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1

Food Safety Standards

- To Discuss and examine the importance of maintaining the food quality
- To learn the methods followed in food quality standard, acts and legislation in bakery unit.



Learning Outcomes

Introduction

Food is one of the basic necessities for the sustenance of life. Pure, fresh and healthy diet is most essential for the health of the people. It is no wonder to say that community health is national health. Today, food safety is an important global issue with international trade and public health implications. All over the world government intensify their efforts to improve food safety.

Food standards have been formulated in the interest of the public, to protect them from consuming improperly handled food and thereby prevent food borne illness from spreading. There are several acts and regulations that are in force. The function of the regulatory agencies is to ensure the wholesomeness of food and maintenance of sanitary conditions during its preparation,



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service, transportation or storage. These agencies work in the interest of the public and prevent food borne illnesses.



Fig. 1. Display of various bakery items

A safe food ensures prevention of food borne diseases, and provides nutrition and good quality to the consumer. It also promotes international trade and stimulates economic development.

1.1 Food quality

Food quality is an important aspect of manufacturing food because consumers are susceptible to any form of contamination that may occur during the manufacturing process. Many consumers also rely on manufacturing and processing standards, particularly to know what ingredients are present, due to dietary, nutritional requirements or medical conditions like diabetes, or allergies.

Quality is a term which denotes a degree of excellence, a high standard or value. **Quality of foods may be defined as the composite of those characteristics that differentiate individual units of a product, and have significance in determining the degree of acceptability of that unit to the user.**

Food Quality is the quality characteristics of food which is acceptable to consumers. The quality includes shape, color, quality, grade, texture, and flavour etc. International Organization for standards defines **“Food Quality as the totality of features and characteristics of a product that bear on its ability to satisfy the standards or needs of the customer”**.





Fig. 2. Display of bakery items.

1.2. Factors affecting food quality

Food quality includes external factors as appearance (size, shape, colour, gloss, and consistency), texture, flavour and internal factors (chemical, physical, microbial).

Besides ingredient quality, there are also sanitation requirements. It is important to ensure that the food processing environment is as clean as possible in order to produce the safest possible food for the consumer.

Food quality also deals with product traceability (e.g., ingredients and packaging suppliers), labeling issues (to ensure there is correct ingredient and nutritional information).



Fig. 3. Product quality and appearance



External factors

Appearance

Appearance is about size and shape. It is important that all pieces have the same appearance. Appearance factors are also useful in sizing and grading, which ensure uniformity and facilitate the process of buying and selling. During food manufacture, grading according to size shortens the success in processing operations and improves the quality of the end product.

Colour

Colour and other aspects of appearance influence food appreciation and quality, especially by the customer. The first impression that a consumer receives concerning a food product is established visually, and among the properties observed are colour, form and surface characteristics. Colour is the main aspect that defines a food's quality, and a product may be rejected simply because of its colour, even before other properties, such as aroma, texture, and taste, can be evaluated.

In some cases, colour changes are accompanied by undesirable changes in texture, taste, or odour. Over aged cheese, beer, meat, and fish all develop off-colour, which the consumer recognizes as being associated with poor flavour quality. The maturity of many fruits and vegetables are closely associated with colour development or changes in colour. In other cases, a colour change may not be actually detrimental, but nevertheless reduces consumer acceptance. Consumers expect certain foods to have certain colours, and deviation from those colours may cause sales resistance.



Fig 4. Appealing colours

Consistency:

Consistency and texture are about how it feels in the mouth, when the consumer is consuming the product. A product must not only be delightful but consistent in taste. This is why standard recipes need to be followed when making bakery products.

Texture

Food texture is an important sensory attribute as it affects the way food tastes and how it feels in the mouth. Texture can be described as the properties of a foodstuff apprehended both by the eyes and by the skin and muscle senses in the mouth, embracing roughness, smoothness, graininess, and so forth. Structure of food influences texture. Examples include porous products such as aerated foods and bakery products where the bubble structure affects softness, and starch-based snacks where it affects crispiness.

- Moist cakes and hard biscuits are regarded as quality products.
- Bread is expected to be soft to a certain degree.
- Moist bread is considered stale.



Fig. 5. Texture of the product

Flavour

Flavour comprising taste (perceived on tongue) and odour (perceived in the olfactory center in the nose), is the response of receptor in the oral cavity to chemical stimuli. Flavour includes taste and odour / aroma. Taste is a four-dimensional phenomenon, consisting of sweet, sour, salt and bitter.



Nutritional value

The hidden characteristics of quality are those, which the consumer cannot evaluate with his senses, and yet are of real importance to his health and economic welfare. Nutritional value is a hidden characteristic that affects our bodies in ways that we cannot perceive, but this quality attribute is becoming increasingly valued by consumers, scientists, and the medical profession. Correct labeling with the ingredients, nutritional information and supplier/manufacturer helps the consumer to choose the needed.

Adulterants and toxins are the other hidden characteristics, which affects the quality of food. Toxins can be microbial toxins, pesticide residues or heavy metals.

Internal factors

Water activity

This determines how much water is available for microbial growth. The lower the water activity, the less chance for microbial spoilage. This is not the same as water content. Foods with the same water content may have different water activity. This property affects odour, colour, flavour, texture and shelf-life. If not controlled, the quality and safety of the food will suffer.

Chemical Composition

Chemical deterioration often involves oxidative and hydrolytic reactions. Oxidative rancidity occurs when a fat (especially a highly unsaturated one) is attacked by oxygen, while hydrolytic rancidity involves enzymatic reactions.

Moisture Content

Moisture content is an important test done in the food industry since it may affect spoilage rates, texture, palatability and product cost. For example, high moisture content is likely to increase spoilage rates due to higher chemical and microbial activity. Lack of water can cause such textures as, hardness, crumbliness, and gumminess where they are not desired, or may provide improved palate-enhancing textures such as tenderness, softness and smoothness.

Water (moisture) is the predominant constituent in many food products. As a medium, water supports chemical reactions, and it is a direct reactant in hydrolytic processes. Therefore,



removal of water from food, or binding it by increasing the concentration of common salt or sugar retards many reactions and inhibits the growth of microorganisms, thus improving the shelf life in a number of products.

Fat Content

This depends on the composition of the product, size of the product, type of processing and type of oil used. Higher fat products are more susceptible to rancidity. This defect is defined as the number of free radicals that can cause an off-odour or off-flavour in foods.

Enzymes

Enzymes are proteins that speed up the rate of chemical reactions. Humans, animals, plants and all life forms need them to support life. Without enzymes we could not eat, breath, move or digest food. In food they are responsible for countless biochemical reactions including growth, maturity and decay. As enzymatic activity increases, foods tend to decay and spoil faster. Therefore, food processing activities such as cooking, freezing, and acidification (adding acid) are essential in controlling their activity. Enzymes are used in certain food processing operations, for example, beer and cheese making. Yeast and bacteria are normally given the credit for these respective processes, however it is really the enzymes in the yeast and the bacteria that does the work. In some food processing operations, the pure enzymes are used. For example,

1. ***Amylase***: Used to convert starch to glucose in bread to give it a softer texture and improved moisture retention
2. ***Glucose isomerase***: Used to convert glucose to fructose in the production of corn syrup
3. ***Pectinase***: Added to juice pulp to soften it and aid in juice extraction
4. ***Papain (from the latex of the green papaya), and bromelain (from pineapple root)***: Used to tenderize meat

Shelf life

Shelf life encompasses several facets of food quality including safety, nutritional value and sensory properties. Shelf life affects food quality, which in turn influences the consumer's buying



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decisions. For many food companies, the ability of a food to retain its overall quality from the processing line, through distribution and marketing, and finally to the consumer, is the result of intensive studies to predict the “life” of a food.

Shelf life is the time frame over which a food product can be relied upon to retain its quality characteristics.

Physical deterioration associated with aging is evident by signs such as colour fading, moisture changes and alterations in sensory properties including aroma and textural changes.

Biological deterioration involves contamination of food products via birds, rodents or insects. These not only devour the food supply but transmit disease; hence, this type of deterioration may lead to microbial problems.

Microbial deterioration occurs when spoilage microorganisms survive processing treatments and cause deterioration via multiplication and propagation. Microorganisms also can produce off-flavors and slime. It affects the quality of food.

Food Additives



Fig 6. Food additives

“Food additive” is defined by the Food and Drug Administration (FDA) as any substance used to provide a technical effect in foods. The use of food additives has become more prominent in recent years, due to the increased production of prepared, processed, and convenience foods. Additives are used for flavour and appeal, food preparation and processing, freshness, and safety. At the same time, consumers and scientists have raised questions about the necessity and safety of these substances.

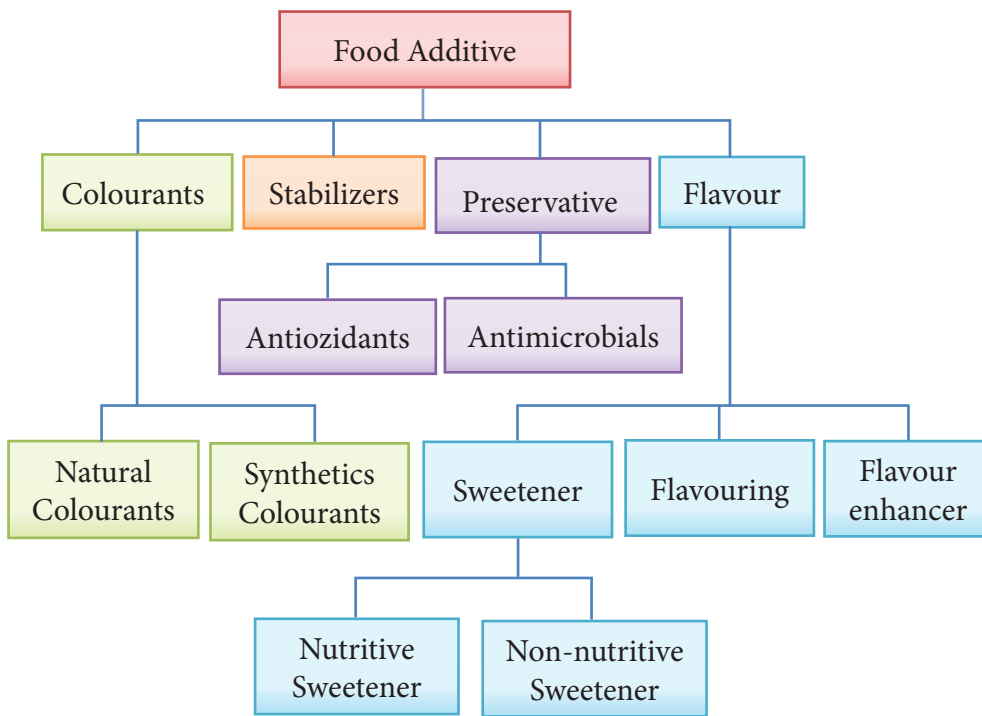


Fig 7. Types of food additives.

The effects of food additives may be immediate or may be harmful in the long run if one has constant exposure or accumulations. Immediate effects may include headaches, change in energy level, and alterations in mental concentration, behaviour, or immune response. Long-term effects may increase one's risk of cancer, cardiovascular disease and other degenerative conditions. Some modern synthetic preservatives have become controversial because they have been shown to cause respiratory or other health problems.

1.3. Food quality control measures

Quality control

Quality control (QC) is a reactive process and aims to identify and rectify the defects in finished products. It can be achieved by identifying and eliminating sources of quality problems to ensure customer's requirements are continually met. It involves the inspection aspect of quality management and is typically the responsibility of a specific team tasked with testing products for defects.

Quality control measures

Ensuring the quality is not just the responsibility of a single individual of the organization. It is necessary for each



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food handler to comply with set standards of operating. Quality control in food industry focuses on adapting set of measures or setting criteria to maintain quality of the end product.

1. Quality checks should be adapted from the point of procurement till service or delivery.
2. Proper auditing of the systems, procedures and processes by an external agency from time to time.
3. System that ensures that all procedures are implemented thoroughly.
4. The food business operator shall have a quality control programmed in place to include inspection and testing of incoming, in process and finished products.
5. Calibration of laboratory equipment's shall be done periodically.
6. Adequate infrastructure including the laboratory facility, trained and competent testing personnel should be available for carrying out testing. In case of inadequate in-house test facilities, a system shall be in place for testing these materials in an accredited external laboratory or a laboratory notified by FSSAI.
7. In case of complaints, the food business operator shall carry out testing either through their in-house or external NABL accredited laboratories notified by FSSAI.
8. Finished food product shall be tested as per FSS standards and regulations 2011 at least once in six months from an FSSAI notified laboratory.
9. It is recommended to retain the control samples, till the end of the shelf life. Testing records shall be maintained.

1.4. Food safety, laws and standards

Food Standards

Effective food standards and control systems are required to integrate quality into every aspect of food production and service, to ensure the supply of hygienic, wholesome food as well as to facilitate trade within and between nations. There are four levels of standards which are well coordinated.

- a. **Company Standards:** These are prepared by a Company for its own use. Normally, they are copies of National Standards.



- b. **National Standards:** These are issued by the national standards body.
- c. **Regional Standards:** Regional groups with similar geographical, climate, etc. have legislation standardisation bodies.
- d. **International Standards:** The International Organisation for Standardisation (ISO) and Codex Alimentarius Commission (CAC) publish international standards.

National Standards



The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food related issues in various Ministries and Departments. FSSAI has been created for laying down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food for human consumption.

Highlights of the Food Safety and Standard Act, 2006

Various central Acts like

- Prevention of Food Adulteration Act, 1954,
- Fruit Products Order, 1955,
- Meat Food Products Order, 1973,
- Vegetable Oil Products (Control) Order, 1947,
- Edible Oils Packaging (Regulation) Order 1988,
- Solvent Extracted Oil, De- Oiled Meal and Edible Flour (Control) Order, 1967,
- Milk and Milk Products Order, 1992 etc.,

will be repealed after commencement of FSS Act, 2006.



The Act also aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi- level, multi- departmental control to a single line of command. To this effect, the Act establishes an independent statutory authority – the Food Safety and Standards Authority of India with head office at Delhi. Food Safety and Standards Authority of India (FSSAI) and the State Food Safety Authorities shall enforce various provisions of the Act.

Voluntary product certification:

There are voluntary grading and marking schemes such as ISI mark of BIS and Agmark.

Bureau of Indian Standards Act, 1986

Bureau of Indian Standards has been constituted under an act of Parliament i.e., BIS Act, 1986, which deals with standardization of various consumer goods including food products. The organization also runs a voluntary certification scheme known as “ISI Mark for certification of processed food items”. The authorities after inspection and ensuring that the manufacturers have got the necessary technical know-how, hygienic conditions and other facilities available, grant them a certificate to use ISI mark on their products.

Under the provisions of PFA Act, it has been made compulsory that commonly used food additives permitted for use in specified items of food, condensed milk, different categories of Milk Powder, Infant milk substitute, Infant food, packaged drinking water and mineral water and some food additives will be sold only under ISI Certification Mark.



Agmark Grading and Marking Act and Rules, 1937

AGMARK is a certification mark employed on agricultural products in India, assuring that they conform to a set of standards approved by the Directorate of Marketing and Inspection, an agency of the Government of India. The ‘Agmark’ is a trademark of quality control set up by the government. It establishes the norms relating to the acceptable physical and chemical characteristics in both natural and processed products. It promotes standardisation, grading and quality control of



agricultural products. The Agmark standard covers 222 agricultural, horticultural, forest and livestock products.

International Standards:

1. Codex Alimentarius Commission



CAC is an intergovernmental body formed with the objective of establishing international standards to protect the health of the consumers and facilitate food and agricultural trade. In 2017, the membership of Codex was 187 member countries and one Member Organisation (European Community) respectively. India is a member through the Ministry of Health and Family Welfare. CAC has become the single most important international reference point for developments associated with food standards. The document published by the CAC is Codex Alimentarius which means 'Food Code' and is a collection of internationally adopted Food Standards. The document includes Standards, Codes of Practice, Guidelines and other recommendations in order to protect consumers and ensure fair practices in food trade. Different countries use Codex Standards to develop national standards.

Codex India

'Codex India' - the National Codex Contact Point (NCCP) for India, is located at the Directorate General of Health Services, Ministry of Health and Family Welfare (MOHFW), Government of India. It coordinates and promotes Codex activities in India in association with the National Codex Committee and facilitates India's input to work of Codex through an established consultation process.

2. International Organisation for Standardisation (ISO)

The International Organisation for Standardisation (ISO) is a worldwide, non-governmental federation of national standards





bodies (ISO member bodies). The mission of ISO is to promote the development of standardisation and related activities in the world with a view to facilitate the international exchange of goods and services, and to develop cooperation in the spheres of intellectual, scientific, technological and economic activity. The work done by ISO results in international agreements which are published as International Standards. ISO 9000 is an international reference for quality requirements. It is concerned with “Quality Management” of an organisation.

HACCP (Hazard Analysis and Critical Control Point)

HACCP, stands for Hazard Analysis Critical Control Point, a systematic, science-based approach used in food production as a means to assure food safety.

HACCP is a food-related operation to:

- identify and assess hazard at every stage of operation, right from start to finish
- determine the critical control points
- establish the critical limit and procedures to monitor each critical control point,
- establish corrective procedures.



It is obvious, therefore, that HACCP is not just based on end product testing and inspection. It is a preventive and a continuous approach to food safety identifying / examining, analyzing / evaluating and establishing correctives measures and controlling hazards at every stage of a food-related operation. That is why it is effective and unique.

Basic principles of HACCP

Principle1: conduct a hazard analysis

HACCP team identifies all the hazards which could occur at each stage and describe preventive measures for their control. The hazard could be biological, such as a microbe, chemical, such as a toxin, or physical such as ground glass, metal fragments etc.

Principle 2: Determine the Critical Control Points (CCPs)

When all the hazards and preventative measures have been described, the HACCP team establishes the points where control is critical to managing the safety of the product. These are points in a food’s production - from its raw state through processing and



shipping to consumption by the consumer - at which the potential hazard can be controlled or eliminated. Examples are cooking, cooling, packaging, a metal detection etc.

Principle 3: Establish Critical Limit(s)

The third step establishes preventive measures with critical limits for each control point. For a cooked food, for example, this might include setting the minimum cooking temperature and time required to ensure the elimination of any harmful microbes. The critical limits describe the difference between safe and unsafe product at the CCPs. These must involve a measurable parameter and may also be known as the absolute tolerance for the CCP.

Principle 4: Establish a System to Monitor Control of the CCP

The HACCP team should specify monitoring requirements for management of the CCP within its critical limits. This will involve specifying monitoring actions along with frequency and responsibility. Such procedures might include determining how and by whom cooking time and temperature should be monitored.

Principle 5: Establish the Corrective Action to be taken when Monitoring Indicates that a Particular CCP is not Under Control

Corrective action procedures and responsibilities for their implementation need to be specified. This will include action to bring the process back under control and action to deal with product manufactured while the process was out of control. For example, reprocessing or disposing of food if the minimum cooking temperature is not met.

Principle 6: Establish Procedures for Verification to Confirm that the HACCP System is Working Effectively

Verification procedure must be developed to maintain the HACCP system and ensure that it continues to work effectively. For example, testing time-and-temperature recording devices to verify that a cooking unit is working properly.

Principle 7: Establish effective record keeping for documentation

Records must be kept to demonstrate that the HACCP system is operating under control and that appropriate corrective action has been taken for any deviations from the critical limits.



Importance of HACCP

HACCP is so important because it:

- Prioritizes and controls potential hazards in food production.
- Controlling major food risks, such as microbiological, chemical and physical contaminants.
- Provides the framework to produce foods safely and to prove they were produced safely.
- Focuses on prevention and control of potential food safety hazards rather than inspection.
- Covers all type of potential food safety hazards whether they are naturally occurring in the food, contributed by the environment, or generated by a mistake in the manufacturing process. Hazards such as biological hazards (e.g., bacteria, viruses), Chemical hazards (e.g., pesticide residues, and mycotoxins) and Physical hazards (e.g., metal, glass).
- Various customers in the food chain required their suppliers to have certified HACCP systems.
- Provide businesses with a cost-effective system for control of food safety, from ingredients right through to production, storage and distribution to sale and service of the final consumer.

Food standardization and regulatory agencies in India

1. Central Committee for Food Standards (CCFS):

It is concerned with prevention of food adulteration and fraudulent practices. Since 1947, CCFS has been functioning to advise the central and state government on matters arising out of the administration of Food Safety and Standards act and provide guidelines for

- Minimum basic requirements of food quality during handling, storage, preparation and serving of food under sanitary conditions.
- Freedom from extraneous matter, foreign matters, impurities and mixed inferior materials.



- Use of approved food additives such as preservative flavour, colour, etc.

The guidelines are primarily intended to protect consumers from the health hazards of the poisoning food and also exploitation by malpractice such as misbranding, adulteration, incorrect labelling, false claims, less weight, excessive and indiscriminate use of food additives, etc.

2. Central Food Laboratories (CFL):

Government of India has established four central food laboratories serving as appellate laboratories for analysis of food supplies. These are

- Central Food Laboratory, Kolkata.
- Food Research and Standardisation Laboratory, Ghaziabad.
- Public Health Laboratory, Pune.
- Central Food Technological Research Institute Laboratory, Mysore.

In addition to these, every state has established their own food analysing laboratories in their states.

Food Allergy (gluten, nuts and lactose)

Food allergy or hypersensitivity means an adverse immunological response to a specific substance in food which produces the characteristic symptoms after the food is eaten.

A food allergy is an immune system response. It is caused when the body mistakes an ingredient in food — usually a protein — as harmful and creates a defense system (antibodies) to fight it. An allergic reaction occurs when the antibodies are battling an invading food protein.

Allergens

An allergen is normally any harmless substance that causes an immediate allergic reaction in a susceptible person. Food allergens are almost always proteins although other food constituents, such as certain additives, are known to have allergenic (allergy-causing) properties.



Two Categories of Food Allergies

1. **Immunoglobulin E (IgE) mediated.** Symptoms result from the body's immune system making antibodies called Immunoglobulin E (IgE) antibodies. These IgE antibodies react with a certain food.
2. **Non-immunoglobulin E (non IgE) mediated.** Other parts of the body's immune system react to a certain food. This reaction causes symptoms, but does not involve an IgE antibody. Someone can have both IgE mediated and non-IgE mediated food allergies.

The following foods and ingredients are known to cause hypersensitivity and shall always be declared:

1. Cereals containing gluten; i.e., wheat, rye, barley, oats, spelt or their hybridized strains and products of these;
2. Crustacean and products of these;
3. Eggs and egg products;
4. Fish and fish products;
5. Peanuts, soybeans and products of these;
6. Milk and milk products (lactose included);
7. Tree nuts and nut products; and
8. Sulphite in concentrations of 10 mg/kg or more.”



Fig 8. Gluten rich foods

Causes:

A food allergy occurs when the immune system:

- * Identifies a particular food protein as dangerous and creates antibodies against it
- * The next time the individual eats that food, immune system tries to protect the body against the danger by releasing massive amount of chemicals including Histamine
- * Histamine is a powerful chemical that can cause a reaction in the respiratory system, gastrointestinal tract, skin or cardiovascular system.
- * In the most extreme cases, food allergies can be fatal. Although any food can provoke an immune response in allergic individuals, a few foods are responsible for the majority of food allergies.



Gluten allergy

Gluten is a protein in wheat, barley, rye, and other grains. It makes dough elastic and gives bread its chewy texture. Celiac disease is a digestive disorder caused by an abnormal immune reaction to gluten.

When someone with celiac disease eats something with gluten, their body overreacts to the protein and damages their villi, small finger-like projections found along the wall of their small intestine.

When villi are injured, the small intestine can't properly absorb nutrients from food. Eventually, this can lead to malnourishment, as well as loss of bone density, miscarriage, infertility or even neurological diseases or certain cancers.

The intestinal damage often causes diarrhoea, fatigue, weight loss, bloating and anemia, and can lead to serious complications. In children, malabsorption can affect growth and development.

There is no cure for celiac disease — but for most people, following a strict gluten-free diet can help manage symptoms and promote intestinal healing.



Fig 9. Celiac disease



Fig 10. Symptoms of celiac disease

Nut allergy

Nut allergy is one of the most common types of food allergy in both children and adults. Like celiac disease someone has a nut allergy their immune system is reacting to the proteins in the nut.

Types of nuts

Nuts, also known as tree nuts, come in different varieties. They include:



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- * Walnuts
- * Pistachios
- * Pecans
- * Macadamia nuts
- * Cashew nut
- * Brazil nut
- * Almonds



Fig 11. Types of nuts

There is often confusion between peanuts and tree nuts. Although peanuts have the word nut in their

name, they aren't nuts. Peanuts are legumes and, unlike tree nuts, grow underground. Although peanuts are not tree nuts, people with a peanut allergy have a similar allergic reaction as those with a tree nut allergy.

When someone is allergic to nuts, their immune system mistakenly identifies nuts as a harmful substance. The immune system reacts to these substances, or allergens. The first time someone is exposed to a nut allergen, they usually don't have any symptoms. Their immune system, however, has recognized the allergen as a threat and gets ready to fight the allergen the next time it enters the body. When the allergen enters the body again, the immune system launches an attack by releasing chemicals such as histamine. The release of histamine causes allergy symptoms.

Tree Nut Allergy Symptoms

- * Abdominal pain, cramps, nausea and vomiting
- * Diarrhoea
- * Difficulty in swallowing
- * Itching of the mouth, throat, eyes, skin or any other area
- * Nasal congestion or a runny nose
- * Nausea



- * Shortness of breath
- * Anaphylaxis, a potentially life-threatening reaction that impairs breathing and can send the body into shock

FOOD ALLERGY SIGNS AND SYMPTOMS



Fig 12. Tree Nut Allergy Symptoms

Lactose intolerance

Lactose intolerance is a clinical syndrome that manifests with characteristic signs and symptoms upon the consumption of food substances containing lactose, a disaccharide. Lactose is a sugar found in milk and milk products. Normally upon the consumption of lactose, it is hydrolyzed into glucose and galactose by lactase enzyme, which is found in the small intestinal brush border (micro villi). Deficiency of lactase due to primary or secondary causes results in clinical symptoms.

Etiology

Lactase enzyme deficiency can occur in individuals, and they have lower levels of this which may result in failure to hydrolyze lactose into absorbable glucose and galactose components. There are 4 main causes of lactase deficiency.



Primary Lactase Deficiency

It is the most common cause of lactase deficiency, also known as lactose non persistence. There is a gradual decline in lactase enzyme activity with increasing age. Enzyme activity begins to decline in infancy and symptoms manifest in adolescence or early adulthood. It is a hereditary cause of lactase deficiency.

Secondary Lactase Deficiency

Injury to intestinal mucosa due to several infectious, Inflammatory or other diseases can cause secondary lactase deficiency. Common causes include: Gastro enteritis, Celiac disease, Crohn disease, Ulcerative colitis, Chemo therapy, Antibiotics.

Congenital Lactase Deficiency

There is a decrease or absence of lactase enzyme activity since birth due to autosomal recessive inheritance. It manifests in the newborn after ingestion of milk. It is a rare cause of the deficiency.

Developmental Lactase Deficiency

It is seen in premature infants born at 28 to 37 weeks of gestation. The intestine of the infant is under developed resulting in an inability to hydrolyze lactose. This condition improves with increasing age due to the maturation of intestine, which results in adequate lactase activity.



Fig 13. Lactose rich foods

- * Abdominal bloating
- * Abdominal Pain
- * Nausea and vomiting
- * Fullness
- * Flatulence

Less commonly it can present with headache, muscle pain, joint pain, mouth ulcers, urinary symptoms and loss of concentration.

Food adulteration

Food adulteration is a process in which the quality of food is lowered or reduced by replacing food ingredient or addition of non-authenticated substances or removal of a vital component from food for the sake of earning profit or due to other incidental reasons. Food adulteration ultimately deceives consumers and leads various health risks. Nowadays, it is very difficult to find a sector of food industry which is free of adulteration.

Definition:

Adulteration is defined as the process by which the quality or the nature of a given substance is reduced through

- i) Addition of a foreign or an inferior substance (addition of water to the milk)
- ii) The removal of a vital element (removal of fat from the milk).

Adulterant:

Any material which is employed or which could be employed for the purpose of adulteration is defined as adulterant.

Causes of food adulteration

- To make maximum profit from food items by fewer investments
- To increase quantity of food production and sale
- Lack of consciousness of proper food consumption
- Lack of effective food laws





Fig 14. Food Adulteration

Types of Adulteration

Prevention of Food Adulteration act clearly distinguishes the types of adulterants- intentional or incidental.

Intentional adulteration:

The adulterant substances are added as a deliberate act with intention to increase profit. e.g., sand, marble chips, stones, mud, chalk powder, water, etc. This type of adulteration causes harmful effects on the body.

Incidental adulteration:

Adulterants are found in food due to ignorance, negligence, or lack of proper facilities. e.g., pesticides residues, dropping of rodents, larvae in foods, etc. Metallic contamination with arsenic lead, mercury can also occur accidentally.

Common food adulterants

Following are the main food adulterants commonly used in food:

1. Chalk powder: Wheat flour, Maida, Asafoetida is adulterated by chalk powder.
2. Washing soda: Bura sugar may be adulterated with washing soda.
3. Starch: It can be added in milk for thickness and also to increase the weight.
4. Colours: Metanil yellow colour is used to adulterate bengal gram and red gram dals. Turmeric powder is



coloured with metanil yellow. Chilli powder is coloured with congo red colour. Inedible colours are also added in processing of jelly and jam.

5. Saw dust: it is used to adulterate chilli powder, coriander powder and tea powder.
6. Chicory: Coffee is adulterated with chicory powder.
7. Iron fillings: most of the times iron fillings are added in semolina (rava) to increase the weight.

Effects of adulteration on health:

Adulteration of food cause several problems in human beings. Some adulterated food stuffs and its harmful effects are as follows.

Food Article	Adulterant	Harmful Effects
Bengal gram and red gram dal	Kesari dal	Lathyrism, cancer
Tea	Coloured, exhausted tea leaves	Liver disorder
Coffee powder	Tamarind or date seed powder	Stomach disorder, diarrhoea
	Chicory powder	Giddiness, joint pains
Milk	Unhygienic water and starch	Stomach disorder
Khoa	Starch or less fat content	Stomach disorder
Wheat and other food grains (Bajra)	Ergot (a fungus containing poisonous substance)	poisonous
Sugar	Chalk powder	Stomach disorder
Black pepper seeds	Papaya seeds and light berries	Stomach and liver problem



Notes

Mustard seeds	Argemone seeds	Epidemic dropsy and glaucoma
Edible oils	Argemone oil	Loss of eye sight, heart diseases, tumour
	Mineral oil	Damage to liver, cancer
	Castor oil	Stomach problem
Asafoetida	Foreign resins, soup stones and other earthy materials	Dysentery
Turmeric powder	Yellow aniline dyes	cancer
	Non permitted colours like metanil yellow	Highly carcinogenic
Chilli powder	Brick powder, saw dust	Stomach disorder
	Artificial colours	cancer
Sweets, juice, jam	Non permitted coal tar dye (metanil yellow)	Toxic substance cancer
Jaggery	Washing soda, Chalk powder	Vomiting, diarrhoea
honey	Molasses sugar (sugar plus water)	Stomach disorder

Impacts of adulteration

The problems of adulteration make the food items used in our daily life unsafe and unhygienic for use due to poor handling. In the past few decades, adulteration of food has become one of the serious problems and consumption of adulterated food causes serious diseases like cancer, diarrhoea, asthma, ulcers. In general, adulteration of food items has a very serious impact on producers/farmers, processors or manufacturers/enterprises, consumers and government.



Good Manufacturing Practices (GMP)

Good Manufacturing Practices can achieve food safety. Good Manufacturing Practices in manufacturing and packing are pre-requisites for acceptable food safety. GMPs are essential for the manufacture and distribution of foods that are safe from microbiological, chemical, and physical hazards. It is essential that the food industry manage a comprehensive programme that evaluates, identifies, and controls potential hazards at every step in the production, development and manufacturing environment.

Requirements for GMP for Food Industry

Good Manufacturing Practices are prescribed to ensure that:

- * Factory is at proper location.
- * Factory has right layout and building design.
- * Raw materials used in the products are of right specifications.
- * Manufacturing processes are properly prescribed and implemented to ensure right quality finished products.
- * Adequate quality standards are in place.
- * All critical control points are specified by hazard analysis.
- * Finished products are released for market only after prescribed quality analysis.
- * These are stored and transported in hygienic manner.
- * All market returns are properly stored, analyzed, reworked or disposed off with proper procedure.
- * Traceability procedure is in place.

To achieve the above objectives each manufacturer ensures that each step is properly followed with detail procedures in place.

Quality Management System

Definition:

A quality management system (QMS) is a term that refers to a system in charge of documenting all processes, responsibilities,



Notes

and procedures for achieving quality objectives and policies. A QMS allows companies to direct and coordinate their operations to meet both regulatory and customer requirements while also improving its efficiency and effectiveness on a regular basis.

Quality management systems actually serve plenty of purposes, including:

- * Engaging staff
- * Lowering costs
- * Reducing wasted materials
- * Setting company-wide direction
- * Identifying and facilitating training opportunities
- * Improving processes

Benefits of Quality Management Systems

Once implemented, quality management systems have the power to affect all aspects of your company's performance. However, the design and implementation of a QMS will bring you two overarching benefits:

Meeting the organization's requirements, which ensures that your company complies with industry regulations and provisions of services and products in the most cost-effective way. In the end, this will create room for growth, expansion, and profit.

Meeting customer's needs, which will help to build trust in your company, in turn engaging even more customers, sales, and profits.

Other advantages include preventing errors, reducing costs, helping to communicate a willingness to produce consistent results, improving your company's offerings, and ensuring all processes are completely controlled and defined.

GLOSSARY

Food-borne disease : Foodborne illness (also called food poisoning) is an illness caused by eating foods that have harmful organisms in them. These harmful germs can include bacteria, parasites and viruses.



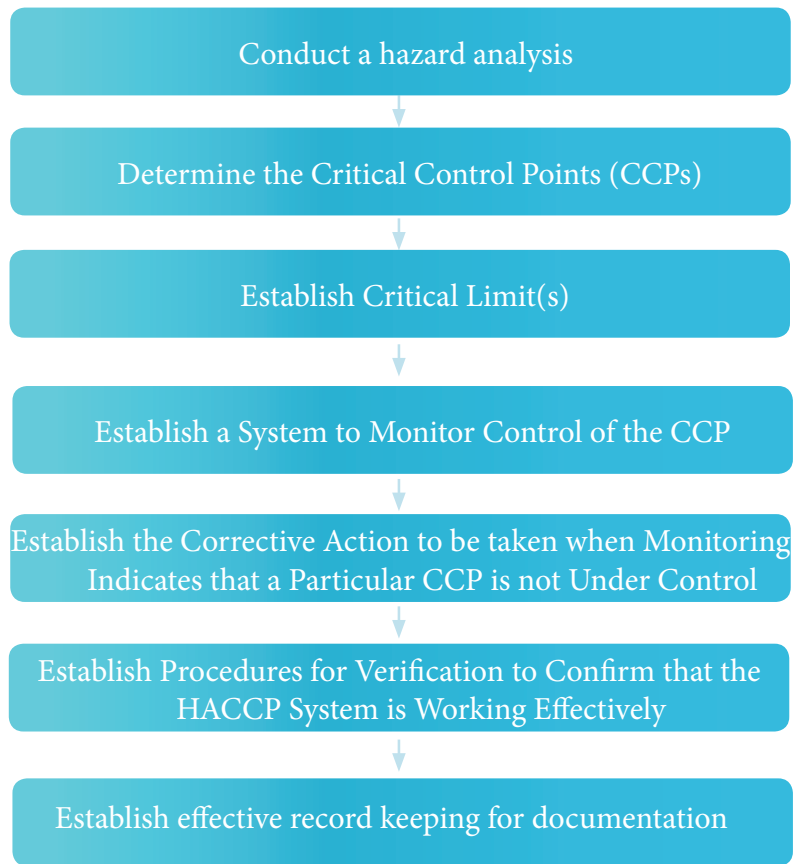
- Good Manufacturing Practices (GMPs)** : Standards published in the Code of Federal Regulations and used by the Food and Drug Administration to ensure the quality of marketed products and that products are produced under sanitary condition.
- Traceability** : Traceability is the ability to trace all processes from procurement of raw materials to production, consumption and disposal to clarify “when and where the product was produced by whom.”
- Rancidity** : Rancidity, condition produced by aerial oxidation of unsaturated fat present in foods and other products, marked by unpleasant odour or flavour.
- NABL** : National Accreditation Board for Testing and Calibration Laboratories (NABL) is a Constituent Board of Quality Council of India.
- Autosomal recessive inheritance** : One of the ways a genetic trait or a genetic condition can be inherited. In autosomal recessive inheritance, a genetic condition occurs when one variant is present on both alleles (copies) of a given gene.
- Antibodies** : Antibody, also called immunoglobulin, a protective protein produced by the immune system in response to the presence of a foreign substance, called an antigen.
- Antigen** : Any substance that induces the immune system to produce antibodies against it is called an antigen. Any foreign invaders, such as pathogens (bacteria and viruses), chemicals, toxins, and pollens, can be antigens.
- Immune system** : The immune system is a complex network of cells and proteins that defends the body against infection. The immune system keeps a record of every germ (microbe) it has ever defeated so it can recognise and destroy the microbe quickly if it enters the body again.



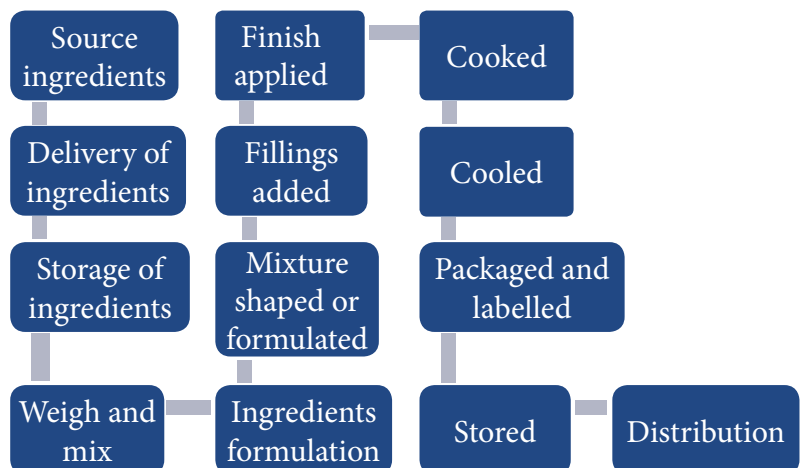
Practical Activity:

1. Video demonstration on the importance of food quality standards and measures.
2. Draw the flow diagram of HACCP, GMP and QMS.
3. Take a sample food product (packed) available in the market and make a study on the label provided, constituents of the product, and mention the standardization issued to the product.

a. Flow diagram of HACCP

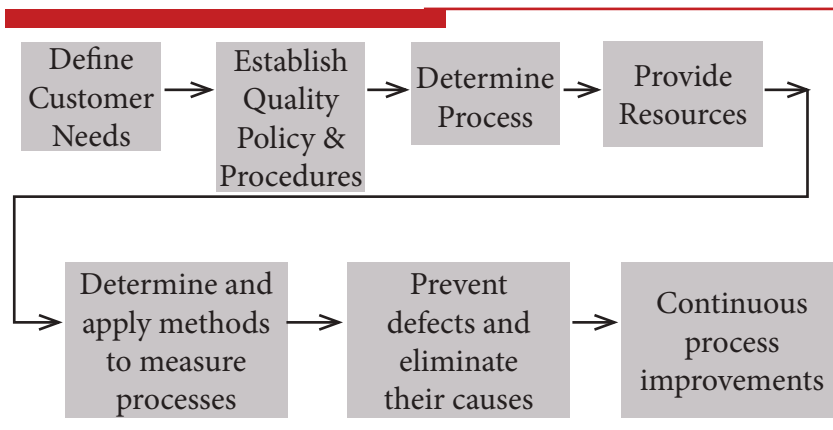


b. Flow chart of GMP of a bakery unit



c. Flow chart of QMS

QMS Process



EVALUATION

Answer all the questions

6×1=6

- _____ is a four-dimensional phenomenon, consisting of sweet, sour, salt and bitter.
 - Colour
 - Taste
 - Flavour
 - Appearance
- Adulterants and _____ are the other hidden characteristics, which affects the quality of food.
 - Toxins
 - Enzymes
 - Bacteria
 - Nutrients
- Chemical deterioration often involves _____ and hydrolytic reactions.
 - Sulphur
 - Chloride
 - Oxidative
 - Carbon
- Higher fat products are more susceptible to _____.
 - Rancidity
 - Tenderness
 - Hardness
 - Freshness
- Enzymes are proteins that speed up the rate of _____ reactions.
 - Physical
 - Microbial
 - Biological
 - Chemical
- _____ are used for flavour and appeal.
 - Additives
 - Condiments
 - Chemicals
 - Spices



Notes

Answer in Short**2×12=24**

1. What is meant by shelf life of foods?
2. Define food additives.
3. Differentiate between company standards and regional standards.
4. Write a note on Bureau of Indian Standards.
5. What is meant by ISO?
6. What is meant by food allergy?
7. What are the two categories of food allergy?
8. Define food adulteration.
9. What are the causes of food adulteration?
10. Define food quality.
11. What are food allergens?
12. GMP is important in any food industry. Justify the statement.

Answer in detail**6×3=18**

1. What is meant by food quality? Explain the factors responsible for food quality.
2. Explain the four food quality standards.
3. Define HACCP. Explain the principles of HACCP.
4. What is meant by gluten allergy? How does it affect the human body and what are its consequences?
5. Explain Lactose intolerance and its causes.
6. Write the name of the adulterants present in the foods given below and ill effects of the adulterant.

(a) Milk	(b) Sugar	(c) Jaggery
(d) Chilli powder	(e) Turmeric powder	



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Quality control (module 9) FSSAI

IGNOU material.

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2

HYGIENE AND SANITATION

- To explain and follow hygiene and sanitation practices in the work area
- To explain safety practices in the work area.
- To undertake physical and biological methods of treating waste materials.



Learning Outcomes

INTRODUCTION

Sanitation has always been important in bakeries and other food service establishments. But now, the stakes are even higher. The COVID-19 pandemic has caused bakeries and other food service establishments to temporarily close their doors around the world, with the exception of takeout service. When doors reopen, consumers and regulators will most likely demand ever-higher sanitation standards. Sanitation, in fact, may make the difference between businesses that survive and those that shutter their doors forever.





Fig 1. Cleaning of bakery equipments

2.1.1. Importance of safety, Hygiene and sanitation in work area.

Safety

Food safety and hygiene is important because it helps keep a workplace healthier, more productive and happier. A hygienic workplace is a healthier workplace. There is less sickness, and illness spreads more slowly. As a result, a hygienic workplace is also more productive.

Safety is the state of being “safe” (from French sauf), the condition of being protected from harm or other non-desirable outcomes. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk.

Workplace safety is very important for each and every employee in the industry because all the workers desire to work in a safe and protected atmosphere. Health and safety are the key factor for all the industries in order to promote the wellness of both employees and employers. It is a duty and moral responsibility of the company to look after the employee’s protection.





Fig 2. Work place safety

In order to prevent food-borne illness, certain food safety practices are used when handling, preparing, and storing food. Spoiled or rotten food can smell, however not all harmful bacteria have a scent. Making sure to clean your hands before handling food, cooking food to the proper temperature, and storing food promptly are ways to practice good food hygiene. When using a cutting board, make sure to sanitize it after every use. Wooden and plastic cutting boards are porous and bacteria can lurk behind in grooves made by a knife. Keeping hair up and out of the face prevents it from landing in food and wearing an apron protects your clothing from coming in contact with the food.

Hygiene

Hygiene, as defined by the WHO refers to “the conditions and practices that help maintain health and prevent the spread of diseases.”

Hygiene means to maintain the production area in neat and clean conditions. It is very important in a food handling area. Good food hygiene is essential to make or sell food that is safe to eat. Poor hygiene procedures can put everyone at risk. Harmful germs that cause food poisoning can spread very easily, so it is needed to make sure that every activity can prevent this. And to safeguard the consumer from such problems everyone should follow the precautionary measures against food contamination. A food handler should give special attention to his personal hygiene, personal health, working area, the commodities used, food preparation and storing. Hence, every chef should follow the food hygiene rules in production area. A clean and neat area



automatically attracts the attention to the products which will, in turn, attract the customer and also increase the sales percentage.

Good personal hygiene is very important in today's society for both health and social reasons. Keeping your hands and body clean is vital in stopping the development and spread of illness and infection. This simple habit doesn't just benefit your health – it can help protect those around you too.

Maintaining personal hygiene and sanitation is important for several reasons such as personal, social, psychological, health, etc. Proper hygiene and sanitation prevent the spread of diseases and infections. If every individual on the planet maintains good hygiene for himself and the things around him, diseases will eradicate to a great level.

Sanitation

The word sanitation is derived from the Latin word *sanitas*, meaning “health.” Applied to the food industry, sanitation is “the creation and maintenance of hygienic and healthful conditions.” It is the application of a science to provide wholesome food processed, prepared, merchandised, and sold in a clean environment by healthy workers; to prevent contamination with microorganisms that cause foodborne illness; and to minimize the proliferation of food spoilage microorganisms.

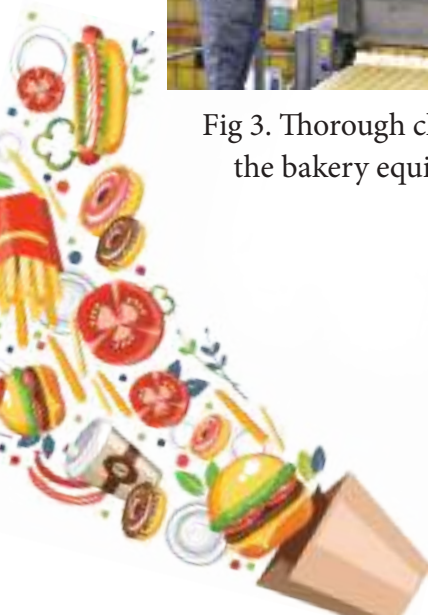
The primary tenet of food-service sanitation is absolute cleanliness. It begins with personal hygiene, the safe handling of foods during preparation, and clean utensils, equipment, appliances, storage facilities, kitchen and dining room.



Fig 3. Thorough cleaning of the bakery equipment.

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

Spending more time at work makes us more responsible to follow proper hygiene as there are more people to spread germs and variety of infections. Employees and employers both can contribute towards maintaining good hygiene and sanitation.



2.1.2. Personal hygiene and sanitation guidelines

Personal hygiene

Good health, personal grooming and working habits refer to the personal hygiene. Food can be contaminated very easily when it is handled. Therefore, giving special attention to these things will help prevent the spread of infection. So, everyone should strictly adhere to the following instructions in the production premises

Wear a hat / hairnet that completely covers the hair.	Do not comb your hair in a processing room or storeroom.
Cover all cuts, burns, sores and abrasions with a clean, waterproof dressing.	Do not handle any food if you have sores, boils, septic spots, a bad cold, chest infection, sore throat or a stomach upset. Report any of these to the manager and do alternative work.
Wash hands and wrists thoroughly with soap after using the toilet, eating, smoking, coughing, blowing your nose, combing your hair, handling waste food, rubbish or cleaning chemicals. Dry them on a clean towel before handling food again.	Do not spit in a processing room or storeroom. Do not cough or sneeze over food. Do not smoke or eat in any room where there is open food because bacteria can be transferred from the mouth to the food.
Keep finger nails cut short.	Do not wear perfume or nail varnish as these can contaminate products.

Sanitation

1. Be sure that work areas and equipment are clean before you start preparing food.
2. Sanitize counters and work areas with a sanitizer before and after use.
3. Avoid cross-contamination – letting microorganisms from one food get into another.



Notes

4. Wash the top of a can before opening it to keep dirt from getting into the food.
5. If you use a spoon to taste food during preparation, wash it after each use to avoid transferring harmful bacteria from your mouth to the food you are preparing.
6. Keep pets out of the kitchen. They may bring in dirt, germs, or bugs from outside.
7. Dishcloths and sponges can harbor harmful bacteria. Use a clean dishcloth each day. Wash sponges at the end of the day and allow them to air-dry before reuse.
8. Never use dish towels to wipe spills, the floor, or for anything other than drying dishes. Use paper towels for drying hands.
9. Wash dishes and dry dishes properly using the following techniques:
 - a. Scrape all garbage from dishes and place in proper containers.
 - b. Rinse to remove small food particles and sauces.
 - c. Stack dishes properly. Put all silverware together. Put like dishes together, such as dinner plates, saucers, bowls, etc.
 - d. Fill sink with hot soapy water.
 - e. Wash dishes in this order: glasses, flatware, dishes, pots and pans skillets.
 - f. Change dishwater if needed.
 - g. Rinse dishes in hot water.
 - h. Allow to air dry or dry with a clean towel and put away.
9. Keep large appliances clean inside and out.
10. Floor should be kept clean by frequent mopping.
11. Keep trash cans clean. Periodically wash with hot soapy water, rinse, and let air dry.
12. Occasionally clean behind the stove and refrigerator and wipe off cabinet shelves.



Sanitizing solution:

Add 1 teaspoon regular household bleach to 1 quart (4 cups) of tap water in a spray bottle. Sanitize counters, cutting boards, tables, utensils, etc. before and after use.



Fig 4. Safe and hygienic work place.

2.1.3. Industry standards to maintain a safe and hygienic work place

1. Staff needs to be properly trained to avoid accidents and deal with occupational hazards

Training of team members is essential as they need to be aware of all the guidelines pertaining to food safety in your bakery. They are required to wear proper gear at all times and should be trained to know what to do in an unforeseen situation.

2. Prevent cross-contamination by properly guiding your staff on hygiene and sanitation

There is always a risk of cross-contamination if the staff is not properly trained on the do's and don'ts of proper sanitation of the workplace and equipment.



- ✓ Keep raw ingredients away from cooked food.
- ✓ Keep cooked meat above raw meat in the refrigerator
- ✓ Keep food covered and protected.





- ⊘ Chop raw and cooked meat on the same chopping board.
- ⊘ Handle raw food then cooked food without washing your hands
- ⊘ Use the same knife for raw and cooked ingredients without washing it before.



Fig 5. Cross contamination.

3. Be on the lookout for employee illness and handle it with care

Heavy checks need to be made to ensure that no employee is feeling ill, especially symptoms related to food poisoning. Employees need to know what should be reported and managers should know how to deal with it in order to maintain the directed food safety standards in the bakery.

4. Employees should use the equipment properly

Bakery staff are vulnerable to many different hazards. It is essential they know how to detect these hazards and how to eliminate them from the workplace. This comes from the proper use and maintenance of the bakery equipment.

5. High-quality uniforms and shoes for employees

Ensure your employees have good quality uniforms and slip-resistant shoes as these too will help avoid unnecessary accidents.



Hygiene can be improved in the workplace by following four simple steps.

Introduce a hygiene policy.

This policy should clearly explain what you expect of staff. It should also state what the business is willing to provide employees.

Regular cleaning.

Simply, regularly cleaning – of the toilets, workstations and the office – is one of the most effective ways to improve hygiene. If possible, hire external cleaners to clean the office after hours.

Provide toiletries to employees.

Prompt your employees into maintain a hygienic workplace by providing them with toiletries. For example, sanitizer bottles, soap, boxes of tissues, and clean wipes.

Internal communication.

Remind employees of the importance of personal hygiene on a regular basis. Let them know how much it means to your business. Also, it is best practice to lead by example.

2.2.1. Potential safety hazards at work place

- ✱ Bakers may suffer from allergies (mainly of the respiratory system and of the skin) caused by substances used in their work.
- ✱ Bakers work with hot equipment and sharp tools, which may cause such accidents as burns, cuts, etc.
- ✱ Bakers often handle heavy loads (e.g., flour bags). This may cause back pains and trauma.
- ✱ Bakers work in heat and, sometimes, at night or other irregular hours. This may cause fatigue, overexertion, and other harmful effects.

Hazards related to this job

Accident hazards

These are hazards that create unsafe working conditions. For example, exposed wires or a damaged carpet might result in a tripping hazard. These are sometimes included under the category of physical hazards.



- * Cuts and punctures, especially while working with sharp tools.
- * Falls of workers because of incorrect use of ladders, wet and slippery floors and unguarded scaffolds.
- * Falls of bags of flour and sugar during transportation.
- * Danger of falls while carrying heavy loads.
- * Mechanical and electrical injuries during work with conveyors, mechanized equipment used for mixing ingredients to make dough, and baking processes.
- * Defective electrical equipment and installations, especially hand-held tools which may cause electric shock.
- * Extensive use of liquid and/or gaseous fuels for baking creates increased fire and explosion hazard.
- * Dry flour presents a constant hazard of fire and dust explosion (cigarette lighting in such an environment may be extremely hazardous).
- * The high temperatures and the high levels of relative humidity may cause fatigue and thermal exhaustion in bakers.



Fig 6. Accident hazards.

Physical hazards

Physical hazards are environmental factors that can harm an employee without necessarily touching them, including heights, noise, radiation and pressure.

- * Exposure to infrared radiation; cataracts may be produced by prolonged exposure
- * Radiation leakage from defective microwave ovens.



EXPLOSIVE



FLAMMABLE



OXIDIZING



CORROSIVE



TOXIC



IRRITANT



HEALTH HAZZARD

Fig 7. Accident hazards signs.

Chemical hazards

Chemical hazards are hazardous substances that can cause harm. These hazards can result in both health and physical impacts, such as skin irritation, respiratory system irritation, blindness, corrosion and explosions.

- * Exposure to flour: may cause respiratory system disorders and skin diseases.
- * Exposure to spices: many bakers working with some spices suffers from chronic conjunctivitis and chronic rhinitis; allergic skin diseases are sometimes found; after prolonged exposure, respiratory infections, particularly chronic bronchitis and sometimes even bronchial asthma, may develop.





Chemical Hazards

- * Exposure to sugar dust: may cause dental caries.
- * Exposure to carbon dioxide: in mechanized bakeries, dough which is in an active state of fermentation may give off dangerous amounts of carbon dioxide.
- * Exposure to carbon monoxide, combustion products and fuel vapors: firing equipment which is badly adjusted or has insufficient draw, or defective chimneys, may lead to the accumulation of unburned fuel vapors or gases or of combustion products, including carbon monoxide, which may cause intoxication or asphyxia.

Biological hazards

Biological hazards include viruses, bacteria, insects, animals, etc., that can cause adverse health impacts. For example, mould, blood and other bodily fluids, harmful plants, sewage, dust and vermin.

- * Exposure to fungi and yeast: hypersensitivity reactions and skin infections may be caused due to fungal antigens inhaled with dusts during the work time; these usually involve pneumonitis with asthmatic symptoms.
- * Exposure to parasites: vanilla flour and coconut flour may be infested with cereal parasites, which cause lesions and “grain itch”.
- * Exposure to moulds: bakers may suffer from allergic skin conditions caused by moulds such as *Aspergillus glaucus* and *Penicillium glaucum* that develop in stored flour.
- * Presence of rodents and insects may result in bites and infectious diseases.

BIOLOGICAL HAZARDS



VIRUSES



BACTERIA



FUNGI



PARASITES

Fig 8. Biological hazards.



Ergonomic, psychosocial and organizational factors

Ergonomic hazards are a result of physical factors that can result in musculoskeletal injuries. For example, a poor workstation setup in an office, poor posture and manual handling.

- * Continuous repetitive movements, awkward postures (e.g., sitting or standing for long hours), and excessive efforts (especially during lifting and moving of sacks and heavy loads) may result in cumulative trauma disorders.
- * Handling of heavy loads may cause acute disorders, especially back pain and lesions of intervertebral discs.
- * Exposure to certain spices may cause specific positive or negative sensitivity to their odours, addiction or distaste.

Psychosocial hazards include those that can have an adverse effect on an employee's mental health or wellbeing. For example, sexual harassment, victimization, stress and workplace violence.

Regular work at odd hours, especially in night shifts, may cause psychological stress.

Preventive measures

- * Regularly wet-scrub or vacuum-clean (as applicable) floors and other surfaces, and install effective exhaust ventilation to prevent formation of dust (dry flour) clouds.
- * Install effective exhaust ventilation and air conditioning to prevent air contamination and heat stress.
- * Check microwave ovens for radiation leakage, and repair if needed.
- * Adjust burners for clean burning, to reduce CO formation; install monitors to sound an alarm if CO level exceeds a hazard limit.
- * Wear a respirator to avoid inhalation of dust or aerosols.
- * Arrange periodic visits by professional pest exterminator, to control pest population, and special visits in the case of heavy infestation.



Notes

- * Learn and use safe lifting and moving techniques for heavy or awkward loads; use mechanical aids to assist in lifting.
- * Maintain a high level of personal hygiene; shower and change clothes at the end of work; do not take work-soiled clothing home.

2.2.2. Safety signs and symbols

A safety sign provides information about safety or health and can be a signboard, colour, acoustic signal, verbal communication, or hand signal.

Danger signs:

Used for situations where there is a hazard present that will cause serious injury or death if not actively avoided. Danger signs feature a red background with white text and should be reserved for only the most dangerous hazards in the facility.



Warning signs:



One level of severity down from danger signs are warning signs. The signs have black text surrounded by an orange background and means there is a serious hazard present that could result in injury or death.

Caution signs:

Caution signs, black text with a yellow background, are used for hazardous situations that if not avoided, might cause minor or moderate injury. Common caution signs include tripping hazard signs, or “Slippery When Wet” signs.



Notice signs:



The blue signs with white text are to convey other information not related to safety and when there is no hazard present. A “no smoking” sign for instance might be placed on a warning



sign if there are flammable liquids, but a blue no smoking sign means the prohibited act is not due to safety reasons.

Safety instruction signs:

Safety instruction signs are a green background with white text, is informational in nature but still related to safety. The most common kind of these signs are related to first aid.



2.2.3. Do's and Don'ts of handling the equipment

The restaurant industry can be a hazardous business, particularly for those working in the kitchen. Many pieces of commercial food service equipment can pose harmful risks, and therefore, need to be operated properly and with caution. Keep reading to learn about some do's and don'ts when it comes to operating and maintaining your restaurant equipment.



Fig 9. Bakery equipments.

DO's for Equipment Safety

Follow this list of do's to help keep your staff safe from equipment hazards, and keep your kitchen running smooth and efficiently:



DO`S



- ✓ Do follow manufacturer's guidelines for use of all commercial kitchen equipment.
- ✓ Do fully train all staff on the use and maintenance of all commercial kitchen equipment.
- ✓ Do use proper pots and pans to keep food from spilling over.
- ✓ Do use dry oven mitts when handling hot or warming pots
- ✓ Do clean any spillage inside the oven (after the oven has cooled).
- ✓ Do clean the interior & door seals of microwaves regularly.
- ✓ Do turn the microwave off immediately if any food ignites or sparks
- ✓ Do allow the oil in commercial deep fryers to cool before handling .
- ✓ Do be aware of the correct temperatures for heating the oil in commercial deep fryers. .
- ✓ Do clean greasy surfaces with warm, soapy water.
- ✓ Do use proper protective equipment, such as aprons & gloves, while operating a commercial deep fryer. .
- ✓ Do check that the cables on toasters are not frayed.
- ✓ Do make sure the cable is not sitting under the toaster while in operation.
- ✓ Do only put the proper types and sizes of breads in the toaster.
- ✓ Do empty crumbs on a weekly or daily basis, depending on toaster usage.

DON`Ts for Equipment Safety

In order to make your commercial kitchen a safe place for all staff, make sure everyone avoids this don'ts listed below in regards to equipment safety:



DON'TS

- ⊘ Don't leave ovens on when they are not in use.
- ⊘ Don't leave oven doors open when unattended.
- ⊘ Don't store plastic items or other flammable utensils or materials in or around the ovens.
- ⊘ Don't overload the oven.
- ⊘ Don't use microwaves if there is any damage to the doors, seals or hinges. This could cause radiation emission.
- ⊘ Don't overfill containers in commercial deep fryers.
- ⊘ Don't overheat the oil in commercial deep fryers.
- ⊘ Don't move containers filled with hot oil.
- ⊘ Don't spill grease when changing or filtering the grease.
- ⊘ Don't splash water or hot oil.
- ⊘ Don't ever stick a knife or any other object into a toaster.
- ⊘ Don't use toasters to make sandwiches with melted cheese or other ingredients that could pose a fire risk.
- ⊘ Don't leave a hot toaster unattended.
- ⊘ Don't touch a toaster just after use.
- ⊘ Don't ever leave a pizza oven unattended.
- ⊘ Don't handle a pizza without the necessary tools.

Dough mixer

Fig 10. Dough mixer



Notes

Do's:

- ✓ Make sure mixer bowl is firmly in place
- ✓ Attach proper paddle or whip securely
- ✓ Place ingredients into mixer bowl
- ✓ Close Guard Net
- ✓ Raise bowl by turning the lever on the right side of the mixer. Do this while pushing and holding black start button.
- ✓ Always start mixer at lowest speed, working your way up to desired speed. Set speed ,1-4, by moving the lever labeled “clutch”.
- ✓ Set timer, numbers on the timer correspond to minutes
- ✓ Keep hands and body away from mixer while it is mixing
- ✓ When done return speed to one and turn lever to off position when done
- ✓ Place product into clean container
- ✓ Lower mixer bowl, remove paddle/whip, and mixing bowl for cleaning
- ✓ Clean exterior of machine and guard net with damp cloth and sanitizer

Don't:

- ✗ Don't add any product to mixer, while mixing. Bring mixer to a stop by pushing red stop button before adding anything to avoid spills and bodily injuries
- ✗ Don't leave guard net open while mixer is in operation
- ✗ Don't put clothing, utensils or body into moving mixer. Even a slow-moving mixer can severely injure finger or hand

Convection Ovens

Burns, flames and hot spill liquids are some risks associated with the convection ovens. When it comes to operating and maintaining commercial ovens, you should take care of these dos and don'ts:



Notes



Fig 11. Convection Ovens

Do's:

- ✓ Use the right pans and pots to avoid food from spilling over.
- ✓ Make use of dry oven mitts while handling hot pots.
- ✓ Clean all spillage inside the oven.

Don'ts:

- ✗ Don't leave the ovens power on all the time.
- ✗ Don't leave oven doors open.
- ✗ Don't store plastic items in convection oven.
- ✗ Don't overload the oven.

Microwaves

Electrical shock, Scalds from hot food and Microwave radiation are some risks associated with microwaves. When it comes to operating and maintaining microwave ovens, you should take care of these dos and don'ts:



Fig 12. Microwave oven



Do's:

- ✓ Read manufacturer's guidelines on equipment use.
- ✓ Clean the dirt, grime and grease from your microwave.
- ✓ Turn off the equipment immediately if you notice food ignites or sparks.

Don'ts:

- ✗ Don't use microwaves with damaged doors. This could result radiation emission.
- ✗ Try to avoid cooking in sealed container.
- ✗ Never microwave food in plastic containers.
- ✗ Never work near or with a microwave if you have an unshielded pacemaker.

Mixer grinder

Mixer grinders are one of the most important appliances in the food industry. It is essential that you should take good care of it. Over here we discuss how to use mixer grinder effectively.

Here's a list of dos and don'ts when it comes to how to operate mixer grinder



Fig 13. Mixer grinder

Do's

- ✓ **Do clean it after every use:**

As the mixer grinders are used almost every day it is essential to keep them clean after every use. To get rid of the stains and smell, make a solution of vinegar and water and run it for a few seconds. Rinse the jars thoroughly.

✓ **Do switch off the appliance before checking the jar:**

Before removing the jars to check if the ingredients have been blended well, make sure you switch off the appliance.

✓ **Make sure the appliance is level:**

If you don't have a designated spot for your mixer grinder, make sure you place it on a flat surface. If the appliance is rocking, level it properly before using it.

✓ **Increase the speed gradually:**

Instead of starting it at full speed, go from low to medium to high. This will ensure that there is no sudden pressure on the motor.

Don'ts

✗ **Don't put any hot liquids:**

Make sure you are not putting hot ingredients into the jar. Hot liquids and steam arising out of it can cause the lid to blow causing a mess. You may also end up with burns if the ingredients are too hot.

✗ **Don't fill the jars to the brim:**

To avoid spills and splatter, you should always leave $\frac{1}{4}$ th of the jar empty. Overloading the jar can cause it to explode.

✗ **Don't put coffee beans:**

The flavour and the aroma of freshly ground coffee is just unmatched. But the coffee beans can cause damage to the appliance's blades. Moreover, you may not even get the right consistency. It's better to use a coffee grinder instead of a mixer grinder.

✗ **Don't add any ingredient when the blades are still moving:**

Bring the mixer to a complete stop before adding any ingredient to avoid spills and bodily injuries.



Dough sheeter

Daily and Proper Cleaning

Unplug the machine before cleaning. Visually inspect the dough sheeter daily, especially the scrapers and rollers. Remove any remnants of dough and clean the machine every day. Keeping the scrapers in good shape prolongs the life of the rollers, which are expensive to replace.



Fig 14. Dough sheeter.

Refer to the manual for your particular machine for the manufacturer's specific cleaning instructions. Unplug the machine before cleaning. Visually inspect the dough sheeter daily, especially the scrapers and rollers. Remove any remnants of dough and clean the machine every day. Keeping the scrapers in good shape prolongs the life of the rollers, which are expensive to replace. Cleaning the machine should be a checklist item for closing, and checking that the machine is clean should be on the opening checklist. Fresh hot water, a new and dedicated toothbrush (used only to clean the dough sheeter), and some clean cloths should be enough for daily cleaning. The goal is to prevent the build-up of flour and dough balls in the first place.

2.3.1. Procedure for treating waste materials using physical and biological methods

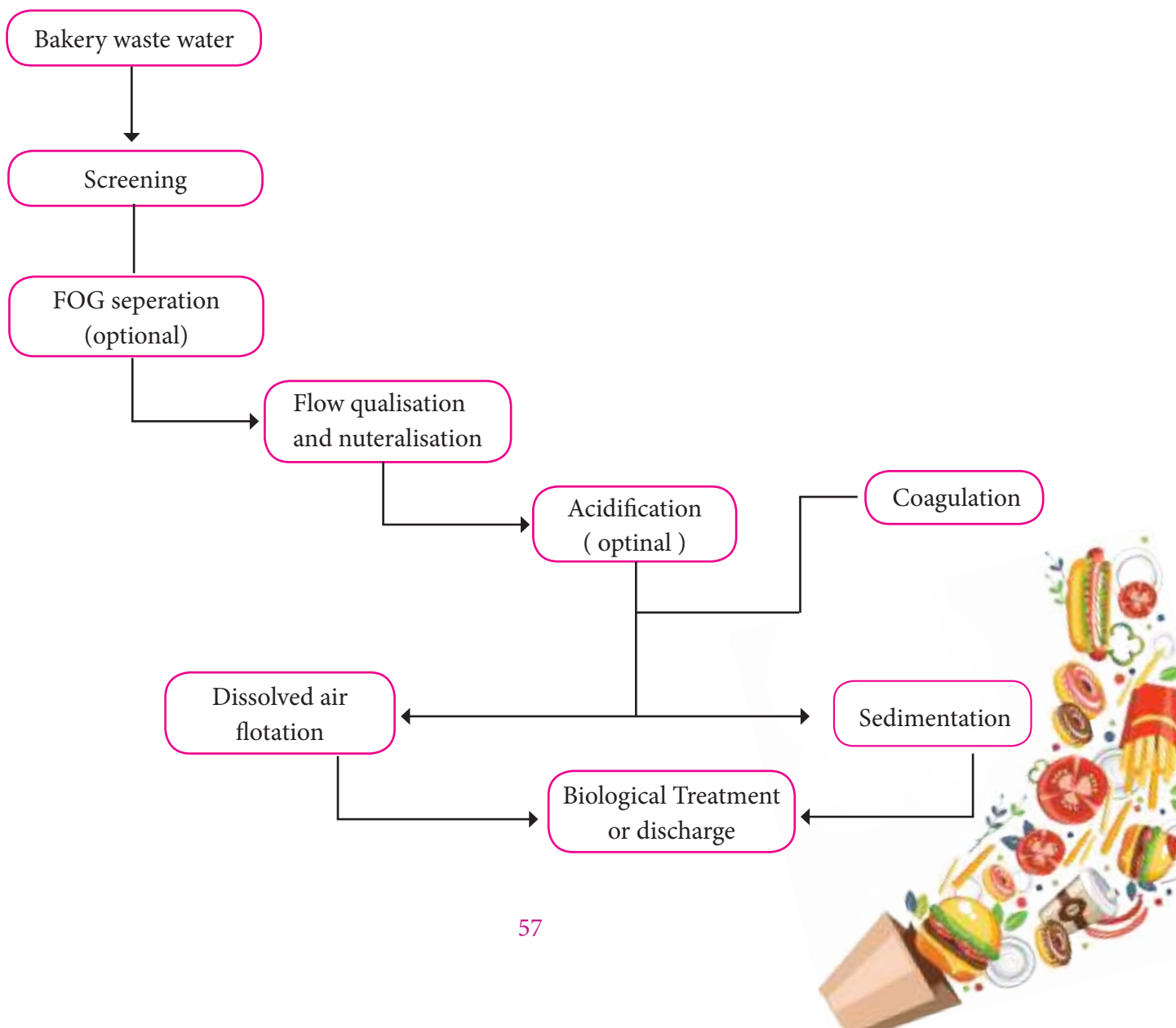
Generally, bakery industry waste is nontoxic. It can be divided into liquid waste, solid waste and gaseous waste. In the liquid phase, there are high contents of organic pollutants including chemical oxygen demand (COD), biochemical oxygen demand (BOD), as well as fats, oils and greases (FOG) and suspended solids (SS). Waste water is normally treated by physical, chemical and biological processes.



The main organic components in bakery wastewater are flour, sugar, oil, grease, and yeast. Primary treatment of bakery wastewater involves reducing the suspended solids and removing the floatable FOG. Secondary treatment involves removing the dissolved biodegradable components through a biological process using microorganisms/bacteria.

The volume and strength of the waste water depends on the products/processes and varies according to the operational times of the bakery. For example, pastry produces the greatest volume of wastewater while cakes produce the strongest wastewater. Because the flow rate and loading of bakery wastewater will vary throughout the day, an equalization tank or buffer tank for temporary storage can help to meet the demands of peak discharge times.

Primary Treatment/Pretreatment



Screening:

Primary treatment requires a screening process to firstly remove any coarse particles in the bakery sewage. Screens vary in the size of the openings from micrometers to in excess of 100 millimeters. The right type of screen will depend on the characteristics of the wastewater and the requirements of the bakery.

FOG separation:

The next step in the treatment process involves separating and skimming FOG from the screened wastewater. Traditional treatment systems use mechanical scrapers to remove FOG from bakery wastewater.

Acidification:

Acidification can further help to break down any remaining FOG by adding an acid such as sulfuric acid which helps to keep the pH at an optimal level.

Coagulation and flocculation:

Coagulation and flocculation work on any remaining fine SS by making the particles clump together for easier removal with the addition of chemicals such as alum and ferric chloride combined with a mixing process.

Sedimentation:

Sedimentation, also called clarification, has a working mechanism based on the density difference between SS and the water, allowing SS with larger particle sizes to more easily settle down. Rectangular tanks, circular tanks, combination flocculator-clarifiers and stacked multilevel clarifiers can be used.

DAF for primary treatment of bakery wastewater

Dissolved air flotation (DAF) is usually implemented by pumping compressed air bubbles to remove fine SS and FOG in the bakery waste water. Dissolved air flotation (DAF) is an effective, proven means of bakery wastewater treatment. A good DAF system will remove SS, FOG, control pH and precondition the wastewater to a level optimum for secondary or biological treatment. For a commercial bakery discharging to a public sewer, a DAF system is an ideal solution to improving the quality of the wastewater so that it meets discharge limits and is safe for



treatment at a municipal plant. If a bakery is not discharging to municipal sewerage works, the wastewater will require secondary treatment prior to discharge.

Biological Treatment

The objective of secondary or biological treatment of bakery wastewater is to remove the remaining biodegradable components in the wastewater using microorganisms.

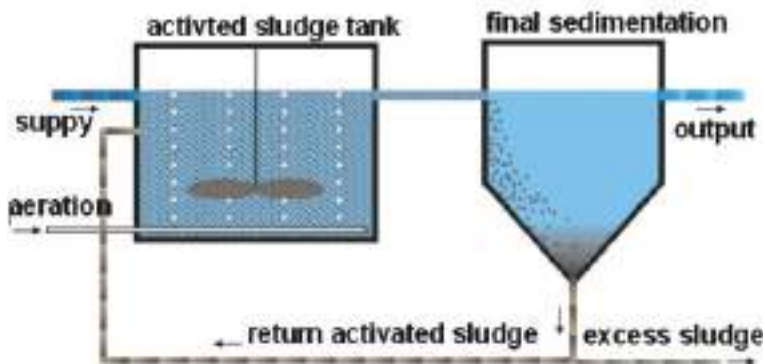


Fig 15. Activated sludge process

With regard to different growth types, biological systems can be classified as suspended growth or attached growth systems. Biological treatment can also be classified by oxygen utilization – aerobic, anaerobic and facultative. In an aerobic system, the organic matter is decomposed to carbon dioxide, water and a series of simple compounds. If the system is anaerobic, the final products are carbon dioxide and methane.

The most common form of secondary treatment for bakery wastewater is the activated sludge process which uses suspended growth microorganisms. Here, waste flows around and through free-floating microorganisms and settles out as a type of sludge, most of which can be recycled back into the system. The typical arrangement of an activated sludge process is an aeration tank (bioreactor) that provides the bacteria in the wastewater with oxygen, and a settling tank (final clarifier) to allow the resulting sludge to settle and be reused/removed.

SBR for secondary treatment of bakery wastewater

A sequential batch reactor (SBR) is very effective biological treatment system that uses the activated sludge process. An SBR



system treats batches of wastewater in a timed sequence. While the final clarifier is settling and decanting, the bioreactor is aerating and filling. Clear water collects in the top of the clarifier where it is now clean and suitable for discharge.



Fig 16. Sequential batch reactor (SBR)

Practical Activity

01. Demonstrate common methods of hygiene and sanitation

Objective: To know the common methods of hygiene and sanitation

Procedure: hygiene and sanitation methods.

Personal hygiene includes:

- * Showering and bathing regularly
- * Keeping hair clean and covered or tied back.
- * Keeping clothing and footwear clean that is used only at work
- * Washing hands regularly.
- * Using clean utensils for tasting food
- * Using separate cloths for cleaning and wiping plates

The steps for proper handwashing are as follows:

1. Wet hands with warm water.
2. Apply liquid soap and lather for at least 20 to 30 seconds.
3. Scrub backs of hands, wrists, all fingers, and under nails.
4. Rinse under running water, pointing down toward the drain.



5. Dry with a paper towel.
6. Turn off taps and open bathroom door using the paper towel.

Sanitation practices are:

- * Proper personal hygiene, including frequent hand and arm washing and covering cuts;
- * Proper cleaning and sanitizing of all food contact surfaces and utensils;
- * Proper cleaning and sanitizing of food equipment;
- * Good basic housekeeping and maintenance; and.
- * Food storage for the proper time and at safe temperatures.

02. Demonstrate functions of the equipment

Objective: To know the functions of the equipment

Procedure: Write down the functions of the following equipment

- a) Dough mixer b) oven

03. Identify safety and hazards symbols

Objective: To identify the safety and hazards symbols

Procedure: Prepare a chart pasting the different types of safety symbols.

04. Disposing waste safely and correctly in a designated area

Objective: To know the disposing methods of bakery waste

Procedure: Write down the physical methods for treating waste materials.

EVALUATION

Choose the correct answer

5×1=5

1. _____ means to maintain the production area in neat and clean conditions.
 - a) Hygiene b) Sanitation
 - c) Health d) Safety



Notes

2. _____ hazards are a result of physical factors that can result in musculoskeletal injuries.
 - a) Biological
 - b) Chemical
 - c) Ergonomic
 - d) Physical
3. _____ hazards are hazardous substances that can cause harm.
 - a) Physical
 - b) Chemical
 - c) Biological
 - d) Ergonomic
4. One level of severity down from danger signs are _____ signs.
 - a) Safety instruction
 - b) Caution
 - c) Danger
 - d) Warning
5. _____ is the creation and maintenance of hygienic and healthful conditions.
 - a) Sanitation
 - b) Hygiene
 - c) Safety
 - d) Health

Answer in brief.**10×2=20**

1. Define: Hygiene
2. Why food safety and hygiene are important in bakery?
3. What is meant by personal hygiene?
4. What is meant by physical hazard?
5. Write a note on potential safety hazards at work place?
6. Write a short note on Microwave.
7. Give the expansion of SBR.
8. What are the Do's and don'ts in using of convection ovens?
9. What are safety instruction sign?
10. Write the primary treatment of bakery waste water.

Answer in detail.**5×3=15**

1. Explain any two hazards related to the bakery industry.
2. Explain in details about safety sign and symbols.
3. What are the dos and don'ts of handling the equipment?
4. Write the procedure for treating waste materials using physical and biological methods.
5. What are the personal hygiene should follow in the bakery industry?



3

BAKING, STORING AND PACKAGING

- To describe the quality parameters of raw ingredients and prepare the dough and batter.
- To explain about the types of ovens, fuels and oven baking processes
- To describe the processes, importance and parameters of checking quality, packing and storage of bakery products.
- To Enumerate the steps of post production cleaning and maintenance of process equipment.



Learning Outcomes

Introduction

In most of the bakery units, products are produced according to the knowledge of the workers and these workers learned the procedure from paternal or other workers. Hence, the products are produced by old traditional methods. In order to overcome this problem, the workers should be well trained because they demand specific type of raw material and equipments and prepare quality products from that. In addition, the bakery owner should also know scientific information. Hence, an emphasis on using



better quality raw material and equipments and that way get produced better quality products.



Fig 1. Production of bakery items

Quality of raw material is a vast subject. Even though we tried to present short, informative and necessary information in this paper, emphasis is made on practical base. Many raw materials are used for preparation of bakery products. The desired quality of the raw material, effect of its quality on products and simple scientific experiments to know the quality is discussed herewith.

3.1.1 Quality parameters of ingredients:

Flour:



Fig 2. Flour

Flour constitutes the primary raw material to which all soft wheat product formulations are related. It provides a matrix around which other ingredients in varying proportions are mixed to form batter or dough systems. Most biscuits can be prepared from flour, which has low quantity of protein and has a gluten content that is weak and extensible. Thus, flour with protein level of less than



9% is best and levels of more than 9.5% often create processing problems. The exceptions are fermented cracker doughs and puffs dough where a medium strength of flour is needed, with protein value of 10.5% or more.

Different types of flours are used ranging from soft to strong sponge flour. Cookie, cracker flours normally receive no special treatment or additives i.e., they are not normally chlorinated or chemically matured and have no chemical leavening additives or self-raising ingredients. High protein in the flour leads to hardness of texture and coarseness of internal grain and surface appearance. Flour should be shifted to aerate it for easy mixing operation.

Sugar:

It imparts sweet taste, improves texture, crust colour and extends shelf-life. Selection of the proper sweetener mostly is determined by the desired functions the sweetener is to provide. The principal sweetener used is sucrose (granulated sugar). Corn syrup, high fructose corn syrup, invert sugar, honey, glucose syrups and molasses are used to a lesser extent except in soft cookies.



Fig 3. Sugar

Granulation of sugar is very important. Coarse grain of sugar will cause more spread of cookie affecting its texture, eating quality etc. Very fine granulation will not incorporate enough aeration resulting in dense texture, toughness and poor eating quality. Coarsely powdered or a fine granulated sugar should be used. Some cookies are moist in eating in which case part of sugar is replaced with flavoured liquid such as invert sugar, honey or corn syrup. Dextrose sugar will have reduced sweetness and will impart darker colour to the cookie.



Fat:

Fat lubricates the structure of a baked product. It has tenderizing effect on flour proteins and makes the product tender. Fat improves the eating quality for prolonged period. If the fat level is high the lubricating function in the dough is so pronounced that little or no water is required to achieve a desired consistency, little gluten is formed and of starch swelling and gelatinization is also reduced giving a very soft texture. The dough breaks easily when pulled, it is short. This is the origin of the term 'shortening' for a dough fat. Generally smooth, plastic hydrogenated shortenings are used for cookie making. Granular shortenings are unsuitable as they do not aerate sufficiently and distribution of fat in the cookie remains uneven.

The fat used for cookie making should be able to cream and incorporate aeration and should not melt at baking temperature. Fats used as surface coatings applied as a spray of warm oil, for savory crackers are best if they have limited absorption into the cookie and remain as a glossy film. Addition of part butter improves the taste and flavour of the cookie and also does not affect the creaming quality. Butter should be softened before blending with hydrogenated fat otherwise it will break into lumps which will be difficult to homogenize.



Fig 4. Fat

Eggs:

Eggs affect the texture in several ways. They perform emulsifying, tenderizing and binding functions. Eggs also contribute colour, nutritional value, and desirable flavour. They are essential for obtaining characteristic organoleptic qualities of products.



Eggs whites are a toughener and structure builder and the high fat contents of yolk function as a tenderizer. Eggs must be fresh. Stale eggs may give bad odour and spoil the overall flavour of cookie. Whole eggs are best used at room temperature while egg white whip better when it is cooled. Egg yolk alone or in combination with whole egg produces a cookie with excellent eating quality with a bit inferior grain or internal structure compared to that from whole egg.



Fig 5. Eggs

Leavening Agents:

Leavening agent, substance causing expansion of doughs and batters by the release of gases within such mixtures, producing baked products with porous structure.

Types of Leavening Agents:

Biological Leavening Agent (Yeast)

Yeast is composed of single-celled organisms (a type of fungus) that undergo an existence far removed from what we'd recognize as "life," yet they perform a vital function in cooking. Yeast is responsible for the process of fermentation, without which there would be no such things as beer, wine, or bread.



Fig 6. Yeast



There are a few types of baker's yeasts:

- Active dry yeast is what most recipes call for. It's a dry, granular yeast sold in packets or jars. Before working with it, active dry yeast must be activated, or "proofed," by dissolving it in warm water. The ideal temperature is 105° F, cooler than that and the yeast won't fully activate, much hotter and you'll kill the yeast before it can do anything.
- Instant dry yeast is also a granular yeast sold in packets or jars. Unlike active dry yeast, however, instant dry can be mixed directly in with your flour, no proofing required. You only need to use 1/3 to 1/2 as much instant dry yeast as compared with active dry.
- Fresh yeast is found mainly in commercial bakeshops. It comes in one-pound bricks and can be added directly to the dough or dissolved in water first. Note that dissolving it is only to help disperse it more fully. It also doesn't need to prove.
- You can convert fresh yeast to active dry or instant dry by multiplying by 0.5 and 0.35, respectively. As a general rule, it's best to use whatever type of yeast a given recipe calls for. There are too many variables that can come into play when you start converting.

In most cases, yeast doughs rise once, get punched down and then rise again. Finally, they go into the oven, where the heat rouses the yeast to one last great expulsion of CO₂ before they reach 140° F and die.

Chemical Leavening Agent (Baking Soda & Baking Powder)

Baking soda (sodium bicarbonate or bicarbonate of soda) is a white powder that comes in a box, and it has a pH level of 8 to 9, which means it is a base. When combined with an acidic ingredient, it will produce a chemical reaction that causes the release of CO₂. Some of the acidic ingredients that will activate baking soda are buttermilk, lemon juice, yogurt, sour cream, molasses, and honey. In its dry state, baking soda is inert but once activated, it reacts immediately.



Notes



Fig 7. Baking powder

Unlike the reaction of yeast, which occurs slowly over a long period of time, baking soda acts quickly, which is why the bread and muffins it produces are called quick breads.

Baking powder is a product consisting of baking soda plus some other acidic component, also in powder form. As long as it stays dry, it's inactive. Once moistened, the chemical reaction begins. However, it's less immediate than a straight baking soda reaction, but it's double-acting, which means it begins working when mixed and then gives off another burst of gas when heated. That's why some quick bread batters, like pancakes, can be held for a while without them losing their potency.

Vaporous Leavening Agent (Steam)

Unlike yeast, baking powder, and baking soda, all of which produce CO_2 gas, steam is simply water vapor, produced when the water in your dough reaches 212°F and vaporizes.



Fig 8. Steam



Notes

Steam may seem boring when compared with the fascinating processes described above, but it is a powerful force. When water becomes steam, its volume increases by some 1,500 times. The force with which this expansion takes place is increased by higher temperatures. Puff pastry and choux pastry are two examples of pastry that use only steam as their leavening agent, and when prepared properly are superbly airy and flaky.

The key to this leavening agent is to ensure that the dough captures the steam. With puff pastry, this is done by incorporating butter into the dough and then rolling it into book folds. This technique produces hundreds of layers, which puff out into separate flaky layers as a result of the steam produced by the liquid in the dough and the water in the butter.

Choux pastry, which is used for making cream puffs, eclairs, and beignets, uses a different technique. By cooking the dough once on the stovetop, the glutens are partially denatured, which reduces the dough's elasticity. Meanwhile, the starch in the flour is gelatinized, which helps give it structure. Thus, when it is baked, the steam inflates the pastry rather than snapping back, it holds its shape and the air pockets in the center of the pastry remain intact.

Flavours and Condiments:

Choice of flavours in cookies is very limited. Generally, use of butter and milk as the ingredients of the formula perform the function of flavouring agents, which is further fortified with vanilla, which is used within limits of 0.5 to 1 percent based on flour. Some spices like cinnamon, nutmeg, ginger, zeera are also used as flavours. It should be used with utmost care as even slightly enhanced quantity may impart very strong and unacceptable flavour to the product.



Fig 9. Condiments

The introduction of aromatic ingredients as a contribution to flavour can be made to biscuits and other cooked products in three principal ways:

- By including the flavour in the dough or batter before baking
- By dusting or spraying the flavour after baking
- By flavouring a non -baked portion, such as cream filling, icing, jam or mallow.

3.1.2. Preparations of batter, dough and proofing Batter (Muffin, Cakes)

Muffins:

INGREDIENTS

- 2 cups white flour,
- 1 tablespoon baking powder,
- 1/2 teaspoon salt,
- 2 tablespoons sugar,
- 1 egg, slightly beaten,
- 1 cup milk and
- 1/4 cup melted butter

PREPARATION

Preheat the oven to 375°F. Butter muffin pans. Mix the flour, baking powder, salt, and sugar in a large bowl. Add the egg, milk, and butter, stirring only enough to dampen the flour; the batter should not be smooth. Spoon into the muffin pans, filling each cup about two-thirds full. Bake for about 20 to 25 minutes each.

Blueberry Muffins : Use ½ cup sugar. Reserve ¼ cup of the flour, sprinkle it over 1 cup blueberries, and stir them into the batter last.

Pecan Muffins : Use ¼ cup sugar. Add ½ cup chopped pecans to the batter. After filling the cups, sprinkle with sugar, cinnamon, and more chopped nuts.



Fig 10. Muffins



Whole-Wheat Muffins: Use $\frac{3}{4}$ cup whole-wheat flour and 1 cup white flour.

Date or Raisin Muffins: Add $\frac{1}{2}$ cup chopped pitted dates or $\frac{1}{3}$ cup raisins to the batter.

Bacon Muffins: Add 3 strips bacon, fried crisp and crumbled, to the batter.

The difference between Muffins and Cup cake

- use liquid rather than solid fat (oil or melted butter)
- less fat than cupcakes
- less sugar than cupcakes
- can have lots of mix-ins
- are not necessarily frosted

Cakes:

INGREDIENTS

- 1 cup (2 sticks) unsalted butter,
- $\frac{3}{4}$ cups sugar,
- 4 large eggs plus 2 large egg yolks,
- 1 tablespoon pure vanilla extract,
- 3 cups cake flour (spooned and leveled),
- 1 tablespoon baking powder,
- $\frac{1}{2}$ teaspoon fine salt and
- $1\frac{1}{2}$ cups buttermilk.



Fig 11. Cakes

PREPARATION

Bring cold ingredients to room temperature. Butter should be soft enough to hold a thumbprint but still keep its shape. In a large bowl, using an electric mixer, beat butter and sugar on high until light and fluffy, about 6 minutes. Beat in 4 eggs plus 2 yolks, one at a time, until combined. Beat in vanilla extract. In another large bowl, whisk together cake flour, baking powder, and salt. With mixer on low, add $\frac{1}{3}$ the flour mixture to butter mixture, beating to combine. Beat in $\frac{3}{4}$ cup buttermilk, another $\frac{1}{3}$ the flour mixture, another $\frac{3}{4}$ cup buttermilk, and remaining flour mixture until just combined. Scrape down bowl as needed.



Dough

(soft roll dough, hard roll dough, multigrain dough, sweet short crust pastry)

Soft roll dough:

INGREDIENTS

4½-5 cups flour

1 tsp salt

¼ cup sugar

2 tbsp yeast

1 cup milk

½ cup water

¼ cup butter



Fig 12. Soft roll dough

PREPARATION

- Combine 1 cup of flour, sugar, yeast and salt in a mixing bowl or in your Kitchen-aid bowl. Melt the butter in the microwave and then add milk and warm water to it. Stick your finger in it to test for temp. You might need to microwave it for 20-30 seconds. It should be Luke warm but not hot. If you prefer you can warm the butter, milk and water in a small sauce pan on the stove instead of just in the microwave.
- Add the warm liquid to the pre-measured ingredients in your mixing bowl and whisk or beat for 2 minutes. Add ½ cup more flour and beat for two more minutes.
- Add 3 more cups of flour and knead with your mixer or by hand for 2-3 minutes adding in a little more flour (up to ½ cup) if needed.
- Place dough in a greased glass bowl, cover and let rise until doubles in size. While the dough is mixing turn oven to 200°F degrees to warm up. When the dough is done mixing, turn off the oven and put the covered dough in the warm oven for 20-25 minutes or until it has doubled in size.
- When dough has doubled in size, sprinkle it with flour and punch it down.



- Preheat oven to 475°F.
- Place baking sheets side by side on your middle rack, if possible, or you may need to bake in two batches if only one fits at a time. Before closing the oven throw 3-4 ice cubes in the bottom of your oven. (This is the magic step that makes them hard rolls)
- Bake rolls for 12-15 minutes or until golden brown.
- Cool rolls on a cooling rack

Multigrain dough:

INGREDIENTS

1 cup whole grains and seeds such as rolled oats, flax seeds, cornmeal, sesame seeds, hulled sunflower seeds, or quinoa, plus more for topping,

2 cups bread flour or all-purpose flour, plus more for surfaces,

1½ cups whole wheat flour,

½ cup rye flour,

2 tablespoons brown sugar,

¼ ounce (1 packet) active dry yeast,

1½ teaspoons salt,

Olive oil or vegetable oil, to grease the pan.

PREPARATION

- Soak the grains and seeds. In a medium bowl, combine grains and seeds. Cover with ½ cup boiling water and let sit at room temperature until water is completely absorbed and grains are room temperature, about 1–2 hours.
- Mix the flours. In a large bowl (or the bowl of a stand mixer) whisk together white flour, whole-wheat flour, and rye flour until combined.
- Mix dough. Add soaked grain mixture to flour mixture. On one side of the bowl, sprinkle brown sugar and instant yeast on top of the grains. On the opposite side of the bowl, sprinkle salt on top of the grains. (Placing the salt directly on the yeast can inhibit yeast activity.) Add 1½ cups warm water and stir to combine. Use your hands to



Fig 14. Multigrain dough



knead dough until somewhat smooth. Alternatively, use a stand mixer fitted with the dough hook attachment.

- Turn dough out onto a lightly floured work surface and let it rest 5 minutes. Lightly sprinkle the surface of the dough with more flour and gently pat it into an 8 by 14-inch rectangle. Working from the long edge, roll the dough into a tight log. Transfer dough log to a lightly oiled loaf pan, seam-side down, tucking the sides under to fit in the pan.
- Cover the loaf with a clean kitchen towel or plastic wrap. Let the dough rise in the bread pan in a warm place until doubled in size, 1–2 hours. Sprinkle loaf with more grains and seeds, if desired.
- Place a disposable foil pan on the bottom oven rack and heat the oven to 425°F. Working quickly, throw about ½ cup ice cubes into the foil pan and set the bread loaf pan on the middle rack. (The ice cubes will create steam to help the loaf bake evenly.) If you have a pizza stone or baking stone, you can preheat that and bake the loaf on top of the stone for a crustier loaf. Reduce oven temperature to 400°F and bake 20 minutes, then rotate the pan. Continue baking until the loaf is deeply brown and its internal temperature reads 195–200°F, about 20–30 more minutes. Remove loaf from the pan and cool on a wire rack until completely cool, about 1–2 hours.

Sweet Short crust Pastry:

INGREDIENTS

- 265 g (2 cups) plain flour,
- 3 tbs caster, sugar superfine sugar,
- 150 g butter cold and chopped,
- 2-3 tbs icy cold water see notes

PREPARATION

Conventional Method

- Place the flour, sugar and butter into a food processor and process it until it resembles fine breadcrumbs.
- Slowly adding the iced water until a smooth dough form.



Fig 15. Sweet Short crust Pastry



Notes

- Knead the dough into a ball on a lightly floured surface.
- Wrap in plastic wrap and place it into the fridge for at least 30 minutes.
- When you're ready to use your dough, roll it out on a lightly floured surface with a rolling pin until it is 3mm thick.
- If you're making a pie or dessert that has both a pastry bottom and top, it's best to divide your dough into 2 and roll them out separately.
- Bake the pastry in an oven preheated to 180 degrees Celsius for approximately 20 minutes or until lightly golden and crispy.
- Please note that if you're not adding the pie/dessert filling immediately, place a sheet of baking paper over the bottom of the pastry and fill with baking weights or rice (uncooked) before placing into the oven. Remove the weights halfway through the baking time.

Thermomix Method

- Place the flour, sugar and butter into the TM bowl and mix on Speed 6 for 10 seconds (or until it resembles fine breadcrumbs).
- Add the iced water and knead for 1 minute on interval speed.
- Knead the dough into a ball on a lightly floured surface.
- Wrap in plastic wrap and place it into the fridge for at least 30 minutes.
- When you're ready to use your dough, roll it out on a lightly floured surface with a rolling pin until it is 3mm thick.
- If you're making a pie or dessert that has both a pastry bottom and top, it's best to divide your dough into 2 and roll them out separately.
- Bake the pastry in an oven preheated to 180°C for approximately 20 minutes or until lightly golden and crispy.
- Please note that if you're not adding the pie/dessert filling immediately, place a sheet of baking paper over



Steam injection proofers

Saturated steam at low pressure, from a remote or built-in boiler, is released into the air to bring the internal proofer atmosphere to the [humidity set point \(%RH\)](#) for proofing. Temperature of the moist air is controlled by heat exchangers, usually radiators.

Water spraying proofers

Instead of using steam to increase the air moisture content, atomized water is sprayed from nozzles to maintain the dough's moist external surface. The humid air is also heated by heat exchangers to set the required temperature. Conditions provided by the proofer help ensure moist dough external surface moist. Formation of a dry skin is an indication of improperly functioning / designed proofer.

Oven

An oven is a device for cooking that is like a [box](#) with a [door](#). You heat it and cook food [inside](#) it.

Types of ovens

Double oven: A built-in oven fixture that has either two ovens, or one oven and one microwave oven. It is usually built into the kitchen cabinet.



Fig 17. Double oven

Earth oven: An earth oven is a pit dug into the ground and then heated, usually by rocks or smoldering debris. Historically these have been used by many cultures for cooking. Cooking times are usually long, and the process is usually cooking by slow roasting the food. Earth ovens are among the most common things archaeologists look for at an anthropological dig, as they are one of the key indicators of human civilization and static society.



Fig 18. Earth oven





Fig 19. Ceramic oven



Fig 20. Gas oven

Ceramic oven: The ceramic oven is an oven constructed of clay or any other ceramic material and takes different forms depending on the culture. The Indians refer to it as a tandoor, and use it for cooking. They can be dated back as far as 3,000 BC, and they have been argued to have their origins in the Indus Valley. Brick ovens are also another ceramic type oven. A culture most notable for the use of brick ovens is Italy and its intimate history with pizza. However, its history also dates further back to Roman times, wherein the brick oven was used not only for commercial use but household use as well.

Gas oven: One of the first recorded uses of a gas stove and oven referenced a dinner party in 1802 hosted by Zachaus Winzler, where all the food was prepared either on a gas stove or in its oven compartment. In 1834, British inventor James Sharp began to commercially produce gas ovens after installing one in his own house. In 1851, the Bower's Registered Gas Stove was displayed at the Great Exhibition. This stove would set the standard and basis for the modern gas oven. Notable improvements to the gas stove since include the addition of the thermostat which assisted in temperature regulation; also an enamel coating was added to the production of gas stoves and ovens in order to help with easier cleaning.

Electric oven: These produce their heat electrically, often via resistive heating.



Fig 21. Electric oven



Fig 22. Toaster oven

Toaster oven: Toaster ovens are small electric ovens with a front door, wire rack and removable baking pan. To toast bread with a toaster oven, slices of bread are placed horizontally on the rack. When the toast is done, the toaster turns off, but in most cases the door must be opened manually. Most toaster ovens are significantly larger than toasters, but are capable of performing most of the functions of electric ovens, albeit on a much smaller scale.

Masonry oven: Masonry ovens consist of a baking chamber made of fireproof brick, concrete, stone, or clay. Though traditionally wood-fired, coal-fired ovens were common in the 19th century. Modern masonry ovens are often fired with natural gas or even electricity, and are closely associated with artisanal bread and pizza. In the past, however, they were also used for any cooking task that required baking.



Fig 23. Masonry oven

Microwave oven: An oven that cooks food using microwave radiation rather than infrared radiation (typically a fire source). Conceptualized in 1946, Dr. Percy Spencer allegedly discovered the heating properties of microwaves while studying the magnetron. By 1947, the first commercial microwave was in use in Boston, Mass.



Fig 24. Microwave oven

Wall oven: Wall ovens make it easier to work with large roasting pans and Dutch ovens. A width is typically 24, 27, or 30 inches. Mounted at waist or eye level, a wall oven eliminates bending. However, it can be nested under a countertop to save space. A separate wall oven is expensive compared with a range.



Fig 25. Wall oven

Steam oven: An oven that cooks food using steam to provide heat.



Fig 26. Steam oven



3.2.2 Oven Baking Process

There are some major stages in the Oven baking process: expansion of the dough, drying of the surface, and crust browning. These can be subdivided into the following stages (in the order of temperature increase):

- 1. Formation and expansion of gases (oven spring).**
A rapid rise in volume takes place at the beginning of baking at a core temperature of 35–70°C (95–158°F). This rise creates the oven spring. Five events occur simultaneously to produce the oven spring in the first 5–8 minutes of baking:
 - Yeast reaches its maximum fermentation rate and generates carbon dioxide, CO₂ gas (CO₂ is also produced by chemical leavening).
 - Release of carbon dioxide gas from the saturated liquid dough phase into the surrounding gas cells.
 - Expansion of the gasses trapped in cells (nitrogen from air and CO₂) and generated during mixing, makeup, and proofing.
 - Evaporation of water/ethanol mixture.
- 2. Killing of yeast and other microorganisms.** This usually occurs at an internal temperature of 60–70°C (140–160°F) where the cells can no longer contribute to the gas production or volume increase.
- 3. Gelatinization of starch.** At 76°C (170°F), starch begins to gelatinize as granules become fully swollen with local free water. Thanks to starch gelatinization and protein denaturation, the dough is converted into bread and a structure is set.
- 4. Coagulation/denaturation of gluten (egg or other) proteins** that make up the continuous phase. From 60 to 70°C (140 to 160°F), the proteins begin to denature. As a consequence, gluten becomes increasingly tough and stiff as it irreversibly forms a gel. Moisture loss also imparts rigidity to the product being baked.
- 5. Inactivation of enzymes** in the dough (naturally-occurring or added) at 80–95°C (176–203°F).



6. **Crust formation and browning** (non-enzymatic browning reactions and caramelization). **Maillard browning** takes place above 105°C (220°F) and requires the presence of a reducing sugar together with an amino acid. Sugars caramelize at 160°C (320°F).

Baking of chemically-leavened products

In this case, the three stages of baking (oven spring, setting of structure and crust formation/coloration) can undergo changes in response to differences in type and amount of ingredients in formulation. Chemical reactions and physical transitions during heat processing may be affected by:

- High content of water in system (hydration of flour and other dry ingredients) which creates a liquid or fluid batter.
- Flour to sugar ratio (high ratio cakes contain more sugar than flour). This has a big impact on starch gelatinization, protein coagulation and water evaporation. Low flour content also requires higher levels of structure building ingredients such as whole eggs.
- Rich formulations (higher content of soluble solids such as sugars, fat, etc.) that shift the system towards an aerated oil-in-water emulsion known as batter.
- Absence of yeast but presence of leavening acids and bases that can modify leavening reactions and these require specific conditions of temperature and available water.
- Modification of pH due to the presence of chemical leaveners which can affect final color of crust/crumb and taste of finished product.

The baking process is responsible for major weight loss in the dough/batter, mainly moisture (8–12%) and volatile organic compounds, especially in pan breads and buns. Chemically-leavened products may have higher bake losses. For labeling purposes, the loss in weight during baking is taken into account during dough dividing or batter depositing.

The main parameters involved in the baking process include: time, temperature, humidity, air flow (convection systems) and heat





Fig 27. Bread cooling process

flux. These process variables are a function of the size, unit weight, formulation, water absorption, type and target characteristics of the finished product. Baking times may range from 2–60 minutes, depending on the type of oven and heating pattern.

3.2.3 Cooling procedures for different baked products

Bread Cooling:

Bread cooling is a crucial step in bread production. The main goal is to decrease the internal temperature of the baked bread from 93–97°C (200–208°F), at depanning or coming out of the oven, to 32–43°C (90–110°F). This step allows the finished product to achieve optimum keeping quality and comply with legal moisture limit of 38%.

Bread can be cooled either:

- **Manually** by placing on cooling racks after depanning (ambient or natural cooling)
- **Automatically** using racks, trays, or continuous conveyor belts (or spirals in wholesale bread making operations)

As the loaf cools, some of the moisture moves toward the crust which becomes softer or leathery unlike the hard shell it acquired in the oven. Cooled bread is immediately sliced, bagged or packaged



Fig 28. Biscuit cooling process

Biscuit Cooling:

Before packaging, biscuits are cooled to near-ambient temperature. This is normally accomplished by a series of conveyors carrying the biscuits for a period of 1.5–2.0 times that of the baking time, when the biscuits will be sufficiently cool for packaging. This cooling time has a second function, to reduce the moisture gradient from the centre of the biscuits, which is moister, to the surface of the biscuits, which is very dry. If this moisture gradient is too high, it may cause ‘checking’ a condition of small hairline cracks in the biscuits after packaging. After cooling, the biscuits are marshalled for packaging. The biscuit handling system may consist of an automatic lane reduction and stacking facility to channel the biscuits into a suitable arrangement for transfer to the packaging machines. Most biscuit lines will have automatic metal detection and check weighing systems for the final packaged products.

Cake Cooling:

Cake cooling has 2 methods:

- i) Cooling a Cake in the Refrigerator
- ii) Cooling a Cake on a Cooling Rack

i) Cooling a Cake in the Refrigerator

Refrigerated cooling systems are widely used technology and present in some form in virtually every food processing plant. Refrigeration is the withdrawal of heat from a chamber (refrigeration load) to achieve temperatures lower than ambient temperatures. After heat is withdrawn, it is transferred to a condenser and dissipated to air or water. The purpose of refrigerated cooling systems in food processing is to preserve quality and delay spoilage.

Depending on the type of cake, cooling using this method can be done in just a couple of hours. Here are some things to consider:

- Angel food cakes, pound cakes, sponge cakes and other light and fluffy cakes can cool in the refrigerator in about 1-2 hours.
- This method may not be the best choice for a cheesecake, as quick changes of temperature can upset the structure of the cake, causing cracks. For rich, creamy cakes that are served chilled, this method may take you up to 4 hours.
- If you are cooling a traditional cake, this method will take you about 2-3 hours.

ii) Cooling a Cake on a Cooling Rack

Choose the right cooling rack. Make sure to pick your cooling rack according to the size of the cake you are baking. 10-inches seems to be the largest standard pan size (for bundt cakes and round cakes), so a rack that is at least 10-inches across should serve just about all of your needs. Cooling racks are an essential tool for any baker as they help your cake cool evenly and quickly. Here are a few things to consider:

- Pick a wire rack that is easy to fit in your dishwasher and in the area you plan to store it.



Fig 29. cake cooling process in a refrigerator



Fig 30. cake cooling process in a rack



- Cooling racks work by allowing air to circulate under your cake, which helps prevent condensation which could make the bottom soggy.

3.2.4 Dos & Don'ts of Baking

1. Do read the recipe right through
2. Do preheat the oven according to the recipe
3. Do get to know your oven's idiosyncrasies
4. Do prepare baking pans as indicated by the recipe
5. Do weigh and measure ingredients accurately
6. Don't skip the sifting step
7. Don't substitute unless the recipe indicates it's okay to do so
8. Don't use a different sized pan than indicated in the recipe and expect the same results
9. Don't over mix your dough
10. Don't open the oven door too early

3.3.1 Packaging of bakery products:

Biscuits:

Packaging Materials Biscuits a wide range of packaging materials is used to pack biscuits. Since paper cartons, tins have lost out to flexible packaging materials as the packaging medium, focus is now on the latter. A variety of flexible packaging materials are used for packing biscuits due to advantages such as functionality, lower cost, printability, light weight, savings in freight and other such factors.

- **Flexible Packaging Materials:** These are used as wrappers, pre-formed pouches or form-fill pouches. The oldest flexible film to be used was cellophane because of its excellent gas barrier properties and heat seal ability. MST, MSAT, Coated Cellophane (MXXT) offer excellent moisture barrier, heat seal ability and gloss. Cellophane became less popular when it became too expensive and with the introduction of new materials with better properties. Another material, which is widely used is Biaxially Oriented Polypropylene film commonly known as OPP. For less demanding applications OPP mono film is used while for higher quality products, duplex OPP or OPP combinations (pearlised or metallised) such as OPP/PE, OPP/PET etc. are used.



Today most of the biscuits are packed in flexible laminates of composite structures, where every component fulfills a specific function. These laminates have desirable properties such as moisture barrier, gas barrier heat seal ability, printability characteristics, high production and overall economy.



Fig 31. Biscuit packed in flexible laminates

- **Thermoformed Plastic Trays:** Thermoformed plastic trays of polystyrene or PVC with multiple cavities are used to pack assorted biscuits, pastries, cookies etc. They are closed with a snap-on lid or overwrapped or shrink-wrapped or sealed with a lidding material. The products rest nicely in the compartments and make a good presentation. Use of active packaging with oxygen absorbent and antimicrobial properties for bakery products helps to significantly increase the shelf-life and maintain the original quality of the product. PVDC coated nylon, polyester, LDPE, PP, ethylene vinyl alcohol, polystyrene are examples of flexible packaging material used with active sachet.



Fig 32. Biscuit packed in thermoplastic trays



Bread:

Bread traditionally, bread in India was packed in waxed paper wrappers. The search for lower cost over wrapping materials led to the use of polyethylene film and nearly 80% of all bread is now packed in plastics films such as LDPE, LLDPE-LDPE and PP. Also, auto bagging machines require high slip PE resin i.e. pouches with good openability. LLDPE/ LDPE bags of 1 to 1.5 mm thickness secured by plastic clip or twisted wire ties are normally used.



Fig 33. Bread packed in plastic films

Cakes, Pastries, Doughnuts:

Cakes, Pastries, Doughnuts These products are available in various sizes, shapes and forms. Since these products contain high moisture content, they are prone to mould growth and hence the packaging material selected should not encourage mould growth. The packaging material used is Polypropylene (PP), Cast Polypropylene (CPP), Poly Vinyl Chloride (PVC) etc., while the choice of the film depends upon the machinability and economics required.



Fig 34. Cakes packed in Polypropylene (PP)

3.3.2 Storage of raw material

A food business shall store food & packaging material in appropriate areas for effective protection from dust, condensation, drains, waste & other sources of contamination during storage. Storage areas shall be dry and well ventilated. All material shall be stored as per their temperature & humidity requirements & in particular section. Material shall be stored off the floor & away from walls. Wooden pallets are not recommended, as they are source of pest harborage. In case wooden pallets are used, they should be fumigated once in six months. A distance of 0.5 feet off the floor & 1.5 feet away from floor is preferred to be maintained. In case large godown are there, distance should be maintained between the pallets also, to avoid pest activity & ease of cleaning.



Fig 35. Storage of raw material

The storage shall be subjected to First in First Out or First Expiry First Out approach. To meet this, adequate stock rotation systems should be in place. No expired material shall be stored in the storage section and sent to production. As far as possible, secondary cartons should be removed before sending the raw material/packing material in production/packaging area. All glass bottles should be stored at the lowermost level, to avoid contamination in case of breakage. Wrappers & trays should be kept under fumigation & ozonization. All wrappers should be shrunk wrap. All containers used for storing raw material & finished product should be kept covered. Product that are sensitive to environmental conditions (for ex humidity, light) should be stored in appropriate conditions to prevent deterioration.



During bulk flour handling & storage:

- House couplings, inside & outside plants, should be adequately protected from rodents, clean & in good repair.
- Dust collectors or ventilators bags at the top of the bulk tank should be clean & insect free.
- Inspection parts
- Cleanable/covered & free from contamination.
- Tailings from sifting operations should be free from contamination.

3.3.3 Storage and shelf life of finished products:

Bakery products are an important part of a balanced diet and, today, a wide variety of such products can be found on supermarket shelves. This includes unsweetened goods (bread, rolls, buns, crumpets, muffins and bagels), sweet goods (pancakes, doughnuts, waffles and cookies) and filled goods (fruit and meat pies, sausage rolls, pastries, sandwiches, cream cakes, pizza and quiche). However, bakery products, like many processed foods, are subject to physical, chemical and microbiological spoilage. While physical and chemical spoilage limits the shelf life of low and intermediate moisture bakery products, microbiological spoilage by bacteria, yeast and molds is the concern in high moisture products i.e., products with a water activity (a_w) >0.85 . Furthermore, several bakery products also have been implicated in foodborne illnesses involving *Salmonella* spp., *Listeria monocytogenes* and *Bacillus cereus*, while *Clostridium botulinum* is a concern in high moisture bakery products packaged under modified atmospheres. This extensive review is divided into two parts. Part I focuses on the spoilage concerns of low, intermediate and high moisture bakery products while Part II focuses on the safety concerns of high moisture bakery products only. In both parts, traditional and novel methods of food preservation that can be used by the bakery industry to extend the shelf life and enhance the safety of products are discussed in detail.

Shelf-life extension is an effort to make food safe for long periods, still keeping its original quality. Baked products beyond their shelf life can become:





Fig 36. Bakery waste

- Stale, firm and dry
- Less resilient
- Not as flavourful
- Unsafe due to microbial growth

Advances in bakery processing technologies and ingredients innovation have led to significant shelf-life extension. For example, breads and buns that traditionally lasted 6 or 10 days, now remain soft, springy and mold-free up to 3 weeks.

3.4.1 Cleaning machinery, tools and equipment

Any food processing plant, including a commercial bakery, must follow a high-quality cleaning and maintenance program to prevent food contamination. Baked-on stains on the baking racks, splattered food on the pots, and burnt food in the pans are everyday occurrences. They must be tackled on a daily basis using efficient bakery steam cleaning equipment.



Fig 37. Bakery cleaning process

Cleaning of tough deposits, messy pots, racks, and trays using ordinary bakery cleaning equipment can not only be time-consuming but also highly stressful on the personnel manning the operation. There are a lot of areas and equipment to take care of in



Notes

a commercial bakery. Apart from the floors and walls, equipment such as dough rollers, mixers, retarder proofers, ovens, conveyor belts, bread slicers, and other daily use materials, must be cleaned thoroughly and regularly to maintain the highest standards of hygiene and sanitation in the bakery.

The unmatched cleaning power of steam power washers the best results in commercial bakeries cleaning can be achieved by using wet steam pressure washer systems. By their nature, commercial bakeries do not want excess water and moisture. Bakery steam cleaning machines from top suppliers can help bakery owners tackle the various challenges of bakery cleaning. However, it is important to choose the right type of steam cleaning systems that can match the specific cleaning needs of your commercial bakery.



Fig 38. Bakery cleaning process steam power washing

Superior cleaning without chemicals and manual scrubbing

Normal cleaning procedures are time consuming and labor intensive. The cleaning involves the use of excessive amounts of water, chemicals, scrubbing, and rinsing. By using a powerful wet steam pressure washer, cleaning professionals can achieve amazing cleaning results within the quickest possible time. The relatively low water consumption makes cleaning faster and less cumbersome, as the high steam temperature level can easily dislodge tough deposits from a variety of surfaces.



There are numerous benefits of using the best bakery steam cleaner available for bakery-specific cleaning applications:

- The best steam pressure washer offers the highest steam temperature in the industry, which helps clean surfaces better than hot water pressure washers.
- The robust construction and best quality components ensure consistently high performance and extreme durability.
- Temperature control features allow operators to set temperature levels to match the demands of various cleaning applications.
- They come with a host of advanced technologies to clean faster and offer better user-convenience.

Top of Form



3.4.2 Cleaning Procedure

Closed and open equipment in the baking industry

In the practice, it is easier if the machinery/equipment is classified as open or closed equipment. This way, the design, construction, installation, cleaning, maintenance, and food safety conditions can be better planned and managed:

Open equipment

Open equipment is that which cannot be cleaned in place (CIP), and in which the products being processed or handled are not fully enclosed (i.e., isolated from the plant environment) by a continuous wall (e.g., piping, vacuum cavities, tubing, barrels).

Open equipment often requires:

1. Cleaning out of place (COP)
2. Manual cleaning
3. Immersion cleaning

Open equipment must be manually dismantled for cleaning. Such tasks can be performed with open plant cleaning (OPC) techniques, like foam cleaning and rinsing with medium-pressure systems (e.g., up to 40 bar). Dismantled machine parts can be cleaned in COP baths. The time required will depend mostly on validation of microbiological monitoring results. The time will vary depending on the available cleaning equipment and utensils.



state. Baking plants are special processing environments in which chemical reactions and physical transitions take place within the production line. All these conditions must be considered when designing, constructing and/or buying equipment.

3.4.3 Minor repairs

Major equipment in bakery are Mixers, Ovens, Packing machines, Air Compressors, Material Handling equipment, Fire Hydrant Systems, Bulk Handling systems, Grinders, Motors, Gear Boxes, Fans, Screw Conveyors, Gears and Chain, Burners and Sprockets. A good maintenance system would have the following elements of maintenance system in place.

Manpower

A bakery plant would have an engineering head / plant manager / maintenance manager who is responsible for all activity related to plant and machinery. Depending upon the size and hours of operation, factory needs to have skilled technicians who would perform maintenance jobs. Planning and scheduling are done with machine history. Idle time available for maintenance and requirement of machinery in accordance with production planning.

Manpower requirement varies as per size of the plant. We can have

Three shift coverage - 8 hrs. Shift

Two shift coverage - 12 hrs. Shift

General shift coverage - 8/12 hrs. Shift

Each shift coverage needs to have foreman, Fitters / technician (Elect/Mech) and Helpers. Now days concept of outsourcing of maintenance part are being implemented but this concept is yet to take ground as factories still prefer to have their own maintenance personnel.

Tools

Maintenance work force requires all basic to advance tools to perform their job efficiently. I have been observed few task which could have been done are executed by people from outside as the maintenance team lack latest or basic tools to perform. Training for maintenance personnel by the machine manufacturers / tool manufacturer should be included in factory programs.



Critical Spare Inventory

A small store to cater all critical and regular spares with a person responsible for monitoring /inspection/liasing for stock out material /indent with purchase dept. is must for any medium to big bakery plants .Concept of making spare available at work station or production hall are popular in many factories.

Predictive Maintenance

This methods utilises prior diagnosis of any aberration from ideal operations with help of sensing equipment through Inspection.

Heat

Noise

Smell

Equipment used are Multimeter, Ultrasonic equipment, Vibration analyser, Decibel Meters, Infra-red equipment. Now days PLC based systems are common hence system health can be checked through various software .

Preventive Maintenance

This is the most common practice for plant maintenance as this is based on equipments life preventive maintenance can be scheduled by number of hours or days such as weekly /monthly/ half yearly/annually.

Preventive maintenance is done with schedules in hand and could be planned and required spares could be ordered as per plan. Preventive maintenance main activity can be divided into C-O-T:

C - Cleaning of equipments is Very Important as majority of break downs happens due to lack of proper cleaning

O - Oiling or topping for gearboxes, chain and sprockets, moving parts, lubricating systems.

T - Tightening of all fastener which have loosened in operations or which could not be done in course of production.



Normally for bakeries a day is fixed in a week for preventive maintenance. Maintenance jobs are listed in the course of the week and all critical repair, replacement and modifications are done on preventive maintenance along with regular maintenance job (COT).

Break Down Maintenance:

Break Down maintenance requires immediate actions as to run the production with quick fix solution or whatever best in those circumstances. Break down maintenance would need to be done when we take preventive maintenance of the equipment. This may require certain by pass, modification and alternation from basic set up. For such type of maintenance skill and level of experience, the technician comes into role. Therefore, training and seminars must be conducted to improve the analytical and trouble shooting skills of the technicians.

Records or Log books

Maintenance log book should be filled or written by shift technicians on observations during break downs such as action taken, material replaced or repaired and job to be done by the next shift personnel. The log book should be the basis of any major overhaul during preventive maintenance. Other important documents and records which are to be maintained are

Checklist for equipments

Layout Diagram of Machinery

Operations and Maintenance Book from Manufacturers

Circuit Diagram

Cross Section Diagrams

Safety Precautions during maintenance

These also helps in root cause analysis of the problem Circuits/layout / cross section diagrams along with operation and maintenance manual to be kept handy and to ensure that they are available for study. This is very important for the maintenance activity.



Notes

Glossary:

Granulate	- Grind or Powder
Extraneous	- External to a thing
Sprinkle	- Dredge or Dust
Masonry	- Stone wall or Brick wall
Cumbersome	- Useless or ineffective
Viscosity	- A measure of a fluid's resistance to flow
Foodborne illness	- Caused by consuming contaminated foods or beverages
Dough	- The thick uncooked mass of combined ingredients for bread rolls and biscuits
Leavening	- Raising or lightening by air steam or gas
Prove	- The filling of yeast dough with gas
Mould	- The operation of shaping dough either by hand or by machine
Icing sugar	- Very finely powdered sugar that has been sieved through a fine mesh

EVALUATION**Choose the correct answer****10×1=10**

- The flour with the protein level of _____ is best.
 - Less than 9%
 - More than 9.5%
 - More than 10.5%
 - Equal to 10%
- pH level of baking soda is _____.
 - 6 to 7
 - 7 to 8
 - 8 to 9
 - 9 to 10



Notes

3. Vanilla used in its flavours within limits of _____ percent based on flour.
 - a) 0.5 to 1
 - b) 1 to 1.5
 - c) 1.5 to 2
 - d) 2 to 2.5
4. Preheat the oven to _____ make a Muffins
 - a) 375°F
 - b) 275°F
 - c) 175°F
 - d) 475°F
5. Bake the pastry in an oven preheated to _____ Celsius for 20 minutes.
 - a) 180o
 - b) 360o
 - c) 90o
 - d) 270o
6. _____ make it easier to work with large roasting pans and Dutch ovens.
 - a) Microwave Oven
 - b) Toaster Oven
 - c) Wall Oven
 - d) Ceramic Oven
7. Bread cooling is a _____ step in bread production.
 - a) Minor
 - b) Crucial
 - c) Missing
 - d) Small
8. Thickness of LLDPE / LDPE bags is _____
 - a) 1 to 1.5 mm
 - b) 0.5 to 1 mm
 - c) 0.1 to 0.5 mm
 - d) 1.5 to 2 mm
9. Three shift coverage is _____
 - a) 12 hrs shift
 - b) 6 hrs shift
 - c) 8 hrs shift
 - d) 4 hrs shift
10. Materials storage area shall be _____
 - a) wet
 - b) dark
 - c) dry
 - d) heat



Answer the following**15×2=30**

1. What are the main ingredients used in Bakery?
2. What is the role of leavening agents in bakery products?
3. What are the quality parameters for condiments?
4. What are the ingredients need to make Muffins?
5. What is Oven? Write and its types.
6. Explain about Earth Oven.
7. List out the stages of oven baking process.
8. Give short note about biscuit cooling.
9. What are Dos of baking?
10. Write about the bread packaging.
11. Write about the baked products beyond their shelf life?
12. what are the benefits of using the best bakery steam cleaner?
13. Write about the general procedures include in CIP.
14. Write about break down maintenance.
15. How can we maintain the records or log books in bakery sector?

Answer in detail**6×3=18**

1. What are the quality parameters for flour, fat & egg?
2. Explain about Leavening agents and its types.
3. Give brief notes about preparation of dough.
4. What are the cooling procedures for cake and explain it?
5. Explain about storage of raw materials in bakery sector.
6. What are the cleaning procedures in bakery?



PRACTICAL ACTIVITY

1. Identify the difference between dough and batter

OBJECTIVE: To identify the difference between Dough & Batter

MATERIALS REQUIRED:

1. Dough
2. Batter

CONCLUSION:

2. Identify the under proofed and over proofed dough

OBJECTIVE: To identify the under proofed and over proofed dough

MATERIALS REQUIRED:

1. Under proofed Dough
2. Over proofed Dough

CONCLUSION:

3. Identify half baked, baked and over baked products

OBJECTIVE: To identify the half-baked, baked and over baked products

MATERIALS REQUIRED:

1. Baked Products

CONCLUSION:



4. Visit to nearby baking centre to see the difference between continuous and batch making process

5. Demonstrate cooling, packing and storage process of bread, biscuit, cakes, rusk / toast

OBJECTIVE: To understand the cooling, packing and storage process of the bakery products.

CONCLUSION:

6. Demonstrate the differences between CIP and COP.

OBJECTIVE: To demonstrate the difference between CIP & COP.

MATERIALS REQUIRED:

- 1. Bakery Materials
- 2. Cleaning Products

7. Enlist the items cleaned through COP.

OBJECTIVE: List the items cleaned through COP

CONCLUSION:



4

DOCUMENTATION AND RECORD KEEPING

- To Keep record of raw material at collection stage and understand loading process of raw material details in enterprise resource planning (ERP).
- To Assess the details to be documented at production schedule.
- To document and maintain records.



Learning Outcomes

4.1. Record keeping

One of the main parts of accounting is record keeping or book keeping. As with all other inputs to a business, keeping records is an investment of time and money and the benefits must outweigh the costs. There is no point in recording information for its own sake and records must be used if they are to have any value. This means that the owner or manager must understand why the information is collected and what it can be used for. The time and effort spent in keeping records must be related to the scale and profitability of the business.

Definition: Record keeping is the process of recording transactions and events in an accounting system. Since the



Notes

principles of accounting rely on accurate and thorough records, record keeping is the foundation accounting.



Before computers and servers became widespread, accounting records were recorded on ledger paper by hand. Each account was manually transferred from the general ledger to T-accounts in order assembly reports and financial statements. Today technology has change accounting systems and record keeping procedures. Most of these accounting processes that were done manually in the past are now automated. The time savings and reliability of accounting systems also help create more accurate records.

4.1.1. What Does Record Keeping Mean?

Many times, accounting and record keeping are used interchangeably, but this is incorrect. Accounting has a much broader definition than simply recording transactions in an accounting system. Accounting is used to identify events that need to be recorded, recording the transactions of these events, and communicating the effects of these transactions with people inside and outside of the company. As you can see, record keeping is only a small part of the broader definition of accounting.

4.1.2. Value of record keeping:

- Detailed knowledge about the operation of the business
- Identification of trends
- Accurate control over finances and product quality
- Identification of individual costs to allow changes to a product or process to optimise profits
- Keeping track of money owed to the business
- Evidence for tax authorities (may be a legal requirement)



- Factual basis for product pricing or salary levels
- Knowledge and avoidance of theft.

There are three sets of basic records that should be kept by the owner of a bakery and food processing unit:

1. Financial records,
2. Those that relate to the production of the products and
3. Sales records.



The uses of these records are inter-related. Accurate information is essential and this means that staff who are required to collect information should know its value and why it is being collected. This should be part of the induction and training when new staff learn their job. The entrepreneur should employ people who have the skills and aptitude to do the work, but should also put in place a system of checks to ensure that one person does not have responsibility for a whole area of business activity. The owner or manager should also ensure that all records are kept up to date and where appropriate, the arithmetic is checked for accuracy. There is no single correct way to keep records and individual owners should devise systems that suit their way of working.

4.2. Financial and sales records

A separate record of the cash that comes into a business and the cash that is used to buy daily items is usefully prepared using a Cash Book. Additionally, when entrepreneurs have a bank account, they will require a Bank Book to record cheques that have been received and paid, using the same headings.



Example of a Cash Book layout

Date	Item	Cash In	Cash Out	Balance
	Description of invoice number.			

It is important to know how much money the business is owed by debtors at any given time but also how much is owed to creditors. This is particularly important if for example, retailers expect a period of credit before they pay for goods received. The amount of money owed by an enterprise and the amount owing to it can be combined in a single ledger so that a weekly comparison of the difference can be made. Invoices and receipts should be kept together in date order. An example of this type of ledger is an Accounts Receivable and Payable Book.

Example of an Accounts Receivable and Payable Book

Date	Item	Credit given	Balance	Date	Item	Credit taken	Balance
	Description or receipt number				Description or invoice number		

Other books can be used but these are the basic requirement for collecting all financial information needed to prepare monthly profit and loss statements, balance sheets and to check cashflow forecasts. The other information needed to prepare profit and loss statements are records of sales and stock in the storeroom.

Example of a page from a Sales Book

Product Name _____			Batch Number _____		
Date	Customer	Amount Sold	Value	Invoice Date	Payment Date
	Write in amount in kg or number of packs				



Records that are kept by storekeepers show which products and materials are transferred into and out of the store-rooms. The balance is used to indicate when reordering is needed and can also be used to highlight pilferage or other losses that are not accounted for data from the sales book is totalled to give monthly income. The costs of ingredients, packaging etc., that were used during the month are recorded in the storekeeper’s book and other expenses are totalled from the cash book and bank book to calculate the monthly Profit and Loss Account.

Example of a Storekeeper’s Book to keep account of ingredients (similar entries are made for packaging, materials and finished products).

Ingredient name _____				
Date	Amount to store	Amount from store	Process batch number	Balance
	Write amounts in kg or number of packs.			

Data from the sales book is totalled to give monthly income. The costs of ingredients, packaging etc., that were used during the month are recorded in the storekeeper’s book and other expenses are totalled from the cash book and bank book to calculate the monthly Profit and Loss Account.

The Profit and Loss Account describes how money comes into and leaves a business over a month (or other suitable period of time). This allows the owner to plot the progress of the business and compare the results to those expected in the Business Plan.

However, to obtain a ‘snapshot’ of the performance of the business at a given moment, a balance sheet is a strong management tool which can help to understand where money came from, how it is used in a business and how it could be better used. An example of a balance sheet from a small wine-making business is shown below



Notes

Example of a monthly Profit and Loss Account

Month: April			
Item	Rs in thousands		
Income from sales		750	from Sales Book
Less costs			
Opening stocks	25		
Purchases	55		
Stocks at end of the month	30		
= Stocks used during month	50		from Storeroom Ledger
Gross profit		700	
Less other expenses			
Salaries	75		
Rent	25		
Supplies	20		from cash and bank books
Transport	45		
Marketing costs	25		
Interest repaid to lender	18		
Taxes paid	6		
	214		
Net profit		486	

The balance sheet is therefore a statement about the money in a business at a particular time, which shows how the money is being used (the assets) and where it came from (the liabilities). In the above example, the money that remains in the business as unclaimed profits is a main source of working capital. It is important to note that the owner has already taken a salary from the business and that the remaining profit belongs to the business to be used for reinvestment. This picture of the business can be used to determine, for example, whether more stock should be ordered, whether unpaid invoices to retailers should be followed up urgently or whether there are sufficient profits to repay a larger amount from the loan.



Example of a balance sheet for a small wine-maker

Where money came from (Liabilities) (in lakhs)		How the money was used (Assets) (in lakhs)	
Accounts payable	450	Cash	65
Customer payments	865	Accounts receivable	650
Bank loan	1200	Stocks	600
Owner's capital	500	Equipment	2180
Profits	880	Owner's salary	400
	3895		3895

Notes

4.3. Definition of Enterprise Resource Planning (ERP)

Enterprise resource planning (ERP) refers to a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, project management, risk management and compliance, and supply chain operations. A complete ERP suite also includes enterprise performance management, software that helps plan, budget, predict, and report on an organization's financial results.

ERP systems tie together a multitude of business processes and enable the flow of data between them. By collecting an organization's shared transactional data from multiple sources, ERP systems eliminate data duplication and provide data integrity with a single source of truth.

Why Is ERP Important for Businesses?

ERP systems have become table stakes for businesses looking to use resources wisely. They can help leaders reallocate human and financial capital or build more efficient processes that save money without sacrificing on quality or performance.

A true Enterprise Resource Planning (ERP) system integrates both internal and external information flows used by the organization within a single, comprehensive solution. An ERP solution incorporates the practical systems used by organizations to manage the basic commercial functions of their business, such as: planning, inventory or materials management, purchasing, manufacturing, finance, accounting, human resources, marketing and sales, services etc. The objective of the ERP solution is to drive the flow of information between all internal business functions while managing connections, or “touch points”.



Notes

ERP solutions run on a variety of computer hardware and network configurations, including “on premises” (i.e., client/server) or hosted (i.e., “cloud-based” or Software as a Service). ERP solutions use a common database to hold information from the various business functions that’s accessible in some form or another by various users. The use of an integrated database to manage the solution’s multi-module application framework within a common information system is one of the primary ERP benefits of this kind of system over “point solutions”.



Unlike point solutions (historically used by small to midsize businesses) that rely on multiple (sometimes duplicating) databases which strain IT resources, ERP solutions standardize the use of one application to run an entire business. This not only increases efficiencies, but also decreases the overall total cost of ownership (TCO), thereby reducing operational costs and improving the company’s profitability

Indent:

Indent is a document stating the requirements of goods with the quantity required along with its specification. It is sent to the store department, which in turn procures the items, and dispatches the same to the department on the day specified.



Indenting procedure:

Indenting of materials as per the requirement shall be done by the user department material indenting shall be done on indent book.

During indenting proper details of material shall be given in indent book. ex., item description, count/quantity required, quantity in stock, department name, remarks and nature of requirement (like immediate or normal) always details shall be furnished during indenting of materials.

User shall initiate the indenting procedure and duly signed it by the concerned HOD, store department etc.

Store officer upon receipt of Indent from user department shall forward it to purchase department for purchasing the material.

Receipt

After purchasing the materials, it shall be received at the site during receipt of material, the details shall be verified and checked against the indent book. Materials shall be received by store officer and he or she shall check the following document

- Invoice copy.
- The quantity of material shall be checked against the invoice and also the physical condition of materials and packets shall be checked for any damage.
- After complete verification the material shall be entered in its respective inward register.
- After involving the material original copy of invoice shall be sent to accounts or purchase department.

Storage

- The received materials upon complete verification by store officer shall be arranged and stored in designated racks as per the material.
- Separate storage provision shall be done for chemicals glassware and miscellaneous items.



FOOD STORE REQUISITION

DELIVERY DATE

INDENT NO.

DEPARTMENT

SLNO	STOCK NO.	ITEM	SIZE	QNTY REQUIRED	QNTY ISSUED	UNIT COST	TOTAL COST

REQUESTED BY-

INDENT MADE BY-

(CONTROLLER)

DELIVERED BY

RECEIVED BY

4.4. Production records

The main reasons for production records are to ensure that quality assurance procedures are in place and operating satisfactorily and to record the use of ingredients and amounts of stock for use in financial accounting. When raw materials are processed, each batch should be recorded in an Incoming Materials Test Book. The same layout can be used for recording incoming batches of ingredients and packaging materials, some of which also require inspection on arrival.

Records should also be kept of the amount and type of raw materials and ingredients that are used and the important processing conditions (e.g., drying times, heating times and temperatures etc.) to ensure that operators mix together the same ingredients in every batch and process them in the same way each time.

Each batch of food should be given a Batch Number which is recorded in stock control books, processing log books and product sales records. The batch numbers should be correlated with the product code numbers that are printed on labels or outer cartons. This allows the processor to trace any subsequent faults in a batch of product back to the process or to the raw materials.



4.4.1. Document and record maintenance of raw materials

1. Document and maintain record of details of all raw materials used such as names of raw materials, supplier details, receiving date/ date of manufacture, expiry date, supplier quality document, quality parameters for all raw materials, internal quality analysis report, etc., as per organization standards.
2. Maintain record of observations (if any) related to raw materials and packaging materials.
3. Load the raw material details in computer or in the ERP system followed by the organization for future reference.

Example of an Incoming Materials Test Book

Product Name _____		Batch Number _____		
Raw material	Supplier	Results of inspection for		
		A:	B:	C:
Write in either 'Pass/Fail' or observations on quality				

4.4.2. Maintaining records of production schedule

1. Document and maintain records of production details such as the product produced, production sequence, equipment and machinery details, efficiency and capacity utilization of equipment, etc.
2. Document and maintain records of process details such as type of raw material used, process parameters (temperature, time etc. as applicable) for the entire process in process chart or production log for all products produced.
3. Document and maintain record of batch size, raw material used, yield after each stage of process, wastage, energy utilization and final products produced.
4. Maintain record of observations or deviations (if any) related to production and process parameters.



Notes

5. Load the production and process parameter details in computer or in the ERP system followed by the organization for future reference.
6. Verify documents and track them with respect to the production schedule and process parameters, in case of quality concerns, and during quality management system audits.

4.4.3. Record Maintenance of the finished products.

1. Document and maintain records of finished products details such as name of the product, batch number, time of packing, date of manufacture, date of expiry, other label details, primary and secondary packaging materials for all finished products, storage conditions, etc., as per organization standards
2. Maintain record of observations or deviations (if any) related to finished products
3. Load the finished product details in computer or in the ERP system followed by the organization for future reference
4. Verify the documents and track them from finished product to raw materials, in case of quality concerns, and during quality management system audits.

In summary, therefore, record keeping is a management tool to help the owner to know the state of a enterprise at any time and to have reliable information on which to base his or her plans for development of the business.

Glossary:

Accounting	:	Keeping records of all financial transactions related to an individual or an entity.
Assets and Liabilities	:	Assets are what a business owns and liabilities are what a business owes.
Cash Book	:	It is a financial journal which contains all the cash receipts and disbursements.
Creditors	:	A creditor could be a bank, supplier or person that has provided money, goods, or services to a company and expects to be paid at a later date.



Document	:	A document is one or more official pieces of paper with writing on them.
Entrepreneur	:	someone who starts their own business, especially when this involves seeing a new opportunity.
Ledger	:	A ledger is a book containing accounts in which the classified and summarized information from the journals is posted as debits and credits.
Procurement	:	Procurement is the act or process of buying, including any negotiations that this involves on price and availability.
Pilferage	:	Pilferage is generally an act of stealing items or things of little value.
Quality parameters	:	The quality parameters indicate the degree of similarity between the values of the dataset and the real values.
Total Cost of Ownership (TCO)	:	It is a calculation method that determines the overall cost of a product or service throughout its life cycle.

Evaluation

Answer all the questions.

6x1=6

- Record keeping is the process of recording _____ and events in an accounting system.
 - Cash
 - Transactions
 - Goods
 - Appliances
- Before computers and servers became widespread, accounting records were recorded on _____ by hand.
 - Tapes
 - Note pad
 - ledger paper
 - Computer
- _____ sets of basic records that should be kept by the owner of a bakery and food processing unit.
 - Two
 - Three
 - One
 - Five
- The Profit and Loss Account describes how money comes into and leaves a business over a _____.
 - Month
 - Time span
 - Hour
 - Decade



Notes

5. The _____ is therefore a statement about the money in a business at a particular time.
- (a) Production record (b) Expenditure book
(c) Log book (d) balance sheet
6. Enterprise resource planning (ERP) refers to a type _____ used by the organizations to manage day-to-day business activities
- (a) Accounts (b) software
(c) Ledger (d) Stocks

Answer in brief

12x2=24

1. What is meant by record keeping?
2. What are the uses of accounting?
3. Differentiate between balance sheet and EPR.
4. List the basic records.
5. What is meant by financial records?
6. What is a cash book?
7. What is the use of a bank book?
8. Why Is ERP Important for Businesses?
9. What is the use of an Accounts Receivable and Payable Book?
10. Why do we use a balance sheet?
11. From which record you will get the production and process parameter details?
12. ERP solutions standardize the use of one application to run an entire business. Justify the statement.

Answer in detail.

6x3=18

1. Define record keeping? Explain the importance of record keeping.
2. Explain the objective of the ERP solutions.
3. Explain the importance of record maintenance for raw materials.
4. What is a finished product record? What are the details you will document in a finished products record?
5. Explain sales records.
6. Explain the record maintenance process at production stage.



Practical Activity:

1. Visit to any food industry/ audio visual demonstration of record keeping. Creating an inventory management of raw materials. (Material in, Material out, Opening stock and Remaining stock).

a. Example of an Incoming Raw Materials Test Book

Product Name _____		Batch Number _____		
Raw material	Supplier	Results of inspection for		
		A:	B:	C:
Write in either 'Pass/Fail' or observations on quality				

b. Example of a Finished Product Test Book

Product Name _____		Batch Number _____		
Product name	Supplier	Results of inspection for		
		A:	B:	C:
Write in either 'Pass/Fail' or observations on quality				

c. Example of opening stock and remaining stock Test Book

Ingredient name _____				
Date	Amount to store	Amount from store	Process batch number	Balance
	Write amounts in kg or number of packs.			

2. Demonstration of record maintenance process at production schedule and process stages.
3. Demonstrate the Record of finished product.

Field visit:

1. Visit a nearby bakery unit and observe the different types of records maintained.



MODEL QUESTION PAPER**Std: X****Baking****Total Marks: 60****I. Choose the best answer.****6 X 1 = 6**

1. Food ----- is an important sensory attribute as it affects the way food tastes and how it feels in the mouth.

a) Colour	b) Texture
c) Consistency	d) Flavour
2. Adulterants and ----- are the other hidden characteristics, which affects the quality of food.

a) Toxins	b) Sweet
c) Nutrients	d) Water
3. Keep ----- out of the kitchen, they may bring in dirt, germs, or bugs from outside.

a) Equipments	b) Silverware
c) Glasses	d) Pets
4. ----- lubricates the structure of a baked product.

a) Sugar	b) Salt
c) Fat	d) Flour
5. When water becomes steam, its volume increases by some --- ----- times.

a) 1,500	b) 1,200
c) 1,800	d) 1,000
6. Before computers and servers became widespread, accounting records were recorded on ----- by hand.

a) Note books	b) Ledger paper
c) Record notes	d) Papers

II. Answer any 12 of the following questions: 12 X 2 = 24

7. Define Food quality.
8. List the internal and external factors that affect food quality.
9. Write the importance of texture in food quality.
10. How does chemical deterioration affects food quality?
11. What are Safety instruction signs?
12. What is meant by sequential batch reactor?



13. What are the precautionary methods you will follow while handling a Convection Oven?
14. What are the Physical hazards often faced by workers in a bakery?
15. Write a note on biscuit cooling.
16. Write about the bread packaging.
17. Write about break down maintenance.
18. What are earth ovens?
19. Define Record keeping.
20. What are three sets of basic records?
21. What is meant by Profit and Loss Account?

III. Answer any 10 of the following questions: 10 X 3 = 30

22. What is the importance of Moisture content in food quality?
23. Explain the use of Amylase, Pectinase, Papain in food processing.
24. Differentiate between physical and microbial deterioration of foods.
25. What are the techniques you will follow to wash and dry dishes in a bakery?
26. Hygiene can be improved in the workplace. Give suggestions.
27. Differentiate between danger signs and warning signs.
28. Explain the various Leavening agents used in a bakery.
29. Explain the cooling procedure followed in bread cooling.
30. List the Dos & Don'ts of Baking.
31. Explain the records maintaining in production schedule.
32. Why Is ERP Important for Businesses?
33. Write notes on cash book, bank book and sales book.



AVENUES AVAILABLE FOR VOCATIONAL ASPIRANTS...

Institutional Support for MSMEs

Ministry of Micro, Small and Medium Enterprises- A branch of the Government of India and the apex executive body for the formation and administration of rules, regulations and laws relating to micro, small and medium enterprises in India.

Micro enterprise:

A business operation on a very small scale, especially one in the developing world that is supported by microcredit. (Ex. i. Trading, merchandising and retail, ii. Food business, iii. Agriculture and aquatics, Rice farming, iv. Graphic and Design, v. Arts and Craft, Furniture making, vi, Licensed Professional services, etc).

Small enterprise:

A small enterprise is an enterprise where the investment in plant and machinery is more than Rs. 25 lakh but does not exceed Rs. 5 crore.

Medium enterprise:

A Medium enterprise is an enterprise where the investment in plant and machinery is more than ₹ 5.

1. Commissionerate of Industries & Commerce

Formulate policies for MSME sector in Tamil Nadu

2. MSME Trade & Investment Promotion Bureau

To promote export and Investment in MSME sector

3. District Industries Centre

Implement the state policies at district level

4. Indcoserve and Sagoserve

Industrial Cooperative Societies to improve the socioeconomic conditions by providing gainful employment to the economically weaker sections and in ensuring remunerative prices to the growers like small tea growers and tapioca cultivators

5. Entrepreneurship Development & Innovation Institute

Training and Support for startup ecosystem

6. TN Small Industries Development Corporation

Provide Infrastructure for MSMEs - developed plots/shed

7. Tamil Nadu Industrial Investment and Corporation(TIIC) and Tamil Nadu Industrial Co-operative Bank (TAICO)

Provides -Strong financial support to MSMEs for securing loans and working capital needs

8. Tamil Nadu Small Industries Corporation Limited

Manages small scale units set up by the Government. They manufacture wooden, steel and engineering products

Schemes for MSMEs

1. MSME Subsidy Schemes

The micro, small and medium enterprises (MSMEs) have been accepted as the engine of economic growth and for promoting equitable development. The labour intensity of this sector is much higher than that of the large enterprises. The MSMEs play a pivotal role in the overall industrial economy of the country. With

its agility and dynamism, the sector has shown admirable innovativeness and adaptability.

Taking cognizance of the contribution made by the micro, small and medium enterprises to the economy of the state, the Government of Tamil Nadu has introduced various incentives and concessions to catalyse the growth of this sector.

The following incentives and concessions are being extended to the MSMEs in the state:

A. Capital Subsidy

25% capital subsidy on the value of eligible plant and machinery, subject to a maximum of ₹ 50.00 lakhs.

Eligibility:

- All new micro manufacturing enterprises established anywhere in the state.
- All new small and medium enterprises under the following 15 thrust sectors established anywhere in the state excluding additional capital subsidy and employment generation subsidy:

Electrical and electronic industry	Pollution control equipments
Leather and leather goods	Sports goods and accessories
Auto Parts and Components	Cost effective building materials
Drugs and pharmaceuticals	Readymade garments
Solar energy equipment	Food processing
Gold and diamond jewellery for exports	Plastic (Except "One time use and throw away plastics")
Alternate products to one time use and throw away plastics	Rubber, Electric Vehicle Components, Charging infrastructure and its Components

- All new small and medium manufacturing enterprises established in the 251 industrially backward blocks.
- All new agro based small and medium manufacturing enterprises established in the 385 blocks of the state.
- Existing manufacturing enterprises of the above categories which have taken up substantial expansion/diversification of the existing activities.

Additional Capital Subsidy:

- Additional capital subsidy for enterprises set up by women/scheduled caste/scheduled tribe/differently abled and transgender entrepreneurs at the rate of 5% on the value of eligible plant and machinery, subject to a maximum of ₹ 2 lakhs.
- Additional capital subsidy for promotion of cleaner and environment friendly technologies at the rate of 25% on the value of eligible plant and machinery / equipment meant for environment improvement or sustenance subject to a maximum of ₹ 3lakhs.
- Employment Intensive Subsidy at the rate of 5% on the value of eligible plant and machinery, subject to a maximum of ₹ 5 lakhs.

B. Low Tension Power Tariff Subsidy

Eligible MSME units are provided 20% low tension power tariff subsidy for 36 months from the date of commencement of production or from the date of power connection obtained, whichever is later.

Eligibility:

- All new micro manufacturing enterprises established anywhere in the state.
- All new agro based micro, small and medium manufacturing enterprises established in the 385 blocks of the state.

- All new small and medium manufacturing enterprises established in the 251 industrially backward blocks.
- Existing manufacturing enterprises of the above categories which have taken up substantial expansion/diversification of the existing activities.

C. Generator Subsidy

Micro, small and medium manufacturing enterprises established anywhere in the state are eligible for a subsidy of 25% on the cost of generator set purchased (upto 320 KVA capacity), subject to a maximum of ₹ 5 lakhs.

D. Back-Ended Interest Subsidy

Back-ended interest subsidy at the rate of 5 % subject to a maximum of ₹ 10 lakhs for a period of 5 years is being provided to micro, small and medium manufacturing enterprises for term loans upto Rs.100.00 lakhs obtained for technology upgradation/ modernization and Credit Guarantee Fund Trust Scheme(CGFTS).

2. Scheme for promotion of Energy Audit and Conservation of Energy

The Government have introduced Promotion of Energy Audit and Conservation of Energy (PEACE) scheme for promoting energy efficiency in MSME units. Under this scheme, the Government would reimburse 50% of the cost of conducting energy audit and 25% of the cost of machinery & equipments replaced, retrofitted and technology acquired for the purpose of improving energy efficiency, based on the recommendations of the energy audit.

Objectives of the Scheme:

- Creating awareness & educating MSMEs about benefits / advantages of the new techniques/ technologies for saving energy.
- Undertaking in-depth studies of high energy consuming MSME clusters and identify gaps and potential barriers for energy conservation and promoting

adoption of suitable techniques/ technologies to achieve energy efficiency.

- Encouraging MSMEs for adopting energy audits to improve energy efficiency and fuel substitution, and monitoring the implementation of recommendations.

Incentive for Conducting Detailed Energy Audit:

- Main objective is to identify the major sources of energy in use, identify the lapses in energy usage and areas to improve energy usage, determine the level of consumption of the energy sources and recommend measures that will enhance energy savings in the industry.
- 50% of the energy audit cost subject to a maximum of ₹ 0.75 lakh per energy audit per unit.
- Eligible MSMEs shall file their claims within one year from the date of completion of energy audit.
- Incentive for Implementing Energy Audit Recommendations:
 - The objective is to incentivise MSMEs to implement the recommendations of the Energy Audit Report and to optimize the energy consumption leading to energy saving and moneysaving in electricity bills.
 - Eligibility - all manufacturing MSMEs in the state which have undertaken energy audit and have achieved at least 15% energy savings in terms of number of units of energy consumed per unit of product manufactured.
 - 25% of the cost of the eligible components, subject to a maximum limit of ₹ 2,00,000.

3. Scheme for acquiring quality certification

To encourage MSMEs to acquire quality standard certifications for process and product

such as ISO 9000/ ISO 14001 / ISO 22000 / Hazard Analysis and critical point (HACCP) / Good Hygienic Practices (GHP) / Good Manufacturing Practice (GMP) certifications, BIS certification, Zero defect and Zero Effect (ZED), Rating etc., the Government is providing reimbursement subsidy at the rate of 100% on the charge incurred by the MSMEs for acquiring such quality certifications subject to a maximum of ₹ 1.00 lakh

4. Business Facilitation Act

Tamil Nadu Business Facilitation Act, 2018 was enacted to ensure single point receipt of applications for securing clearances that are required to establish or expand an enterprise and for clearances required during normal course of business including renewals in a time-bound manner. The Act also provides for an effective grievance redressal mechanism in case of failure of Competent Authorities to act within the time limit and for matters connected therewith or incidental thereto.

The Act covers 54 clearances covering pre-establishment, pre-operation, renewals, incentives, etc. District Industries Centres and Guidance Bureau are designated as Nodal Agencies for MSMEs and large industries respectively for operating the single window mechanism.

The Act provides for a 3 tier institutional structure:

1. MSME District Single Window Committee
2. MSME State Single Window Committee, and
3. MSME Investment Promotion and Monitoring Board to monitor and review the progress of the single window mechanism.

5. Single Window Facilitation for MSMEs

The MSME Department supports the entrepreneurs who come forward to set up

an enterprise. The entrepreneurs can get all licenses/approvals from various departments under the single window mechanism.

The Government of Tamil Nadu takes cognizance of the need for continuously improving the ease of doing business in the state. In order to demonstrate the state's interest in creating an investor friendly climate, conducive to the domestic and global business community, the MSME Department has implemented the online Single Window Portal to deliver requisite services to the investors in a time-bound and transparent manner through online mechanism from 11 departments such as the Directorate of Town and Country Planning (DTCP), Tamil Nadu Pollution Control Board (TNPCB), Fire, Directorate of Industrial Safety and Health (DISH), etc. during the pre-establishment, pre-operation and renewal stages.

The Single Window Portal for MSMEs is available at <https://www.easybusiness.tn.gov.in/msme>.

6. Micro and Small Enterprises Facilitation council

In the MSMED Act 2000, one of the objectives is to facilitate settlement of delayed payments to micro and small enterprises for the goods supplied by them to major industrial undertakings. Accordingly, the Government has constituted four regional Micro and Small Enterprises Facilitation Councils at Chennai, Tiruchirappalli, Madurai and Coimbatore. Applicants, who intend to file applications under this, can file applications online at <https://samadhaan.msme.gov.in>.

7. New Entrepreneur cum Enterprise Development Scheme

“New Entrepreneur—cum-Enterprise Development Scheme (NEEDS)” has been introduced by the Government to assist educated youth to become first generation entrepreneurs.

Objective:

To assist first generation entrepreneurs to set up their manufacturing / service enterprises with financial assistance for a maximum project cost of Rs 5 crores from banks or state financial agency.

Eligibility:

Age should be between 21 years to 35 years for General Category and not exceeding 45 years for Special Category (SC / ST / BC / MBC / Minority / Women / Ex-Servicemen / Differently Abled / Transgender).

Should possess educational qualification of any degree / diploma / ITI / vocational training from a recognized institution.

Highlights of the Scheme:

Promoter's contribution is 10% of the project cost for General Category and 5% for Special Category of entrepreneurs.

Individual based subsidy @25% of project cost (not exceeding ₹ 30 lakhs).

3% interest subvention for the entire term loan period.

50% earmarked for women beneficiaries.

15 days training on entrepreneurship by EDII-Chennai.

No income ceiling.

Selection of beneficiaries by district level Task Force chaired by the District Collector.

Subject to availability, reservation upto 25% for allotment of plots/sheds in SIDCO Industrial Estates.

8. AMMA Skill Training and Employment Scheme

The Amma Skill Training and Employment Scheme aims at promotion of the MSME sector by providing them with necessary skilled human resources. The scheme aims to train unemployed youth in enhancing their

skill for employment with 30% reservation for women. The MSME units providing training to the candidates selected by them will have to pay a stipend of 5000/- per month/candidate upto six months. Out of this, 2,000/- per month will be reimbursed by the Government of Tamil Nadu to the MSMEs after completion of the training programme. The trained candidates will be issued with a certificate by the Tamil Nadu Skill Development Corporation(TNSDC).

The objective of the scheme is to fulfill the requirement of skilled human resources in the manufacturing sector through on the job training of candidates fulfilling the norms of NSDC / NSDA / Sector Skill Council / MES / other agencies and possessing required educational qualification and age limit (18 years to 45 years) prescribed for each trade. Disbursement of stipend is done by the TNSDC.

9. UYGEP

The Unemployed Youth Employment Generation Programme (UYEGP) has been introduced to create employment opportunities for the marginalized sections of the society.

Objective:

To create employment opportunities to for the marginalized sections of the society with financial assistance for a maximum project cost of Rs. 10 lakhs for manufacturing activities, Rs. 5 lakhs for service and business activities.

Eligibility:

Age should be between 18 years to 35 years for General Category and upto 45 years for Special Category comprising SC/ ST/ BC/ MBC/ Minority/ Women / Ex-Servicemen / Differently Abled / Transgender.

Pass in VIII Standard.

Family income not exceeding Rs. 5 lakhs per annum.

Highlights of the Scheme:

Promoter's contribution is 10% of the project cost for General Category and 5% for Special Category of entrepreneurs.

Subsidy @ 25 % of project cost (not exceeding ₹ 1.25 lakhs).

7 days EDP training.

Selection of beneficiaries by district level Task Force chaired by the General Manager, District Industries Centre.

10. PMEGP

The **Prime Minister's Employment Generation** have been accepted as the engine of economic Programme (PMEGP) is being implemented with effect from 2008-09.

Objective:

Creation of self employment opportunities in both rural and urban areas with financial assistance for a maximum project cost of ₹ 25 lakhs for manufacturing sector and ₹ 10 lakhs under service sector.

Eligibility:

Age should be minimum of 18 years.

Beneficiaries should have passed minimum 8th Std. to avail loan above ₹ 10 lakhs in manufacturing sector and above Rs. 5 lakhs in service sector.

No income ceiling.

Highlights of the Scheme:

Promoter's contribution is 10% for General Category and 5% for Special Category (SC/ST/OBC/ Minorities/Women/ Ex-Servicemen/DA).

Subsidies from 15% to 35% as detailed below:

Category of Beneficiary	Rate of Subsidy	
	Urban	Rural
General Category	15% of the Project Cost	25% of the Project Cost
Special Category	25% of the Project Cost	35% of the Project Cost

Secondary – Class X – Food Processing

(Vocational Skills)

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