Dairy Products Processing Level-III

Based on October 2019, Version 2 OS and March.2021, V1 Curriculum

Module Title: - Implementing HACCP Principle

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LG #61	LO #1- Prepare to develop and/or review a food safety program

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Applying HACCP principles
- Identifying roles and responsibilities
- Identifying the scope of the food safety program

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Apply HACCP principles
- Identify roles and responsibilities
- Identify the scope of the food safety program

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
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Information Sheet 1- Applying HACCP principles

1.1 Meaning of HACCP

HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the the finished product

1.2 Benefits of HACCP

The main benefits of HACCP based procedures are:

- Save your business money in the long run
- Food safety standards increase
- Ensures you are compliant with the law
- Food quality standards increase
- Organizes your business process to produce safe food

1.3 HACCP plan

A HACCP plan identifies hazards associated with dairy products, and assists in identifying and establishing control measures and procedures to reduce or eliminate the hazards at critical control points (CCPs) in the manufacturing process.

To be effective, your HACCP plan needs a detailed analysis of your raw materials and all steps in manufacturing processes, and the establishment of controls at defined CCPs.

The following seven (7) principles outline the basics of a HACCP program. These principles,properly applied to a dairy plant, will result in minimizing the potential of a foodborne diseaseoutbreak:

I. Assess the hazards in a dairy plant.
II. Determine critical control points (CCPs).
III. Establish critical limits for each CCP.
IV. Implement procedures to monitor CCPs and record data.

V. Institute corrective action.

VI. Establish record keeping systems to document the HACCP plan.

VII. Verify that the HACCP program is working.

It may appear that the seven principles of the HACCP program, when applied to an entire dairyplant, will be complicated and difficult to organize. However, when the dairy plant is brokendown into sections or processes, the number of CCPs becomes quite manageable.

I. Assess the Hazards in a dairy plant

a) Construct a flow diagram of each process in your dairy plant.

b) The flow diagram(s) should give a clear and simple description of the steps in each process.Include the actual equipment, procedures, and operating practices.

c) List all potential hazards associated with each step in the process. Consider as hazards only those microbiological, chemical, and physical agents that could cause a public health risk.

d) List any preventive measures (PM) that may exist to control those potential hazards.Preventive measures are those steps or controls in the process designed to eliminate orcontrol a hazard (i.e. pasteurization, hand dip sanitizing).

e) The potential hazards and preventive measures together identify possible CCPs.

II. Determine critical control points (CCPs)

- Once having identified a possible CCP, four questions willconfirm whether or not a CCP exists. These questions are:
    - ✓ Does a preventive measure exist?
    - ✓ Does this step eliminate or reduce the hazard to an acceptable level?
    - ✓ Could the hazard contaminate the product?
    - ✓ Is this preventive measure the last opportunity for eliminating the hazard?
- Mark each CCP on your flow diagram.
- The CCPS identified in the schematics are explained in the accompanying table. These will assist in the identification of CCPs in your dairy plant.

III. Establish Critical Limits for each CCP

- For each CCP, the preventive measure must be fully defined.
- Critical limits are a set of tolerances for each CCP.
- Examples of Critical Limits

Table.1. Critical limit of hazards

Critical Control Point	Critical Limit
Refrigeration temperatures.	≤ 4°C
Minimum HTST pasteurization times/temperatures for milk.	16 seconds at 72°C
Response of a flow diversion valve on an HTST pasteurizer	≤ 1 second

- Strict adherence to tolerances is important in maintaining a HACCP program. Product safetyis not negotiable; there is no such thing as "almost risk free".
- Tolerances may vary depending on processes in your plant.

IV. Implement procedures to monitor CCP and record data

- The CCP must be monitored on a regular basis to ensure that it is under control.
- Examples of such monitoring can include:
  - ✓ inspection of pasteurizer recording charts.
  - ✓ measurement of sanitizer levels.
  - ✓ observation of the hygiene of an operation or operator .
- Records must be kept to ensure the CCPs are being monitored on a regular basis.
- Several people in the dairy plant may be involved in monitoring CCPs and recordingdata. As such, information regarding the HACCP program must be effectively communicated. Everyone involved must understand its function and their role in itsimplementation in order to be assured of its success.
- The timetable for monitoring CCPs may vary between dairy plants.

V. Institute corrective action

- In any HACCP program, a CCP may fail. As such, corrective action plans must beincluded as a part of the program.
- For each CCP, a specific corrective action must be in place in the event of a CCPdeviation from the critical limit tolerance. Action must include:
  - ✓ Procedure for holding product pending completion of analysis to confirm productsafety.
  - ✓ Disposition of the product if necessary.
- If a product cannot be proven safe, then it must be disposed of, or if possible, safelyreworked.
- Taking appropriate action when the CCP criteria are not meet

VI. Establish record keeping systems to document HACCP plan

- A single individual should be made responsible for ensuring all data is collected andrecorded. This individual must have authority to ensure:
  - ✓ all data is collected
  - ✓ all data is centrally located and thus easy to retrieve
  - ✓ a record of all CCP deviations is kept, and, most importantly
  - ✓ appropriate action is taken when results deviate beyond the critical limits.
- The record keeping system must be as simple as possible. A single binder for smalleroperations or a single filing cabinet for larger operations should be more than adequate

VII. Verify that the HACCP Program is Working

- Most dairy plants are now performing regular quality control testing of their finishedproducts. Results from quality control tests can often indicate that a HACCP program isnot performing as required. In such cases, the program must be reviewed to ensure:
  - ✓ the present HACCP program is being followed
  - ✓ all hazards were identified in the initial HACCP program
- Other methods to verify the HACCP program is working include:
  - ✓ Close monitoring of consumer complaints.

- ✓ Verification inspections: unannounced equipment inspections.
- ✓ Regular review of the current HACCP program. Have processes, procedures, orformulations changed since the initial HACCP program was implemented?
- ✓ Random sample collection and testing (separate from regular QC/QA testing protocol).

- It is particularly important to ensure the HACCP program is working when it is firstinstalled. As well, verification procedures must be made a priority when any changes inprocessing procedures or formulations are made.

Self-check 1	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Define the meaning of HACCP (2pts)
2. List the main benefits of HACCP(5pts)
3. List the seven principles of HACCP(7pts)

Note: Satisfactory rating - 14 points **Unsatisfactory - below 14 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 2- Identifying roles and responsibilities

2.1. Introduction

Roles refer to one's position on a team. Responsibilities refer to the tasks and duties of their particular role or job description. Employees are held accountable for completing several tasks in the workplace.

2.2. Purpose, roles and responsibilities of HACCP team

Assembling the HACCP team is the first prepatory stage within the 12 CODEX steps of HACCP. The miain role and functions of the HACCP team are to develop, implement, and maintain an effective HACCP system, which meets legal requirements,codes of practice standards, and protects consumers from harm.

Members of the HACCP team wil occupy advisory and administrative roles. Advisors within the group provide technical and operational expertise. While members with administrative responsibilities ensure the HACCP process follows a logical and systematic approach and appropriately documented.

The team should be multidisciplinary.the team should be a manageable size between three to six members. Core members will be required on a continual basis while others may be join the team temporily for specific tasks.

The necessary expertise may not be available on site in the case of small-scale manufacturers, so outside expertise and advice may be required to develop the HACCP plan.

Team	Name	Position/skill set
Team leader		Quality assurance manager
Member		Microbiologist
Member		Laboratory manager
Member		Production manager
Member		Maintenance manager

Table 1: A multidisciplinary team

Self-Check – 2	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Define roles and responsibilities?(2pts)
2. List the roles and responsibilities of HACCP team(4pts)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 3- Identifying the scope of the food safety program

3.1. Defintion of food safety program

A food safety program is a written plan that shows what a business does to ensure that the food it sells is safe for people to eat. It is an important tool to help businesses handle, process or sell potentially hazardous foods. This is necessary to maintain safe food handling practices and protect public health.

3.2. Purose and scope of food safety program

It is important to define the scope and purpose of the food safety program. The scope is a statement outlining the products and processes covered by the HACCP plan and the parts of the operations it covers (the start and end point). The scope of the plan is important, as it is a reference point for many of the steps involved in developing other HACCP plans in the business. The purpose is a statement of the reason the program has been put into practice. For example: to ensure food safety and to enhance quality.

3.2.1. Describe product

Prepare a full description of the dairy product/products – including relevant information about the ingredients, the physicochemical properties (e.g. pH, salt concentration, water activity, redox potential) and how each product is prepared, packaged, and stored.

3.2.2 Identify intended use

The intended use of the product should be described, reflecting the expected way the consumer will use the product. It is also important to identify if vulnerable groups will consume the product e.g. aged, infants, allergenic consumers.

Product	Low-fat yoghurt (plain)
Intended use	The low-fat product is unsweetened and may be consumed with complementary ingredients such as fruit or nuts May be consumed as a snack, or as an ingredient in dips and sauces
Condition before consumption	Stored refrigerated May be brought to room temperature before consumption
Consumers	General population including the elderly and pregnant women

Self-Check – 3	**Written test**

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. What is food safety program?(2pts)
2. Discuss the purpose and scope of food safety program?(3pts)

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

LG #62	LO #2- Identify and/or review food safety hazards

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying processes to be covered by the food safety program
- Identifying food hazards
- Identifying handling methods , processing techniques and supporting programs

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify processes to be covered by the food safety program
- Identify food hazards
- Identify handling methods , processing techniques and supporting programs

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Information Sheet 1- Identifying processes in food safety program

1.1 Meaning of processes

Process in relation to food, means any activity conducted to prepare food for sale, including cooking, heating, cooling, freezing, thawing, washing, storing, packing, assembling, transporting and delivery. These are often referred to as process steps.

1.2 Compenents of processes

Prepare a flow diagram to accurately describe the manufacturing process. Ensure all steps are included in the diagram, as well as identify all inputs such as water, ingredients, and packaging. The flow diagram should be revised periodically to ensure it remains current

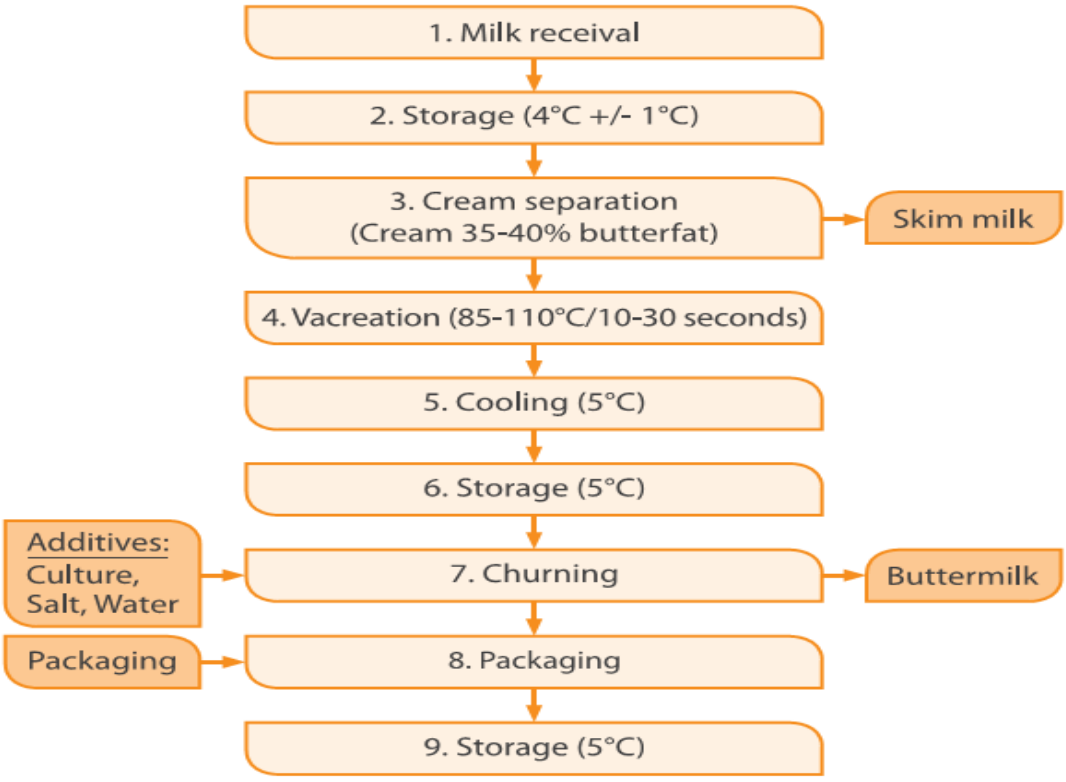

Figure 2: Flow diagram for the manufacture of cultured butter

Self-Check – 1	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. What is mean processes?(2pts)
2. List the components of proceses? (9pts)

Note: **Satisfactory rating - 11 points** **Unsatisfactory - below 11 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 2- Identifying food safety hazards in each processes

2.1 Definition of hazard

A hazard is a substance or foreign agent that has the potential to cause food to be unsafe, ie. It can cause illness or injury.

2.2 Classification of hazards

Hazards can be classified into three main areas listed below.

Biological Hazards

Living organisms like bacteria, viruses and parasites. Specific examples of such organisms include:

- Food poisoning bacteria such as Salmonella spp., Campylobacter jejuni, Escherichia coli, Listeria monocytogenes, Staphylococcus aureus, Bacillus cereus and Clostridium perfringens
- Food-borne viruses such as hepatitis A and noroviruses
- Food-borne parasites such as Cryptosporidium parvum and Giardia lamblia
- Moulds such as Aspergillus flavus.

Chemical Hazards

Food can become contaminated with unwanted chemicals such as cleaning agents, pesticides, fungicides, fertilisers and veterinary chemicals. For example, food could become contaminated with cleaning agents if care is not taken to store and use the chemicals correctly.

Physical Hazards

Food can become contaminated with physical objects such as glass, metal, plastic, insects, adhesive dressings and jewellery. If these things are found in food, they may introduce microbial hazards and may result in physical harm to the consumer, for example, choking, laceration and broken teeth

Self-Check – 2	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Define hazard (2pts)
2. Discuss the classification of hazards (6pts)

Note: **Satisfactory rating - 8 points** **Unsatisfactory - below 8 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 3- Identifying handling methods, processing techniques and support programs

3.1.Introduction

Support programs are the general food safety and hygiene requirements which all food businesses must follow. They include Good Manufacturing Practices (GMP) or Good Hygienic Practices (GHP) and are necessary to support the controls for establishing food safety.

Food handling. Is any aspect of the operations in the preparation, transport, storage, packaging, wrapping, exposure for sale, service, or delivery of food

3.2. Types of handling methods, processing techniques and support programs

The step in the process where a significant hazard is controlled is referred to as a critical control point (CCP). After identifying all significant hazards, it is necessary to identify where they arise and where they can be controlled. Note that more than one control measure may be required to control a specific hazard and more than one hazard may be controlled by a specified control measure.

A CCP can be determined by using a decision tree. In recent years, the introduction of pre-requisite programs has changed our thinking on CCPs. When HACCP was first introduced, manufacturers listed many CCPs because of a lack of pre-requisite programs. Modern HACCP plans are now supported by a detailed set of pre-requisite programs that enable manufacturers to better manage the safety of products and this has reduced the need to have as many CCPs.

Hence, the original Codex decision tree has been modified to include an additional question – is this hazard managed by a prerequisite program? This means that only the significant hazards which are not managed by pre-requisites continue on through the decision tree to possibly identify CCPs.

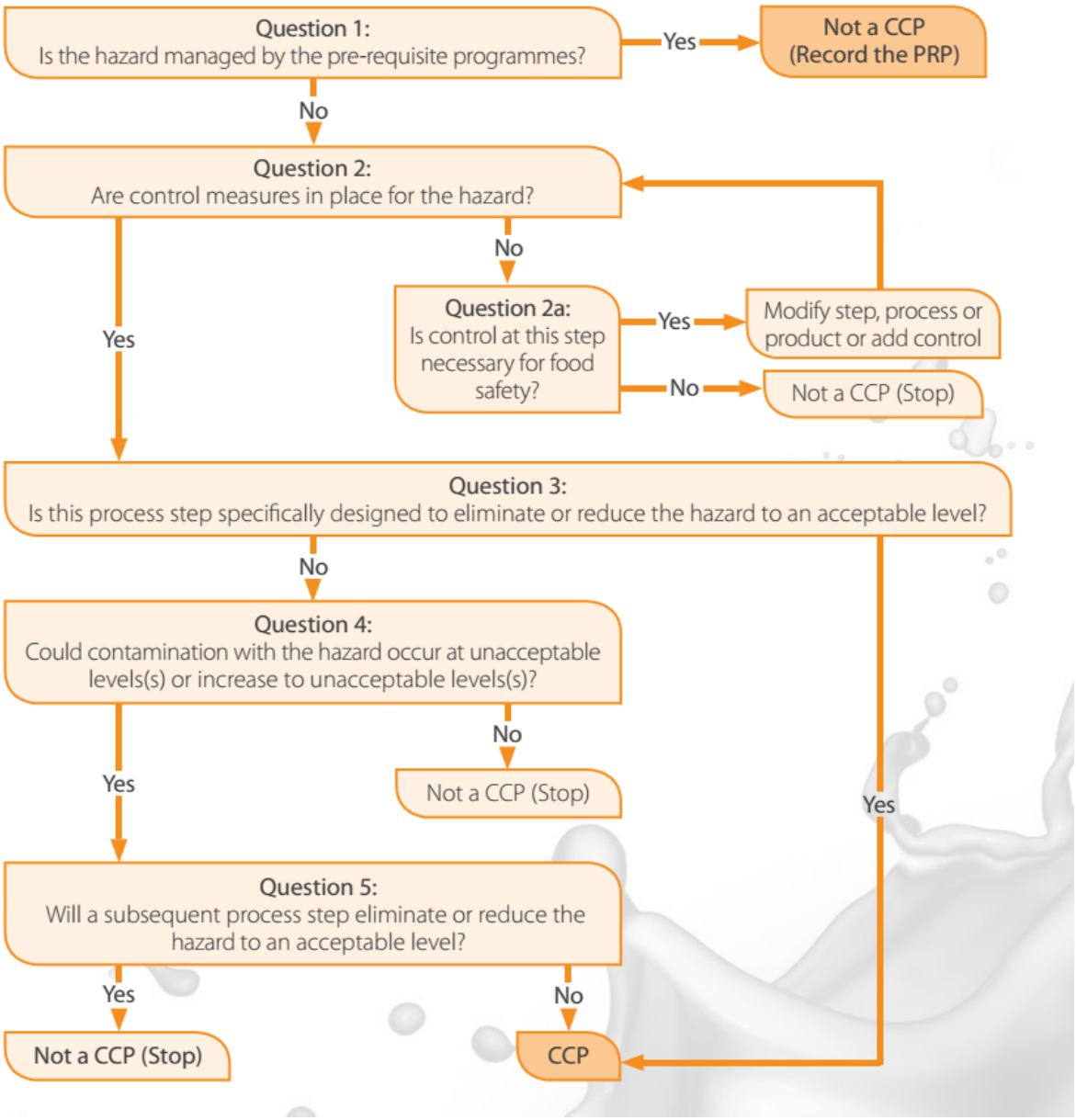

Figure 3: Codex decision tree

The Codex decision tree enables a manufacturer to identify CCPs and their control measures.

Table 2: A CCP for pasteurisation of milk

Process step	Hazard	Control measure	Q1	Q2	Q3	Q4	Q5	CCP
Pasteurisation of milk for market milk	Survival of vegetative bacteria e.g. Salmonella spp., S. aureus, Campylobacterspp., L. monocytogenes, E. coli	Time and temperature of pasteurisation (72°C for 15 seconds)	No	Yes	Yes			YES

If a hazard has been identified at a step where control is necessary for food safety, and no control measure exists, then the product or process should be modified to include a control measure.

The decision tree provides a logical reasoning approach for determining CCPs, but it may not be applicable to all situations.

Self-Check – 3	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Define food handling and support program?(4pts)
2. Define critical control point? (2pts)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers.

LG #63	LO #3- Establish and/or review methods to monitor and control food safety hazards

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Establishing acceptable control methods
- Validating control methods
- Establishing procedures for preventative action
- Establishing appropriate methods for monitoring
- Establishing corrective action
- Conducting work with environmental guidelines

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, **upon completion of this learning guide, you will be able to**:

- Establish acceptable control methods
- Validate control methods
- Establish procedures for preventative action
- Establish appropriate methods for monitoring
- Establish corrective action
- Conduct work with environmental guidelines

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Information Sheet 1- Establishing acceptable control methods

1.1 Introduction

Once a hazard has been identified, the next step is to consider what control methods(s) can be used for each food safety hazard. Food safety control methods are anything that will prevent, eliminate or reduce the hazard from occurring.

1.2 Types of food safety hazard control methods

Food safety control methods include both

- support programs and
- critical control points.

In some cases effective support programs are sufficient to control a hazard (eg a cleaning and sanitation program) and so these can be documented as the control measure. In other cases, critical control points other than support programs are required to control a hazard.

More than one control measure may be used to control a hazard, and a control measure may be used for more than one hazard.

Self-Check – 1	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. What is mean food safety control methods ?(2pts)
2. List the types of food safety control methods(4pts)

Note: **Satisfactory rating - 6points** **Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 2- Validating control methods

2.1.Introduction

Validation means obtaining evidence that a control measure or combination of control measures, if properly implemented, is capable of controlling the hazard to a specified outcome.

It is important to remember that the critical limit must control the hazards. Unless the critical limit is a commonly accepted limit, such as the storage temperature offoods in accordance with the Food Standards Code, businesses will need to show proof that the critical limit will differentiate between safe and unsafe food. This will usually involve having some documented information outlining the source reference, or a validation study showing data, to justify each critical limit. A table summarising the justification for each CCP is recommended.

1.3 Compenents of validation

Validation of processes may consist of a number of components:

• Reference to industry guidelines and Codes of Practice eg accepted time temperature parameters for cooking.

• Reference to regulated standards eg compliance to the Food Standards Code

• Intensive product testing may be used to validate a change to a process.

• Environmental testing may be used to validate the effectiveness of a cleaning system.

This documented evidence should be maintained and revised whenever any changes to the product or process are made to support the justification of the critical limits established for the food safety program.

Self-Check – 2	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. What is mean validation? (2pts)
2. List the components of validation (8pts)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers

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Information Sheet 3- Establishing procedures for preventative action

3.1 Introduction

Standard operating procedure is a set of step by step instructions compiled by the organization to help workers carry out routin operations

Preventive action is planned with the goal of preventive a nonconformity in its entirety

3.2 Components of procedures for preventive actions

The following are some of the preventive action procedures in food safety hazard**.**

3.2.1 Supplier approval and food receipt

- Vendor Quality Development Programme laying down the criteria for selection, approval, review and on going approval should be implemented.
- All raw material, processing aids, ingredients consignments shall be procured from the vendors approved by FDA and registered or licensed from other regulatory authorities. An approved vendor should be evaluated as per the quality supplied and other relevant factors.
- All packaged raw materials shall be checked for 'expiry date'/'best before'/'use by date', packaging integrity and storage conditions.
- All raw materials and ingredients, wherever applicable, shall conform to all Standards laid down under the relevant regulations.
- All raw materials, ingredients and packing material and processing aids, wherever applicable, shall be inspected and sorted before processing. The manufacturer shall have procedures in place to confirm that the incoming materials meet the documented specifications through certificate of analysis, visual inspection, laboratory testing, review of label for allergens etc.
- Records of raw materials or ingredients or any other material used in processing as well as their source of procurements shall be maintained for traceability.

3.2.2 Milk Processing

- Critical food processing parameters like temperature / vacuum etc. records shall be maintained and recorded appropriately.

- Personnel shall put on clean protective clothing including footwear and wash their hands before entering.
- Cleaning schedule for equipment in the food processing sections shall be maintained to ensure entire operations are carried out in hygienic conditions
- Access to processing area by outsiders shall be restricted or controlled**.**

Self-Check – 3	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Define standard operating procedure and preventive action (2pts)
2. List the preventive action procedures in food safety hazard for supplier approval and food receipt (10pts)

Note: Satisfactory rating - 12 points **Unsatisfactory - below 12 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 4- Establishing appropriate methods for monitoring

1.1 Introduction

Food safety monitoring is the mechanism by which we regularly check to see that food safety hazards are under control, procedures are being correctly implemented and food safety compliance is followed. This type of monitoring is deeply embedded in food safety legislation around the world.

Monitoring is an important step for an effective food safety program. Control measures, including CCPs and SOPs, must be monitored, controlled, and documented in writing. Monitoring involves making direct observations or taking measurements to see that the food safety program is being followed. For example, the CCPs are managed by adhering to the established critical limits. Monitoring will identify when there is a loss of control so that corrective action can be taken.

4.2 Purpose of monitoring

Monitoring helps ensure quality and safety because it requires food to be handled in specific ways. Implementing monitoring processes should include those that can be tracked to identify potential issues and concerns over the safety and quality of food products.

For example, in the dairy industry, coolers and freezers need to have ongoing temperature monitoring solutions in place. These solutions need to alert employees and others when a freezer or cooler temperature falls outside the safe operating zone.

Furthermore, food within freezers and coolers should be stored to prevent cross-contamination between food products. For instance, raw milk should be stored separately from other milk products, and any containers should be washed and sanitized before being reused. Cooked foods should also be stored in a different area from raw foods.

Dairy industry owners even need to have methods in place for labeling foods to keep track of their freshness. They should review expiration dates on food products regularly and dispose of any food that expires.

By implementing the right monitoring solutions, those in the food industry can gain several benefits, including:

- Makes collecting data easier.
- Offers the ability to convert data into customized reports.
- Helps businesses comply with specific federal, state and local regulations, rules, and laws.
- Makes it easier to track the source of potential outbreaks before they occur.
- Reduces the potential for human error.

4.3 Establish monitoring procedures

Monitoring involves the scheduled measurement or observation of each CCP. Such monitoring determines if there has been a loss of control at a CCP and should provide information in time to make adjustments to ensure that control of the process is maintained and critical limits are not exceeded.

Importantly, effective scrutinising of monitoring data enables the identification of trends, which may indicate a loss of control at a CCP. If monitoring is not continuous, then the amount or frequency of monitoring must be sufficient to ensure the CCP is maintained within control limits.

Monitoring data must be evaluated by a person with appropriate knowledge and authority so they can carry out identified corrective actions when necessary.

Monitoring procedures may be developed by asking questions such as:

- What is going to be monitored?

- How is it going to be monitored?
- Where is the monitoring point?
- When is it going to be monitored?
- Who is going to monitor it?

Ideally the monitoring of CCPs needs to be in real time in order to quickly respond to any loss of control of a CCP. For example, monitoring the temperature of milk during pasteurization provides real time data and enables immediate action when the process diverges from predetermined limits. In contrast, measuring the bulk milk cell count of incoming raw milk requires laboratory testing and results are often obtained after raw milk has been comingled and processing has commenced. The documented corrective action must address such situations.

Monitoring should, where possible, employ rapid testing. Physical and chemical measurements are preferred to microbiological testing, because results are generated relatively quickly. This enables the manufacturer to limit the amount of out-of-specification product or respond before a critical limit is breached.

Records and documents associated with monitoring CCPs must be signed by the person(s) doing the monitoring and verified by the responsible supervisor. Records must be legible and traceable/identifiable back to the individual who signed it and distinguishable from others.

Self-Check – 4	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Define food safety monitoring (2pts)
2. What is the purpose of monitoring (2pts)
3. List the question you consider developing monitoring procedures (10pts)

Note: Satisfactory rating - 14 points **Unsatisfactory - below 14 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 5- Establishing corrective action

5.1 Introduction

Corrective actions are the action that must be taken if a critical limit is excceded at any step of food production in a food business (e.g. delivery, storage, preparation).crtical limits mark the minimum or maximum acceptable level of an identified food safety hazard at each critical contrl point(CCP)

5.2. Types of corrective action

There are two types of corrective actions. These are :

- Immediate corrective action
- Preventive corrective action

Immediate corrective actions are reactive , whereas preventive corrective actions are proactive.

5.3 Establish corrective action

When ever a critical limit is not met, a corrective action must be carried out immediately. A corrective action may be simply continuing to heat food to the required temperature. Other corrective actions may be more complicated, such as rejecting food items that were not delivered at the right temperature, or discarding food that has been held without temperature control too long.

Your food safety program must include corrective actions. Employees must know what these corrective actions are, and be trained in making the right decisions. This preventive approach is the heart of HACCP. Problems will arise, but you need to find them and correct them before they cause illness or injury. It is also important to document corrective actions when they are taken.

Self-Check – 5	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. What is mean corrective action(2pts)
2. List types of corrective actions(4pts)
3. When corrective action is taken?(2pts)

Note: Satisfactory rating - 8 points **Unsatisfactory - below 8 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 6- Conducting work with environmental guidelines

6.1. Introduction

In “Getting the basics right – how to comply with your environmental permit” (GTBR) we described the standards and measures that we expect businesses to take in order to control the risk of pollution from the most frequent situations in the waste management and process industries. To control the risk of pollution you are required to use the indicative Best Available Techniques (BAT) in this note.

Dairy product processing work include directly associated activities which have a direct technical connection with the main activities and which may have an effect on emissions and pollution. These may involve activities such as raw milk reception, pasteurisation cheesemaking, butter churning, yogurt production , packing ,cleaning ,refrigeration ,the control and abatement systems for emissions to all media and the combustion plant.

6.2.Types of work activities

Some of the dairy product processing work activities with their indicate BAT are listed below.

6.2.1. Pasteurisation, sterilisation and UHT

Indicative BAT

You should where appropriate:

- Use recirculating systems to recycle water. (Once through cooling systems should not be used.)
- Use energy efficiency techniques, including regenerative heat exchangers.

6.2.2. Evaporation

Evaporation systems may be single-stage or multi-stage (also called “effects”) with 2, 3 or more evaporator or vacuum units.

Evaporation produces copious quantities of hot water, suitable for boiler feed makeup and potential re-use within the factory(e.g. cleaning in place (CIP) make-up).

Indicative BAT

You should where appropriate:

1. Reduce energy consumption by re-using heat contained in vapours by, for example:

• vapour recompression

• or by using the vapour to pre-heat incoming feedstock or condensed vapour which is then used to raise steam in a boiler.

2. Install a condensate re-use system (as above – see efficient use of raw materials and water.)

6.2.3 Drying

The main issues are

- emissions to air - typically exhaust air is passed through cyclones. (Note that the outlet air of cyclones may contain dust particles up to 200 mg/m3 which will require secondary abatement e.g. fabric filters)
- odour
- energy efficiency

6.2.4 Centrifugation and bactofugation

Centrifuges need to desludge solid material that builds up in the separating disks to maintain performance and milk quality. This “separator desludge” has a very high Chemical Oxygen Demand(COD) (c.100,000 mg/l). It often accounts for around 10 to 20% of the dairy factory total effluent loading, and is suitable for collection for separate disposal rather than discharge to effluent.

6.2.5 Churning

Due to its high fat content (c.80%), butter has a very high COD (c.>2,400,000mg/l), and even buttermilk has a COD of around 100,000mg/l, so care has to be taken to avoid loss to effluent. Modern cleaning techniques use steam to melt out the residual butter prior to cleaning. This melt-out is then used during the next production run. Effluent streams from buttermaking dairies may contain high levels of fats, oils and greases (FOG).

Indicative BAT

You should where appropriate:

1. Evaluate effluent treatment and disposal options to take account of high COD and FOG from churning.

2. Rework meltout collected from cleaning operations.

6.2.6 Cooling, chilling and freezing

Indicative BAT

You should where appropriate:

1. Use recirculating systems to recycle water. (Once through cooling systems should not be used.)
2. Use detailed drainage plans to ensure that ammonia leaks cannot be discharged to surface waters.
3. Apply energy efficient techniques (see energy efficiency section above).

6.2.7 Cooling, moulding and extrusion

Whey released from cheese moulds and presses has a very high COD (approximately 60 to 80 000mg/l) and this requires collection rather than disposal to effluent. Some solid waste may be generated due to loss of product at the start and finish of the production process. Spillage of whey should be guarded against as it could seriously overload effluent treatment systems.

6.2.8 Filling

Before installing a new filling system you should consider the water requirements of the machine (both in use and during cleaning) along with any systems for the separate collection of high strength purges or interfaces that are produced during start-up and shut-down. Some high-speed fillers (especially with glass bottles) are noisy and require abatement measures to be adopted.

Indicative BAT

1. Optimise filling line speed to reduce volume of reclaimed milk due to carryover when changing product on a filling line.

6.2.9 Fermentation/incubation process

The cultured milk product produced in fermentation reactions is often a viscous, sometimes semi-solid material, with a high COD content (c.200 to 400,000mg/l), so any spillages to effluent can have an impact on effluent treatment processes. Some solid

waste may be generated due to loss of product at the start and finish of the production process.

Indicative BAT

You should where appropriate:

Avoid off specification product by maintaining a very high standard of hygiene and cleanliness.

6.2.10 Cleaning and sanitation

CIP systems can be much more efficient than manual cleaning but should be designed and used with due consideration to wastewater minimisation, since experience shows that CIP systems use much more water than manual cleaning techniques. In modern, large-scale dairy plants about half of all the effluent loading (both volumetric and organic, kgCOD) from the factory comes from CIP operations, so it pays to ensure that these systems are fully optimised with regard to water usage and product loss.

On most CIP cleans, the pre-rinse stage of the sequence contains the most product loss, so this can be examined in detail to build a picture of product wastage from each CIP pre-rinse operation. Samples of the pre-rinse can be taken every 5-15 seconds and analysed. You can use this data to optimise CIP programmes and ensure minimal losses and efficient cleaning.

Careful examination of CIP sequences can give substantial savings in product loss (and hence environmental impact) and water usage.

The exact design of a CIP system is determined by a variety of factors, including:

- how many individual CIP circuits are to be served by each CIP station?
- how many require hot rinses and how many require cold rinses?
- are the initial milk/product rinses collected?
- will they be processed (evaporated), or collected for animal feed?
- what method of disinfection will be used? Chemicals, steam or hot water?
- what is the estimated product loss, steam, and water demand of each cleaning
- operation?

Cleaning and sanitation may have the following environmental impact:

Water: Wash waters will contain remnants of cleaning agents, product rinsed from the system and removed from the equipment that is cleaned.

Energy: Cleaning is commonly carried out at elevated temperatures utilising steam. Preclean systems, for example vacuum transfer, blowers and pigging systems, require power and compressed air.

Accidents: Spillage of cleaning chemicals. Leakage from effluent system. Overloading of effluent treatment system.

Indicative BAT

You should ensure that appropriate cleaning procedures are in place. These should include measures such as the following:

1. Equipment design:

• modifying process lines and operations wherever practicable to eliminate or reduce excessive spillage of material onto the floor

• removing as much residual material as possible from vessels and equipment before they are washed

• ensuring that drains are equipped with catchpots

• ensuring that the catchpots are in place during cleaning (for example by installing lockable catchpots)

• optimising the water pressure at jets, nozzles and orifices

• using an automatic water supply shut off on trigger operated spray guns or hoses.

2. Good housekeeping:

- installing trays to collect waste to prevent it falling to the floor
- sweeping, shovelling or vacuuming spilt material rather than hosing it down the drain
- making sure suitable dry clean-up equipment is always readily available
- providing convenient, secure receptacles for the collected waste
- optimising cleaning schedules
- matching cleaning cycle durations to the vessel size

- product scheduling to minimise numbers of product changes and subsequently cleaning between products.

3. Management of manual cleaning:
   - using procedures to ensure that hoses are only used after dry clean-up
   - using trigger controls on hand-held hoses and water lances to minimise the use of washdown water
   - using high-pressure/low-volume systems.
4. Cleaning chemicals usage:

Ensuring that staff (and contract cleaners) are trained in the handling, making up and application of working solutions, for example, not setting the concentration of the chemical agent too high and avoiding the overuse of chemicals, particularly where manual dosing is used.

5. Cleaning-in-place (CIP):
   - removing product before the start of the wash cycle by gravity draining, pigging or air blowdown
   - pre-rinsing to enable remaining product to be recovered for re-use or disposal
   - using in-line turbidity or conductivity detectors to isolate product/water interface and maximise product recovery

For example conductivity sensors can be used to monitor levels of dissolved salts. This enables the automatic detection of milk:water interfaces so that product may be recovered for re-processing

Turbidity sensors can also be used to monitor the quality of process water and CIP systems and will therefore minimise effluent from out-of-specification products/process water and optimise re-use of cleaning water respectively.

- optimising the CIP programme for the size of plant/vessel and type of soiling
- optimising frequency and duration of rinses to reduce water use
- automatic dosing of chemicals at correct concentrations
- internal recycling of water and chemicals
- setting the recycle control on conductivity rather than time
- continuous cleaning of recirculated solutions

- using water-efficient spray devices.

6. Sanitisation

You should justify the use of organo halogen-based oxidising biocides over the alternatives, for example ozone and UV light.

7. Recycling of water and recovery of cleaning chemicals.
8. Using dry clean-up techniques to reduce waste water strength.

Self-Check – 6	Written test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Discuss the dairy product processing work activities with their indicate BAT (10pts)
2. Discuss the BAT for cleaning procedures (7pts)

Note: Satisfactory rating - 17 points **Unsatisfactory - below 17 points**

You can ask you teacher for the copy of the correct answers.

Operation Sheet – Developing HACCP plan

Objectives: the trainees will be able to develop HACCP plan for dairy products

List of Materials and tools needed:

-
-

Procedures:

Step 1: Assemble HACCP team

Step 2:Describe product

Step 3:Identify intended use

Step 4:Construct flow diagram

Step 5:On-site confirmation of flow diagram .

Step 6:Hazard analysis – list all potential hazards

Step 7:Determine CCPs

Step 8: Establish critical limits for each CCP

Step 9: Establish monitoring for each CCP

Step 10:Establish corrective actions

Step 11:Establish verification procedures

Step12: Establish documentation and record keeping

LAP TEST	Performance Test

Name…… ID…… Date……

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following task within **4** hour. The project is expected from each student to do it.

Task : Develop HACCP Plan

Reference Materials

Book:

1. Abstracts of the IFT Continuing Education Short Course (1991).The Hazard Analysis and Critical Control Point (HACCP) System.

2. Ecolab Incorporated(1992).Study Guide for the Implementation of HACCP,

3. Fssai(2018). Food safety management system,Guidance document,milk and milk products

4. International Association of Milk, Food, and Environmental Sanitarians, Inc. (1991). Procedures to Implement the Hazard Analysis Critical Control Point System,

5. World bank group(2020). Food safety hand book, A Practical Guide for Building a Robust Food Safety Management System.

WEB ADDRESSES

www.fssai.gov.in

http://www.fao org/food-safety-quality/en/

https://www.bmel.de/EN/food-node html

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