sugar, etc. and mixed together with the aid of water to make satisfactory level of dough.</li> <li>• This is ideal for transferring dough into sheets for laminator process.</li> </ul> | <ul style="list-style-type: none"> <li>• All in one mixing and fermentation: All the ingredients including yeast mixed to form a dough that is allowed to ferment for 3 -8 hours</li> <li>• Further, the dough is developed for lamination/cutting process</li> <li>• Two stage mixing and fermentation: A sponge is made by mixing yeast water and flour and fermented for 15-20 hours.</li> <li>• Sponge textured dough is further mixed with remaining ingredients and kept for fermentation for 2-3 hours, which is later used for lamination, etc.</li> </ul> |



## UNIT 4.4: Proofing

### Unit Objectives

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

1. State the process of proofing

### 4.4.1 What is Proofing

Proofing is the method of final dough rise using a leavening agent. Proofing is a part of the larger fermentation process.

#### Purpose of Proofing

Proofing is a crucial step that helps in achieving the desired volume as per the required product. The quantity of dough rises by 3-4 times during proofing. It is a period of continuous fermentation during resting of dough. The purpose of proofing can be stated as:

- To relax the dough from the stress received during previous operations.
- To facilitate production of gas in order to give desired volume to the dough.
- To mellow gluten to extensible character for oven rise.

#### Control Points for Proofing

While proofing following points have to be noted, as if each is not maintained then the product quality is tampered.

- Optimum temperature: 950-980F
- Humidity: 80-85%
- Time: 55-65 minutes

#### Two stages of dough rising are

| Primary fermentation  | Secondary fermentation   |
|---|--|
| This is done right after the dough is mixed together and the size of the dough doubles. | <ul style="list-style-type: none"> <li>• This is final rising period, which takes place before dough is shaped for bread.</li> </ul> |

Leavening agent/leavening is a substance that causes the dough/batter to rise. Yeast or baking soda is used as a leavening agent.

#### Working of leavening agent:

- In the presence of moisture, heat, and acidity, the leavening agent reacts to produce carbon dioxide gas.
- This gas gets trapped as bubbles in the dough and helps to raise the dough making it lighter.
- When the risen dough/batter is baked, the bubbles set and the holes left by the gas bubbles remain.
- This gives the cake, bread, etc. the soft and spongy texture.

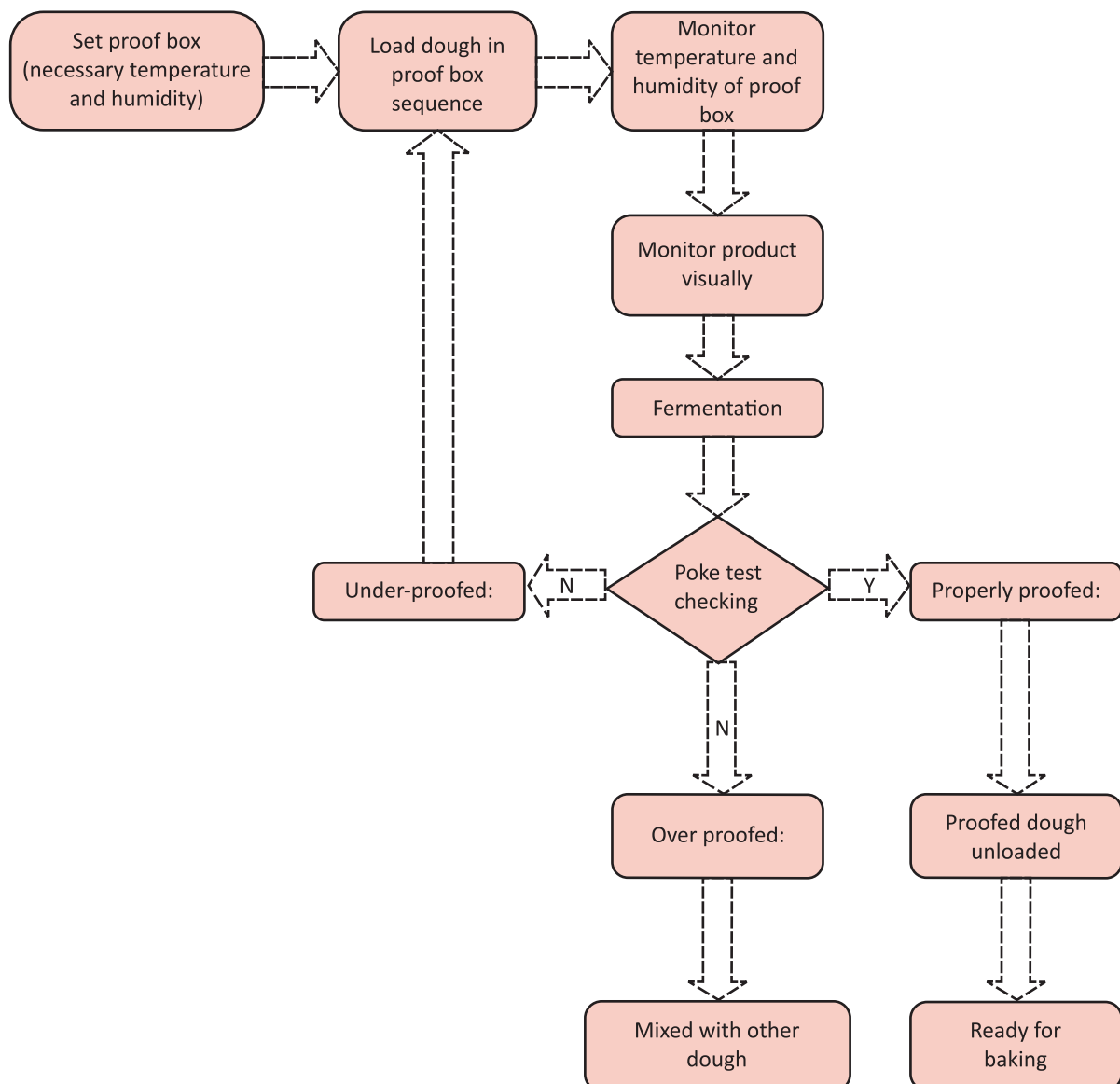
**Test for proofing:**

It is done with the help of poke method. In this method, a pointed stick is poked into the dough. When this is done, one of the following three conditions occurs:

| Under proof   | Over proof   | Proofed  |
|---|--|--|
| <ul style="list-style-type: none"> <li>The dough springs back after poking.</li> <li>It is sent for proofing</li> </ul> | <ul style="list-style-type: none"> <li>A tunnel is seen</li> <li>It is set aside for combining with other dough</li> </ul> | <ul style="list-style-type: none"> <li>The dough has risen as per desired level.</li> <li>It is ready to bake</li> </ul> |

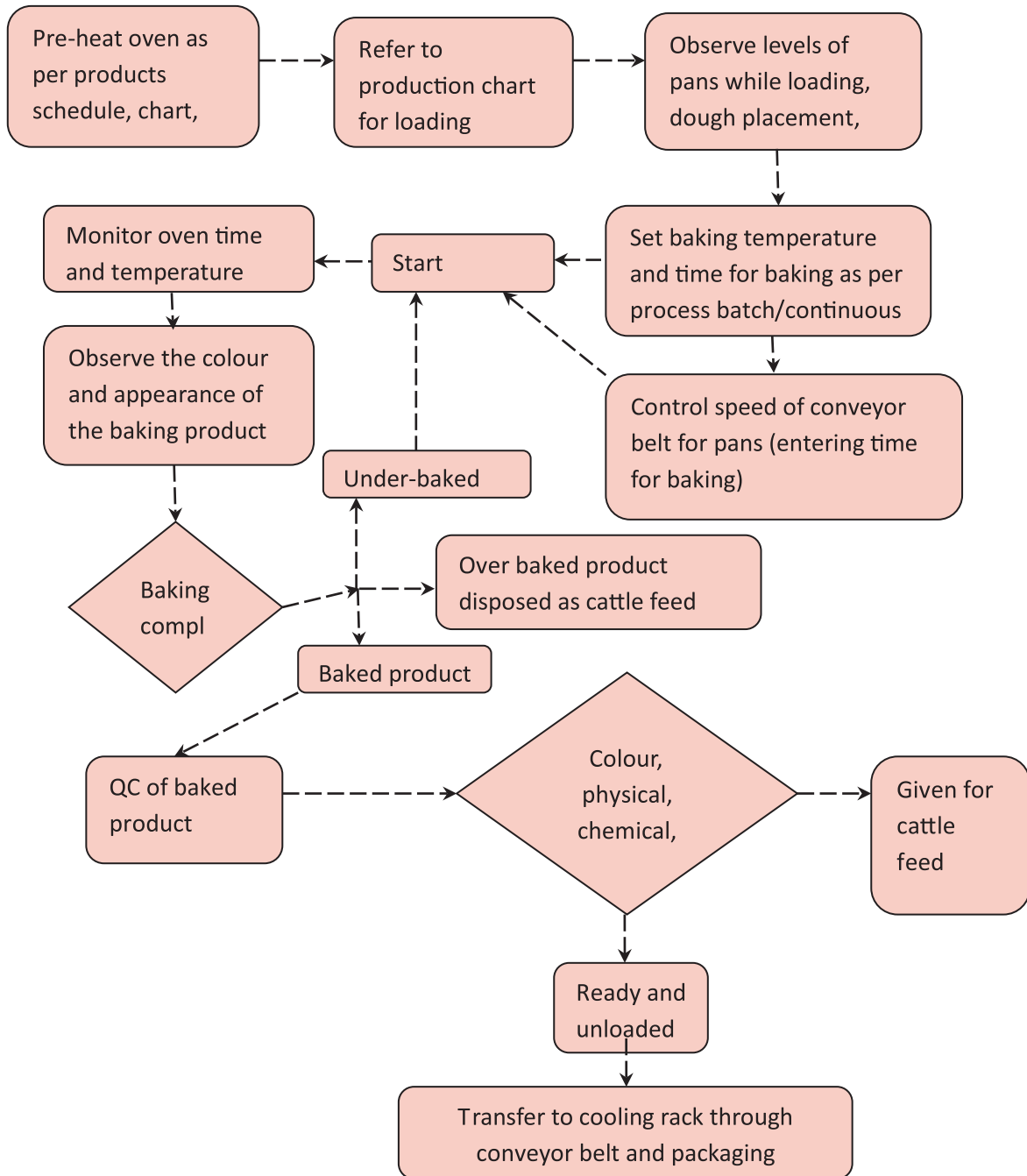
**4.4.2 Process of Proofing**

The process of proofing is explained in the chart below:



### 4.4.3 Process of Baking Oven Baking

The process of baking in an oven is explained in the chart below:



## UNIT 4.5: Bread Making

### Unit Objectives

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

1. Explain the bread making process
2. Use different methods to make breads
3. Identify bread faults and their causes
4. Use given recipes to produce common breads

### 4.5.1 Bread Making

Bread is prepared from a dough of flour, yeast and water, usually by baking. Ingredients that are usually found in bread are: flour, salt, sugar, yeast, fat, water or other liquids such as, milk powder, milk, etc.

Other ingredients used in breads are:

- **Calcium propionate** - Calcium propionate is a preservative that contains propionic acid, Calcium propionate is used as a bread mold inhibitor. It works against spore-forming bacteria and decreases the chance of spoilage.
- **Bread improvers** - Bread improvers reduce the time that the bread takes to rise during fermentation, but also improves its texture and volume. This is done by the action of enzymes included in starch and gluten.

#### Types of bread

There are different types of bread. While one way to classify them is based on the ingredients, another way is based on the process followed.

Generally, bread based on ingredients may be classified as per type of flour used, such as:

- Wheat flour bread-(whole wheat, refined flour, etc.)
- Rye flour
- Multi-grain bread

Bread classified as per the process is:

1. Soft bread or rich dough products
2. Hard bread or lean dough products
3. Flaky bread or rolled in yeast dough bread

## 4.5.2 Bread Making Process

Bread making process involves the following steps:

- 1. Selection of ingredients:** Based on the requirements to select flour, yeast and other ingredients as per the recipe. In case there is variation from the recipe of any ingredient type, its impact must be understood and other changes may have to be made to compensate.
- 2. Weighing or scaling ingredients:** This involves weighing ingredients as per recipe i.e. adjusting the quantities as per variation in any ingredient and other factors that may impact the bread.
- 3. Mixing:** This involves mixing of ingredients, which is done through different methods: Straight dough method, where all ingredients are mixed at the same time.

Modified straight dough method - Yeast is soaked in water. All ingredients but flour and yeast are mixed to form an even mixture and then the flour and yeast are combined with these to make a smooth dough.

Sponge method – This is a two-stage method. Yeast, flour and sugar are mixed first and then the dough is punched down and rest of the ingredients are added after fermentation. A smooth dough is then formed. Dough is stretched to work the gluten at this stage.

- 4. Fermentation:** Yeast acts on the sugars in the mix to produce alcohol and carbon dioxide, expanding the dough. An under fermented dough mix will not have the desired volume and may become heavier and coarser in texture. Dough that over ferments becomes sticky, sour and hard to work with. High temperatures (60°C) kills the yeast and arrests fermentation. Remember: all the processes to follow before the actual baking allows fermentation to continue.



- 5. Punching:** This is the process of deflating the dough by puncturing it to help the carbon dioxide escape, and make it even.

- 6. Scaling:** This refers to the process of dividing the dough into sizes appropriate for baking, taking into account the moisture loss and final product requirements. This may be done manually or through a machine. About 50-60 grams per 500 grams of dough is a suitable for most breads.



- 7. Rounding:** Bread is shaped in small rounds for uniformity. Some bakeries also use machines for this purpose.

- 8. Benching:** The shaped dough is rested for follow-on fermentation and gluten relaxation.

- 9. Make-up and panning:** This is shaping the dough into desired shape of the end product and putting it in the respective pans for baking. Pans should be greased for easy removal and even heating from the base.

- 10. Proofing:** The pans are left for the dough to rise and fermentation to take place to get the desired volume. Dough should be protected from undesired collapsing at this stage which might accidentally happen due to rough handling of pans. Also, this requires the desired temperature and humidity, which may be controlled in proofers. Some bakeries use special while others may use trays and tables.



- 11. Scoring or slashing the crust:** The top of the bread, especially hard breads is slashed by giving one or more cuts with a knife before baking. This is done so that bread does not crack on the sides when it stretches. This may be done only for appearance on some breads.
- 12. Baking:** Bread is then baked in various types of oven, with varying time and temperatures as required by the recipe and type of product. It is important to not over or under bake either in terms of time or temperature. Fermentation gets arrested by baking, gluten solidifies, crust is formed and colour changes. Most breads depending on their type are baked from 175OC – 220OC.
- 13. Glazing:** Bread may be glazed after baking with egg wash (beaten eggs and water/ milk) or other glaze to give the crust a shine, and for keeping it moist.
- 14. Cooling:** Bread once baked is then cooled to allow excess moisture to escape. It is preferred to cool bread on racks as that allows air circulation, which prevents the bottom of the bread from turning soggy.
- 15. Storing:** Bread is then stored. It must be ensured that bread is stored without any weight on them. Bread must be wrapped or packaged in case it has to be stored for a long duration.
- 16. Slicing and Packaging:** Bread may be sliced or unsliced depending on the type of bread and purpose. Slicing machines are used for slicing bread for evenness. The packaging machine may be used for packaging. This may be done manually for smaller quantities or due to shape constraints. It is important to bear in mind that there should be no moisture inside the packaging. For this very purpose, bread is cooled down before being packed. Generally hard crusted breads require air circulation therefore, are not wrapped, but sold in open packages otherwise their crust becomes elastic and soft.



**Sour dough method:** This method of bread making uses a sour dough starter also known as a natural starter for fermentation. Earlier, craft bakers were known to use this method only for baking breads, but in contemporary times, various yeast and other additives are used by craft bakers as well.

A sour dough starter uses wild yeast and bacteria to ferment the dough, and this was used as a perpetual starter culture where the liquid was replenished from time to time to keep the starter alive. This method produces higher acidity levels, and the dough may be used to leaven other doughs.

### 4.5.3 Bread Faults and Causes

A faulty bread not only results in customer dissatisfaction, but loss of revenue and image. It is important that causes for faults are understood and corrected or else losses can perpetuate and get magnified.

Faults can be of the following categories:

1. Flavour faults
2. Crust faults
3. Shape and structure faults
4. Texture faults
5. Other faults such as, contamination

| Sl No. | Factor       | Condition  | Resulting faults   |
|--------|--------------|------------|--|
| 1      | Salt         | Too much   | Poor volume, too dense and improper taste.   |
|        |              | Too little | Increased volume, collapsing of dough, im-proper taste, poor texture and crumbly bread   |
| 2      | Yeast        | Too much   | Too much volume collapsing of dough, Im-proper test, coarse and open texture/crumb       |
|        |              | Too little | Poor volume, too dense and heavy   |
| 3      | Sugar        | Too much   | Too dark a taste and improper test   |
|        |              | Too little | pale crust, improper taste and thick crust   |
| 4      | Liquid       | Too much   | Blisters on crust, too dark, too coarse, open texture/crumb and poor shape               |
|        |              | Too little | Too dense and heavy, poor volume and pale crust  |
| 5      | Flour        | Weak       | Poor volume and poor shape   |
| 6      | Steam        | Too much   | Poor shape   |
|        |              | Too little | Splits, thick crust and dark crust   |
| 7      | Fermentation | Under      | Poor flavour, too dense and heavy, poor and coarse texture and too dark                  |
|        |              | Over       | Increased volume, collapsed structure, poor texture, pale crust and blisters on crust    |
| 8      | Proofing     | Under      | Poor shape, too little volume, dense and heavy.  |
|        |              | Over       | Too much volume, collapse structure, poor texture, too peel crust and blisters on crust. |
| 9      | Temperature  | Too hot    | Poor volumn, split crust, grey crumb and too dark  |
|        |              | Too low    | Too pale, poor and crumbly texture   |
| 10     | Pan          | Too big    | Coarse and open texture and irregular shape  |
| 11     | Handling     | Improper   | Collapse of dough, poor volume and irregular shape                                       |
| 12     | Mixing       | Improper   | Too coarse texture and uneven crumb  |
| 13     | Baking time  | Too long   | Too dark and thick crust   |
|        |              | Too little | Poor crust, too pale and poor flavour  |
| 14     | Shaping      | Improper   | Blisters on crust and poor flavour   |
| 15     | sanitation   | Poor       | Undesirable inclusion and poor flavour   |

### Bread preparation

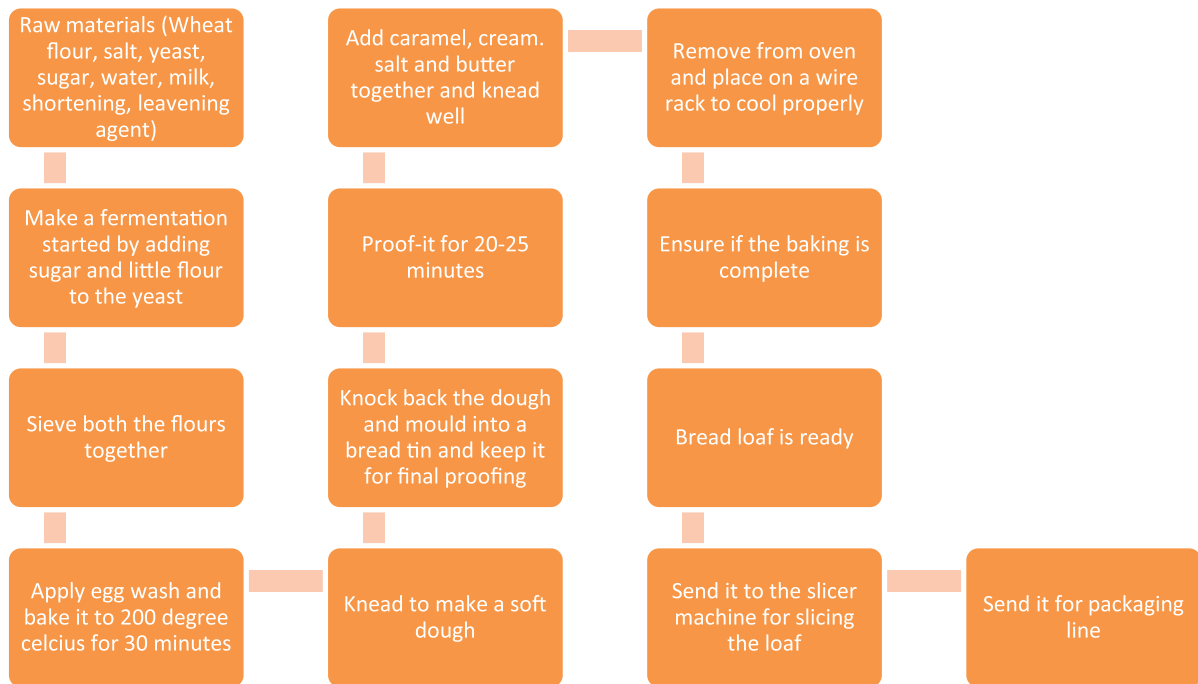


Fig . 4.2.4. Bread preparation

### Biscuit preparation

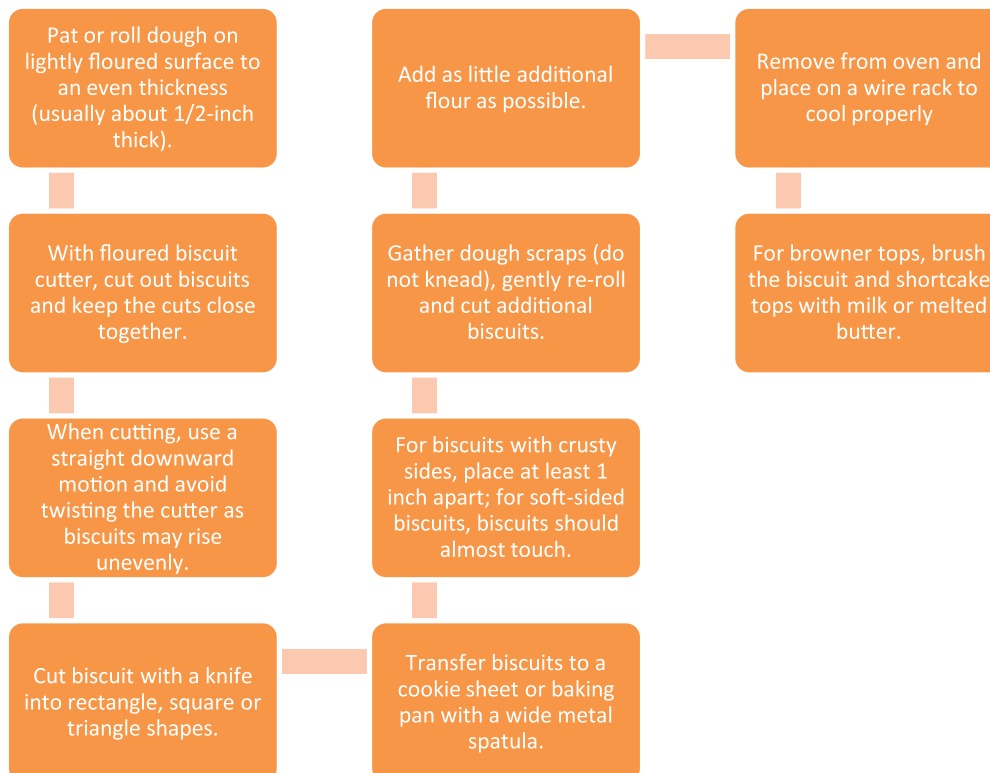


Fig . 4.2.5. Biscuit preparation



## UNIT 4.6: Quality Check of Baked Products

### Unit Objectives

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

1. Identify if the final product meets the quality parameters

### 4.6.1 Parameters to Check the Baked Product

Once the product is baked, there are several specifications to check if it is as per organizational parameters. The following table illustrates this:

#### Faults and Remedies

The following table describes the various faults that may be found in final products and their causes.

| Way of testing | What to observe                    | How to do    |
|----------------|------------------------------------|--------------|
| Sensory        | Colour                             | Observation  |
| Physical       | Appearance, size and texture       | Observation  |
| Organoleptic   | Taste, flavour, mouth feel, rancid | By eating it |

| Faults          | Causes  |
|-----------------|---|
| Lack of volume  | <ul style="list-style-type: none"> <li>• Use of weak flour</li> <li>• Too much salt</li> <li>• Lack shortening</li> <li>• Yeast dissolved in hot water</li> <li>• Too much not enough dough for mixer</li> <li>• Under mixing over mixing</li> <li>• Young/old dough</li> <li>• Too long proof/ insufficient proof</li> <li>• Excessive steam pressure in oven</li> <li>• Oven too hot</li> </ul> |
| Too much volume | <ul style="list-style-type: none"> <li>• Not enough salt</li> <li>• Use of wrong type of flour</li> <li>• Dough slightly overworked</li> <li>• Too much dough for pans</li> <li>• Over proofing</li> <li>• Cool oven</li> </ul>   |

|                          |  |
|--------------------------|--|
| Crust colour too pale    | <ul style="list-style-type: none"> <li>• Too lean formula</li> <li>• Flour lacking diastatic activity</li> <li>• Excessive mineral yeast food</li> <li>• Old dough</li> <li>• Insufficient humidity in proof box</li> <li>• Cool oven</li> <li>• Under baking</li> </ul> |
| Crust colour too dark    | <ul style="list-style-type: none"> <li>• Too much sugar</li> <li>• High milk content</li> <li>• Old dough</li> <li>• Oven too hot</li> <li>• Over baking</li> </ul>  |
| Blisters under the crust | <ul style="list-style-type: none"> <li>• Young dough</li> <li>• Excessive steam in proof box</li> <li>• Over proofed</li> <li>• Rough handling at oven</li> </ul>  |
| Crust too thick          | <ul style="list-style-type: none"> <li>• Insufficient shortening</li> <li>• Low sugar content</li> <li>• Old dough</li> <li>• Lack of moisture in proof box</li> <li>• Excess steam in proof box</li> <li>• Cool oven</li> <li>• Over baking</li> </ul>                  |
| Shell tops               | <ul style="list-style-type: none"> <li>• Green or new flour</li> <li>• Stiff dough</li> <li>• Dough too young</li> <li>• Lack of moisture in proof box</li> <li>• Not enough pan proof</li> <li>• Excessive top heat</li> </ul>  |
| Lack of break and shred  | <ul style="list-style-type: none"> <li>• Weak flour</li> <li>• Excessive amount of mineral yeast</li> <li>• Young dough</li> <li>• Extremely old dough</li> <li>• Excessive proof</li> </ul>   |
| Grey crumb               | <ul style="list-style-type: none"> <li>• Use of too much malt</li> <li>• Old dough</li> <li>• Excessive proofing</li> <li>• Pans too large for amount of dough</li> </ul>  |

|                        |   |
|------------------------|---|
| Streaked crumb         | <ul style="list-style-type: none"> <li>• Improper incorporation of ingredients</li> <li>• Sponge or dough crusted over during fermentation</li> <li>• Sponge not broken up properly</li> <li>• Excessive trough grease</li> <li>• Scrap dough picked up during make up</li> <li>• Excessive use of divider oil</li> <li>• Excessive dusting flour</li> <li>• Dough crusted during intermediate proof</li> <li>• To much machine punishment</li> <li>• Rough handling at oven</li> </ul> |
| Coarse grain           | <ul style="list-style-type: none"> <li>• Weak flour</li> <li>• Improper mixing</li> <li>• Slack dough</li> <li>• Young dough</li> <li>• Old dough</li> <li>• Improper moulding</li> <li>• Excessive proof</li> <li>• Rough handling at oven</li> <li>• Cool oven</li> </ul>   |
| Poor Texture           | <ul style="list-style-type: none"> <li>• Weak flour</li> <li>• Lack of shortening</li> <li>• Improper mixing</li> <li>• Slack dough</li> <li>• Excessive trough grase</li> <li>• Young dough</li> <li>• Old dough</li> <li>• Excessive use of divider oil</li> <li>• Excessive dusting flour</li> <li>• Improper moulding</li> <li>• Cool oven</li> </ul>   |
| Poor flavour and taste | <ul style="list-style-type: none"> <li>• Improper storage of ingredients</li> <li>• Poor quality ingredients</li> <li>• Off-flavoured ingredients</li> <li>• Improper amount of oil</li> <li>• Under fermented dough</li> <li>• Old dough</li> <li>• Unsanitary shop</li> <li>• Dirty pans</li> <li>• Under-baking</li> <li>• Over baking</li> <li>• Bread cooled under unsanitary conditions</li> </ul>  |

|                        |   |
|------------------------|---|
| Poor keeping qualities | <ul style="list-style-type: none"> <li>• Too lean formula</li> <li>• Poor quality ingredients</li> <li>• Improper storage of ingredients</li> <li>• Old dough</li> <li>• Stiff dough</li> <li>• Over proofing</li> <li>• Cool oven</li> <li>• Bread cooled too long before wrapping</li> </ul>  |
| Holes in Bread         | <ul style="list-style-type: none"> <li>• Unbalanced formula</li> <li>• Flour too strong</li> <li>• Improper incorporation of ingredients</li> <li>• Under mixing</li> <li>• Over mixing</li> <li>• Excessive trough grease</li> <li>• Young dough</li> <li>• Old dough</li> <li>• Excessive use of divider oil</li> <li>• Excessive dusting flour</li> <li>• Too much machine punishment</li> <li>• Proof box too hot</li> <li>• Over proofing</li> </ul> |

In checking these faults, an analysis of the various causes will show

- Inferior ingredients,
- Unbalanced formula,
- Improper mixing,
- Incorrect fermentation time,
- Poor control of temperature, time and humidity throughout the production process,
- Poor makeup procedures,
- Poor oven conditions
- Improper handling in cooling,
- Faults in wrapping and shipping.

## 4.6.2 Cooling of Baked Products

### Cooling Baked Products

Baked products continue to lose moisture and starts setting as time passes. Hence, it is important to cool baked products in the right way. This ensures that baked products have a longer shelf life.

During the cooling process, the humidity of the cooling atmosphere must be controlled. There are two types of cooling systems that have to be followed. They are:

1. **Atmospheric multi-tier conveyer cooling:** The products from the oven band travel on a canvas web having single, double or three tiers. They are cooled slowly by the surrounding atmosphere.
2. **Forced draft-cooling conveyer cooling:** In this process, filtered air is blown against the direction of product coming out of the oven on the cooling conveyer. This ensures cooling of products faster than the atmospheric type.

## UNIT 4.7: Packaging of Baked Products

### Unit Objectives

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

1. State the process of packaging baked products
2. Identify different types of packaging materials used for baked goods

### 4.7.1 Packaging Baked Products

The material used to contain, protect, and handle the delivery and preservation of finished goods from the manufacturer to the user is called packaging material. Materials used for packing baked products are selected if they:

- Protect from foreign odour, contamination, heat, and moisture
- Protect from mechanical damage
- Help in easy handling of product
- Are easy to carry
- Increase or maintain product's shelf life
- Follow legal compliance for values and ingredients for consumers

**Packaging is basically categorized into:**

| Primary packaging   | Secondary packaging  |
|---|--|
| The packaging comes in direct contact with the product.                       | It is the packaging that is used for transportation/warehouse storage/handling |
| Wax coated or laminated, bopp film paper is used                              | Cardboard boxes, CBB made of craft papers, tins are used often                 |
| E.g. Bread and bun packaging is generally made of a base coated paraffin wax. | E.g. Plastic crates that contain breads and buns                               |

Apart from these, there are some more materials that are used for packaging. They are:

| Material                      | Products                 |
|-------------------------------|--------------------------|
| Flexible material (laminates) | Family packs of biscuits |
| Cardboard boxes               | Cakes                    |
| Display boxes                 | Cookies, cakes, biscuits |
| Sachets or vertical pouches   | Cookies and cakes        |
| Polybags                      | Breads                   |

**Method Used for Packaging of Finished Goods**

For packaging of finished baked products, a method called Modified Atmosphere Packaging (MAP) is used. The gases used in the method are carbon dioxide and nitrogen that increase the shelf life of the products.

| Thermoforming   | Pre-formed container mechanism  | Horizontal or vertical form-fill-seal   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• The packing material is drawn from the reel into a heating station to soften.</li> <li>• It is sent to forming station where it is moulded into a shape of the container with aid of vacuum and air pressure.</li> </ul> | <ul style="list-style-type: none"> <li>• An automatic tray sealer holds a tray/container held on conveyor chains throughout the length of the machine.</li> <li>• The product is loaded into a tray.</li> <li>• Then it is passed into a gas chamber together with the top lidding material where gas is flushed and the tray is sealed.</li> </ul> | <ul style="list-style-type: none"> <li>• A fully automated system and machines form their own flexible or semi-rigid containers from a base film in the forming station.</li> <li>• Heat softens the film before it is moulded in desired shape and size with the aid of vacuum.</li> <li>• The formed containers are loaded with the product.</li> <li>• Covering is done in the vacuum and gas chamber</li> <li>• Heat-sealed and sent for cutting, tamping, and labelling</li> </ul> |

**Different Types of Packaging Material**



**Primary Packaging Material**



**Secondary Packaging Material**

## UNIT 4.8: Storage of Materials

### Unit Objectives

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

1. State the method of storing baking ingredients
2. State the method of storing finished products

### 4.8.1 Storage of Baking Ingredients

When storing baking ingredients, the baking industry follows some common methods. They are:

- Stock rotation methods like FIFO (First-In-First-Out) and FEFO (First-Expired-First-Out), especially for perishable ingredients, is used.
- Coolers are set at appropriate cooling temperatures (e.g. 41°F/SOC) for safety.
- Leftovers from a process are stored appropriately.
- Potentially hazardous items are thawed in the refrigerator, never at room temperature.
- Newly received baking ingredients are stored in the manufacturers' original packaging.
- Eggs and egg washes are never stored above baked products to avoid cross-contamination.
- Baking ingredients are stored at least 6 inches (15 cm) above the floor.
- All the bins containing ingredients are covered in order to protect them from rodents and pests.
- All baking ingredients stored are properly labelled.

#### Storage of Finished Products

When storing finished products, some common methods are followed. They are:

- Stock rotation methods like FIFO and FEFO is used to rotate finished products.
- Bakery items which may contain perishable ingredients like cream, cheese or eggs must be kept under refrigeration.
- Products that may have a longer shelf life can be stored at room temperature.
- All finished products are stored with labels of its ingredients and shelf life.

#### FIFO and FEFO methods of Storage:

| FIFO  | FEFO  |
|---|---|
| <ul style="list-style-type: none"> <li>• Abbreviation for First-In-First-Out</li> <li>• First received product leaves first from the store room/warehouse.</li> </ul> | <ul style="list-style-type: none"> <li>• Abbreviation for First-Expired-First-Out</li> <li>• Product, which has shortest shelf life, will leave first, irrespective of the order in which it comes in.</li> </ul> |



## UNIT 4.9: Post-Production Cleaning and Maintenance

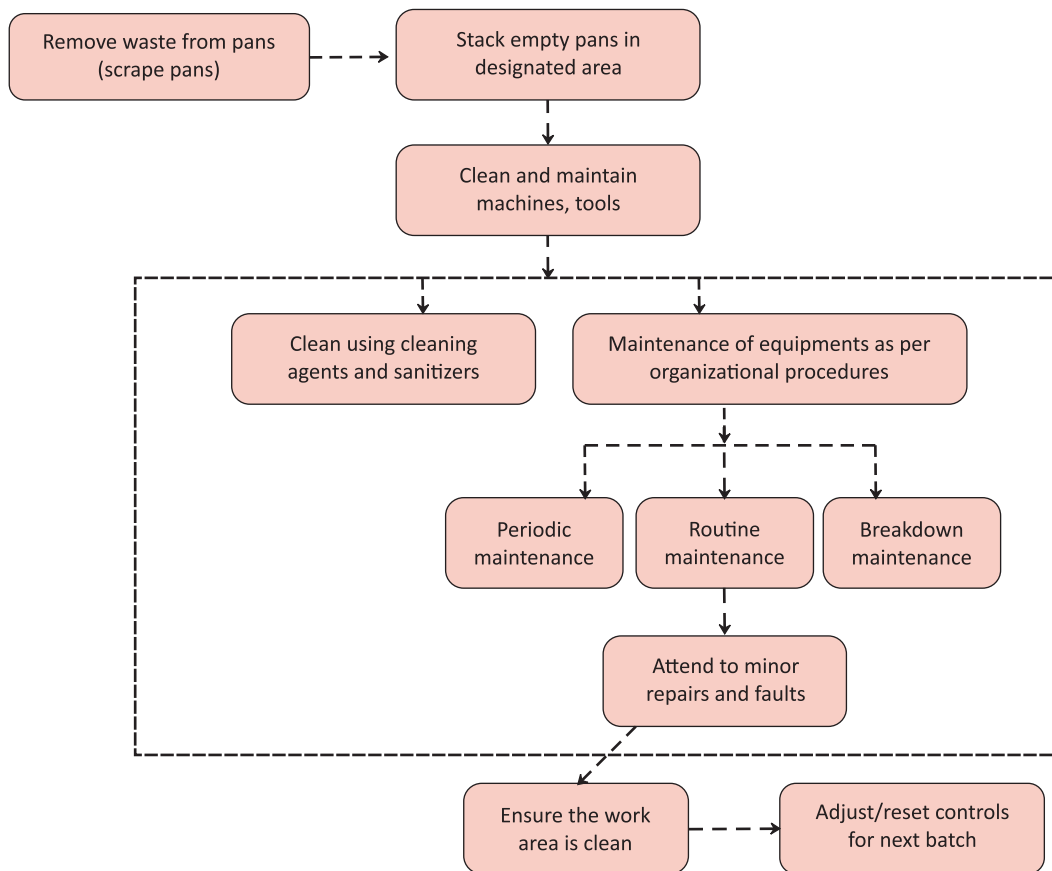
### Unit Objectives

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

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

### 4.9.1 Method of Post-Production Cleaning

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



#### 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. |

## Exercise



1. How should be the loading sequence in the oven planned?
  1. Load the items as per the order priority
  2. Bake products requiring same time and temperature together
  3. Bake fermented products together
  4. Bake products requiring proofing together
  5. Load the fastest baking items first  
  - a) 1,2,3 and 4
  - b) 2 ,4 and 3
  - c) 1,3,4 and 5
  - d) 1,2,3 and 5
  
2. Which of the following tools is not required for minor repairs in oven?
  - a) Slot screwdriver
  - b) Nut driver
  - c) Nose pliers
  - d) Allen key
  
3. Which of the following is not a type of cooling rack?
  - a) Tiered racks
  - b) Glass racks
  - c) Flat cooling racks
  - d) Wood racks
  
4. For how much time an oven should be preheated for baking a sponge cake?
  - a) No pre heating required
  - b) 10 minutes
  - c) 15 minutes
  - d) Minutes
  
5. Which of the following is not relevant when checking the working of an oven?
  - a. Ensure that the oven starts up properly
  - b. Ensure that the oven is placed properly
  - c. Ensure that the oven door gets closed securely
  - d. Ensure that the oven is able to maintain heat as per the set temperature

6. What is the proper timing of loading the dough in the proof box?
  - a. After mixing the ingredients
  - b. After baking the dough
  - c. After dividing the dough
  - d. After molding the dough
  
7. The first step to follow while baking a cake in the oven is
  - a. Mix the wet and dry ingredients
  - b. Preheat the oven to required temperature
  - c. Grease and dust the baking tin
  - d. Put the cake mix in the oven
  
8. Which amongst the following precautions is not relevant while loading filled baking pans in oven?
  - a. Ensure that the pans do not touch the walls of the oven
  - b. Allow space for air circulation
  - c. Ensure that the pans do not touch each other
  - d. Ensure that the pans are of same size
  
9. For maintaining the temperature and humidity levels in the proof box, which of the following statements is/are true:
  - a. If the temperature is less, the dough will not rise sufficiently
  - b. If the temperature is high, the dough will rise faster
  - c. If the humidity is higher, the dough will dry out
  - d. If the humidity is higher, the dough will remain moist
  
10. Which of the following parameter is required when a proof box is set for loading?
  - a. Humidity
  - b. Temperature
  - c. Time needed to proof
  - d. All of the above
  
11. Which of the following statements are true?
  - a. The cake pan should be filled up to two-thirds
  - b. If the pan is filled to the brim, the cake will spill over
  - c. If the pan is filled less than specified, the cake will be flat
  - d. If the pan is filled more than two-thirds, the cake will be burnt

12. What is the correct sequence of steps that needs to be followed to clean the floor after completion of baking process?
1. Sweep thoroughly cleaning under and behind the equipment
  2. Mop the floor with a floor cleaner solution
  3. Sanitize the floor with a sanitizer solution
  4. Rinse the floor with hot water
- a. 1 --> 2 --> 3 --> 4  
b. 1 --> 2 --> 4 --> 3  
c. 1 --> 4 --> 3 --> 2  
d. 1 --> 3 --> 4 --> 2
13. Which of the following should you check to ensure that a batch of chocolate cakes are perfectly baked?
1. The cakes should be golden brown in colour
  2. The cakes should not sink in the middle
  3. The cakes should be firm and hard to touch
  4. The cakes should be not have a close texture
- a. 1, 3 and 4  
b. 1, 2 and 4  
c. 1, 2, 3 and 4  
d. 2, 3 and 4
14. Which amongst the following points are not required when cleaning bake ovens?
- a) Spray interior with degreaser solution and let stand for two minutes
  - b) Preheat the oven and turn it off
  - c) Dismantle the oven
  - d) Rinse with clear water and let air dry
15. What is the calibration range of a baking oven?
- a. 325°F to 375°F
  - b. 325°C to 375°C
  - c. 350°F to 400°F
  - d. 300°F to 325°F

16. What steps should be followed in the production sequence after you have loaded the items?
- Keep an eye on the humidity and temperature of proof box
  - Keep an eye on the product on the proof box
  - Load proof box
  - All of the above
17. If the breads have a best before time of three days, What should be the sequence of moving the following stocks of bread based on FEFO.
- Bread baked on Monday
  - Bread expiring on Wednesday
  - Bread baked on Tuesday
  - Bread expiring on Tuesday
- 4 --> 2 --> 1 --> 3
  - 1 --> 2 --> 3 --> 4
  - 1 --> 4 --> 3 --> 2
  - 4 --> 1 --> 3 --> 2

# Notes



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



<https://www.youtube.com/watch?v=S68TG5SVBMk&t=19s>

Baking Process



[https://www.youtube.com/watch?v=KF6\\_\\_mJehdM&t=466s](https://www.youtube.com/watch?v=KF6__mJehdM&t=466s)

Baking process- Jeera biscuits and muffins



<https://www.youtube.com/watch?v=ufJIYOTIhT4&t=33s>

Demonstration video on Milk Bread Processing



<https://www.youtube.com/watch?v=BzVNYwjm6cA>

Demonstration video on banana flour biscuit



# 5. Complete Documentation and Record Keeping Related to Bakery Products



Unit 5.1 - Documentation and Record Keeping



FIC/N2016

## 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;
3. State ERP system and maintaining documentation via ERP



## UNIT 5.1: 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.

### 5.1.1 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

### 5.1.2 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 ingredients used or the production process.

Example of a stock control book:

| • Product Name       |            | • Batch Number               |   |   |
|----------------------|------------|------------------------------|---|---|
| • Baking ingredients | • Supplier | • Results of inspection for: |   |   |
|                      |            | A                            | B | C |
|                      |            |                              |   |   |

## Exercise

1. Which of the following documents is not relevant for quality standards audit?
  - a) Process charts
  - b) Raw materials records
  - c) Tools and equipment records
  - d) Finished goods records
  
2. Which of the following details should be included in the production logbooks of the finished products?
  1. Details of ingredients used
  2. Details of temperature and time settings
  3. Details of proofing if applicable
  4. Details of batch numbers of finished goods
  - a. 2, 3 and 4
  - b. 1, 2 and 3
  - c. 1, 3 and 4
  - d. 1, 2, 3 and 4
  
3. Which of the following details is not relevant while preparing the records of finished products?
  - a. Date of manufacture of finished goods
  - b. Date of purchase of ingredients of finished goods
  - c. Batch number of finished goods
  - d. Ingredients of finished goods
  
4. Which of the following details is not relevant while preparing the records of finished products?
  - a. Ingredients of finished goods
  - b. Batch number of finished goods
  - c. Date of manufacture of finished goods
  - d. Date of purchase of ingredients of finished goods
  
5. Which of the following observations should be included in the production records?
  1. Any deviation in baking time
  2. Any deviation in sourcing of ingredients
  3. Any deviation in production efficiency
  4. Any deviation in appearance of finished product
  - a. 1, 3 and 4
  - b. 1, 2, 3 and 4

- c. 1, 2 and 3  
d. 2, 3 and 4
6. Which of the following details should be documented while maintaining record of raw materials used in the process?
1. Details of ingredients used
  2. Weights and measurements of ingredients used
  3. Condition of ingredients used
  4. Weight of dough/batter before loading it in oven
- a. 1, 2 and 4  
b. 1, 3 and 4  
c. 1, 2, 3 and 4  
d. 2, 3 and 4
7. During which of the following stages of production, it is not relevant to record the condition/weight of raw materials?
- a. After completion of baking
  - b. After proofing process
  - c. After receiving the raw materials
  - d. Before loading in oven
8. Which of the following details is not relevant to document in the records of finished goods?
- a. Type of finished product
  - b. Quantity of ingredients
  - c. Quantity of each type of product
  - d. Date of manufacture and expiry
9. Which of the following observations should be included in the records of finished goods?
1. Any deviation in appearance of finished product
  2. Any deviation in weight of finished product
  3. Any deviation in baking time of finished product
  4. Any deviation in capacity utilization
- a. 1, 3 and 4  
b. 1, 2, 3 and 4  
c. 2, 3 and 4  
d. 1, 2 and 3





## 6. Food Safety, Hygiene and Sanitation for Bakery Products



Unit 6.1 - Good Manufacturing Practices (GMP)

Unit 6.2 - Hazard Analysis and Critical Control Point (HACCP)

Unit 6.3 - Safety Practices



FIC/N2016  
(Part of - FIC/Q5007)

## Key Learning Outcomes



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

1. State the importance of safety, hygiene, and sanitation in the baking industry
2. Follow the industry standards to maintain a safe and hygiene workplace
3. Follow HACCP principles to eliminate food safety hazards in the process and products
4. Follow safety practices in the work area



## UNIT 6.1: 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

### 6.1.1 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.

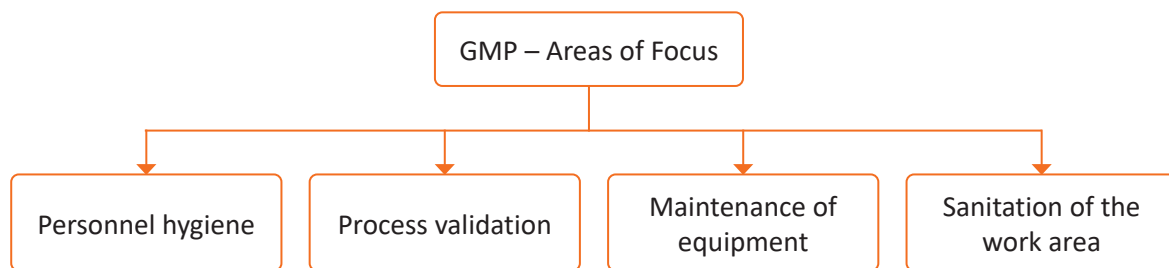


Fig. 2.3.1. Good manufacturing practices (GMP)

| Area of focus   | GMP  |
|---|--|
| <p style="text-align: center;"><b>Personnel hygiene</b></p> <div style="display: flex; justify-content: space-around;">   </div> <p>Fig. 2.3.2. Personnel hygiene      Fig. 2.3.3. Facilities for toilets</p>                                   | <ul style="list-style-type: none"> <li>• Your organisation follows strict hygiene and sanitation guidelines</li> <li>• You are provided training on Good Manufacturing Practices (GMP)</li> <li>• You are in a sound health condition during working hours</li> <li>• You follow high standards of cleanliness</li> <li>• Your processing unit has enough facilities for toilets and wash stations</li> </ul>                  |
| <p style="text-align: center;"><b>Sanitation of the work area</b></p> <div style="display: flex; justify-content: space-around;">   </div> <p>Fig. 2.3.4. Designated area for keeping utensils      Fig. 2.3.5. Sanitation of the work area</p> | <ul style="list-style-type: none"> <li>• The processing unit where you work is located in a clean, pollution-free area</li> <li>• The entire processing unit is well ventilated and has adequate lighting</li> <li>• The entire work area follows high standards of cleaning and sanitisation</li> <li>• There is a designated area for keeping utensils and equipment. It is kept clean and pest-free at all times</li> </ul> |

### 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

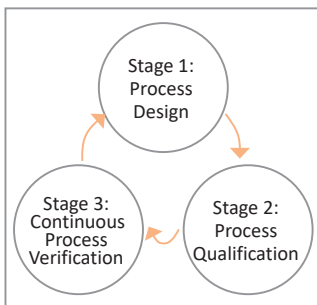


Fig. 2.3.8. Process validation



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

## UNIT 6.2: 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

### 6.2.1 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 |

## UNIT 6.3: 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

### 6.3.1 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



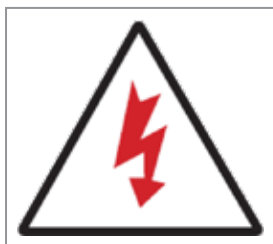
Do Not Enter



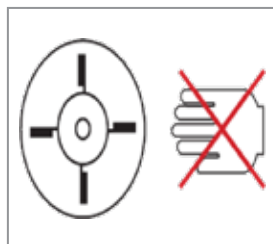
Danger Scaffolding Incomplete



Beware of Electric Shock



Electric Hazard



Never put your Hand Inside  
During the Operation



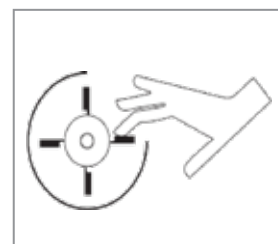
Highly Flammable



Hot Surface Do Not Touch



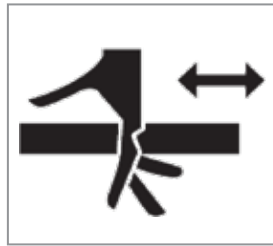
Mind Your Head



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 Tobacco Free Workplace



Assembly Point



Fire Exit

### 6.3.2 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 a 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 →  | Water | Foam | CO <sub>2</sub> | Dry Chemical |
| Types of Fire ↓  |       |      |                 |              |
| <b>A</b> Class A:<br>Paper, Wood,<br>Plastic Fabric,<br>Rubber, Trash      | ✓     | ✓    | ✗               | ✓            |
| <b>B</b> Class B: Oil,<br>Petrol, Some<br>Paints and<br>Solvents           | ✗     | ✓    | ✓               | ✓            |
| <b>C</b> Class C: Electrical<br>Equipment,<br>Appliances,<br>Computers     | ✗     | ✗    | ✓               | ✓            |

Fig. 2.2.2. Types of fire and fire extinguishers

### How to use the Fire Extinguisher?

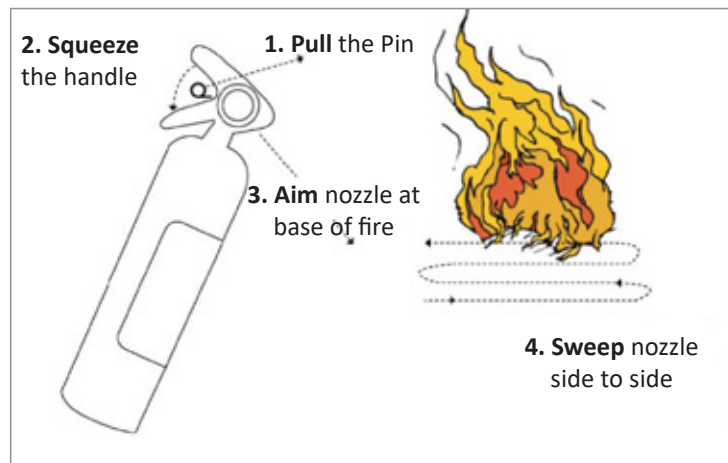


Fig. 2.2.3. Fire extinguisher

### How to use the Fire Buckets?

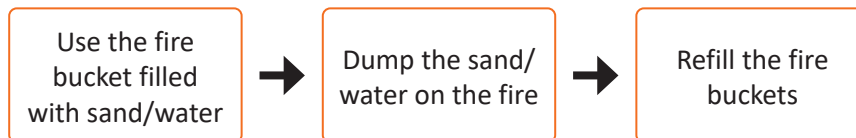


Fig. 2.2.4. Fire bucket



# KNOW YOUR SAFETY SIGNS

Get to know what the symbols mean, they are provided for your safety, There are 4 main categories, each has a different shape and colour.




































|  | MEANING  | SHAPE & COLOUR  | SYMBOLS are put inside the safety shape. These are used in all EEC Countries  |   |  |
|--|--|---|---|---|--|
| <b>PROHIBITION</b>   | You must not.<br>Do not do.<br>Stop.   | <br><b>RED</b><br>means STOP                 | <br>No admittance                      | <br>No smoking                         | <br>No dirty clothes                |
| <b>MANDATORY</b>   | You must do.<br>Carry out the action given by the sign.  | <br><b>BLUE</b><br>means OBEY                | <br>Keep clear                         | <br>Head protection must be worn       | <br>Wear gloves                     |
| <b>WARNING</b>   | Caution.<br>Risk of danger.<br>Hazard ahead.   | <br><b>YELLOW</b><br>means risk of DANGER   | <br>Danger high voltage               | <br>Danger mind your head             | <br>Danger fork lifts in operation |
| <b>SAFE CONDITION</b>  | The safe way.<br>Where to go in an emergency   | <br><b>GREEN</b><br>means GO               | <br>First aid station                | <br>Emergency phone                  | <br>Emergency exit                |
| <b>MULTI-PURPOSE SIGNS</b><br>To be used when the hazard requires more than one of the 4 types to convey the safety message. | <br>Acetylene   | <br>Wear masks                            | <br>Warning flammable liquid       | <br>Protective garments must be worn |  |
| <b>SUPPLEMENTARY TEXT</b><br>If the safety sign needs additional information it may be added in words.                       | <br>Fire alarm call point   | <br>DANGER Highly flammable               | <br>Protective gloves must be worn | <br>Electrical gloves                |  |
| <b>FIRE EQUIPMENT SIGNS</b><br>For indicating the location of fire fighting equipment and how they should be used.           | <br>Fire alarm call point   | <br>Fire hose reel                        | <br>Fire extinguisher              | <br>Fire phone                       |  |
| <b>WORKS TRAFFIC SIGNS</b><br>Are the same design as public road signs.  | <br><br><br><br><br> | <b>DANGER IDENTIFICATION MARKING</b><br> |   |   |  |

Fig. 2.2.5. Safety signs



## Exercise



1. What are the steps involve to use a fire extenguiser?
2. What is Hazard Analysis and Critical Control Point?
3. What are the steps that involve food storage?
4. What is Good Manufacturing Practices?
5. How to use fire buckets?

## Notes



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



<https://www.youtube.com/watch?v=RS4A-uczS6E&t=554s>

GHP,GMP & HACCP



[https://www.youtube.com/watch?v=daNjRoP\\_I0c&t=87s](https://www.youtube.com/watch?v=daNjRoP_I0c&t=87s)






Personnel hygiene and employee facilities















## 7. Annexure



| Module No.   | Unit No.  | Topic Name   | Page No | Link for QR Code (s)  | QR code (s)   |
|--|---|--|---------|---|---|
| 1. In-tro-duction  | UNIT 1.1:<br>Overview<br>of the Food<br>Processing<br>Industry                                | 1.1.1 Food<br>Processing                           | 10      | <a href="https://www.youtube.com/watch?v=J-2EiMVNtp-M&amp;t=11s">https://www.youtube.com/watch?v=J-2EiMVNtp-M&amp;t=11s</a> | <br>Overview of<br>Food processing<br>industry                 |
|  | UNIT 1.2:<br>Overview of<br>the Baking<br>Process   | 1.2.1 Over-<br>view of the<br>Process of<br>Baking | 10      | <a href="https://www.youtube.com/watch?v=waGm1_tUUA0">https://www.youtube.com/watch?v=waGm1_tUUA0</a>                       | <br>Overview of<br>Baking process                              |
|  |   | 1.2.1 Over-<br>view of the<br>Process of<br>Baking | 10      | <a href="https://www.youtube.com/watch?v=DNyzXSb5NcY">https://www.youtube.com/watch?v=DNyzXSb5NcY</a>                       | <br>Orientation<br>video                                      |
|  | UNIT 1.3:<br>Roles and<br>Respon-<br>sibil-ities<br>of Bak-ing<br>Techni-cian /<br>Op-erative | 1.3.1 Roles and<br>Respon-sibil-<br>ities          | 10      | <a href="https://www.youtube.com/watch?v=Yy4gqDdt0Gg">https://www.youtube.com/watch?v=Yy4gqDdt0Gg</a>                       | <br>Roles and<br>Responsibilities<br>of baking<br>technician |
| 2. Prepare<br>and Main-<br>tain Work<br>Area and<br>Equip-<br>ment for<br>Baking | UNIT 2.2:<br>Cleaning<br>and Mainte-<br>nance   | 2.2.1 Clean-ing<br>and Sani-tiza-<br>tion          | 25      | <a href="https://www.youtube.com/watch?v=QWpU7DAf-Ncs&amp;t=38s">https://www.youtube.com/watch?v=QWpU7DAf-Ncs&amp;t=38s</a> | <br>Cleaning and<br>sanitation                               |

| Module No.                          | Unit No.   | Topic Name  | Page No | Link for QR Code (s)  | QR code (s)   |
|-------------------------------------|--|---|---------|---|---|
|                                     | UNIT 2.1:<br>Equipment<br>Used in<br>bakery        | 2.1.1 Bakery<br>Equipment                                 | 25      | <a href="https://www.youtube.com/watch?v=zNArOSLoTiY&amp;t=1s">https://www.youtube.com/watch?v=zNArOSLoTiY&amp;t=1s</a>       |  <p>Tools and Equipments used in baking process</p>            |
| 4. Bake Bakery Products in the Oven | UNIT 4.1:<br>Baker's Math                          | 4.1.1 Baker's<br>Mathematics                              | 70      | <a href="https://www.youtube.com/watch?v=S68TG5SVBM-k&amp;t=19s">https://www.youtube.com/watch?v=S68TG5SVBM-k&amp;t=19s</a>   |  <p>Baking Process</p>   |
|                                     | UNIT 4.2:<br>Overview<br>of Baking<br>In-gredients | 4.2.1 Ingre-<br>di-ents Used<br>in the Baking<br>Industry | 70      | <a href="https://www.youtube.com/watch?v=KF6__mJehd-M&amp;t=466s">https://www.youtube.com/watch?v=KF6__mJehd-M&amp;t=466s</a> |  <p>Baking process-<br/>Jeera biscuits<br/>and muffins</p>    |
|                                     |  | 4.2.1 Ingre-<br>di-ents Used<br>in the Baking<br>Industry | 70      | <a href="https://www.youtube.com/watch?v=ufJIYOTIhT4&amp;t=33s">https://www.youtube.com/watch?v=ufJIYOTIhT4&amp;t=33s</a>     |  <p>Demonstration<br/>video on Milk<br/>Bread Processing</p> |
|                                     |  | 4.2.1 Ingre-<br>di-ents Used<br>in the Baking<br>Industry | 70      | <a href="https://www.youtube.com/watch?v=BzVNYwjm6cA">https://www.youtube.com/watch?v=BzVNYwjm6cA</a>                         |  <p>Demonstration<br/>video on banana<br/>flour biscuit</p>  |

| Module No.  | Unit No.   | Topic Name                               | Page No | Link for QR Code (s)  | QR code (s)  |
|---|--|--|---------|---|--|
| 5. Complete Documentation and Record Keeping Related to Production of Ice Cream | UNIT 5.1: Documentation and Record Keeping                   | 5.1.1 Need for Documentation             | 78      | <a href="https://www.youtube.com/watch?v=N382yRgS6q0">https://www.youtube.com/watch?v=N382yRgS6q0</a>                       | <br>Packaging of Bakery products                |
|   |  | 5.1.3 Introduction to ERP Solutions      | 78      | <a href="https://www.youtube.com/watch?v=LgpdaL3Ejxo">https://www.youtube.com/watch?v=LgpdaL3Ejxo</a>                       | <br>Packaging of banana flour biscuits          |
| 6. Food Safety, Hygiene and Sanitation for Bakery Products                      | UNIT 6.1: Good Manufacturing Practices (GMP)                 | 6.1.1 Good Manufacturing Practices (GMP) | 89      | <a href="https://www.youtube.com/watch?v=RS4A-uczS6E&amp;t=554s">https://www.youtube.com/watch?v=RS4A-uczS6E&amp;t=554s</a> | <br>GHP, GMP & HACCP                           |
|   | UNIT 6.2: Hazard Analysis and Critical Control Point (HACCP) | 6.2.1 What is HACCP?                     | 89      | <a href="https://www.youtube.com/watch?v=daNjRoP_I0c&amp;t=87s">https://www.youtube.com/watch?v=daNjRoP_I0c&amp;t=87s</a>   | <br>Personnel hygiene and employee facilities |
| <b>Employability Skills (30 Hrs)</b>  |  |  |         | <a href="https://eskillindia.org/NewEmployability">https://eskillindia.org/NewEmployability</a>                             |   |





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