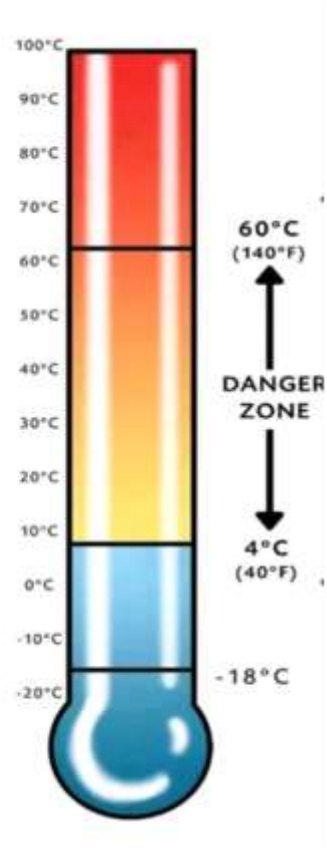
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Ministry of Labor and Skills

FRUIT AND VEGETABLE PROCESSING
Level-I





Based On *June 2021*, Version 3 Occupational Standard

Module Title: Working with Fruit and Vegetable Temperature Controlled Stock

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CONTENTS

Introduction to the Module **1**

LO #1- Prepare Freezer Storage Environment and Freezing Processes Operation. **2**
Instruction sheet 2
Information sheet 1 4
Self-check 1 40
Operation Sheet 1 42
LAP TEST-1 43

Lo #2- Identify and monitor equipment operation in a freezer storage environment **44**
Instruction sheet 44
Information sheet 2 45
Self-check 2 66
Operation Sheet 2. 67
LAP TEST-2 68

Lo #3- Operate and monitor the freezing process **69**
Instruction sheet 69
Information sheet 3 71
Self-check 3 94
Operation Sheet 3 95
LAP TEST-1 96

LO #4- Shut down the freezing Process **97**
Instruction sheet 97
Information sheet 4 98
Self-check 4 105

LO #5- Handle frozen product Safely **106**
Instruction sheet 106
Self-check 5 115

LO #6- Respond to emergencies **116**
Instruction sheet 116
Self-check 6 119
Reference 120

INTRODUCTION TO THE MODULE

This module covers the knowledge, skills and attitude required to store and retrieve temperature-controlled stock from appropriate storage facilities for fruit and vegetables. Keeping fruit and vegetables at a proper temperature is one of the most important things a food handler can do to prevent spoilage that cause foodborne illness from growing rapidly. Proper storage conditions - temperature and humidity - are required to maximize storage life and maintain quality of harvested fruits and vegetables.

The quality of frozen foods depends fundamentally on the quality of raw materials used and product manufacture can to maintain product temperature at a suitable low level in any part of the cold chain, including storage, transport, distribution, and display in retail stores.

Freezing methods for food are convenient and easily applied. Frozen products are very similar to the original fresh product, particularly if good handling and safety practices are utilized both before and after freezing.

LG #10	LO #1- Prepare Freezer Storage Environment and Freezing Processes Operation.

INSTRUCTION SHEET

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

- Identifying goods requiring temperature control
- Storing goods in correct storage areas.
- Recording and storing information to workplace requirement.
- Identifying appropriate clothing and foot wear.
- Correcting clothing and footwear fit to enter a freezer
- Confirming materials to meet operating requirements
- Identifying and confirming Cleaning and maintenance requirements.
- Fitting and adjusting machine components and related attachments in operation
- Meeting safety and production requirements in operating parameters.
- Checking and adjusting equipment performance.
- Conducting checks and inspection.

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 required goods at controlled temperature.
- Store goods in correct storage areas.
- Record and store information to workplace requirement.
- Identify appropriate clothing and foot wear.
- Correct clothing and footwear fit to enter a freezer
- Confirm materials to meet operating requirements
- Identify and confirm Cleaning and maintenance requirements.
- Fit and adjust machine components and related attachments in operation
- Meet safety and production requirements in operating parameters.
- Check and adjust equipment performance.

- Conduct checks and inspection.

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
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test

INFORMATION SHEET 1

1.1. Identifying goods requiring temperature control

1.1.1. Introduction

Fruits and vegetables are sensitive perishable fresh produce. It is important to keep them in suitable storage facilities. Most fruits and vegetables are stored in positive cold rooms. As a general rule, the storage temperature is between 3 and 6°C to prevent the products from losing their freshness too quickly.

These storage conditions also help to avoid the proliferation of bacteria. The humidity must also be monitored to avoid a too fast deterioration.

However, placing these foodstuffs in cold storage is only one step. It is also necessary:

- To ensure that the temperature of the positive cold room used is constant.
- Not to break the cold chain when shipping fruits and vegetables.
- To ensure that the cold chain has been respected from harvest to processing.
- Freezing preservation retains the quality of agricultural products over long storage periods.

1.1.2. Cold storage of fruits and vegetables

Deterioration of fruits and vegetables during storage depends largely on temperature. One way to slow down this change and so increase the length of time fruits and vegetables can be stored, is by lowering the temperature to an appropriate level.

1.Harvesting: It is essential that fruits and vegetables are not damaged during harvest and that they are kept clean. Damaged and bruised produce have much shorter storage lives and very poor appearance after storage. Dirty produce can introduce pests and molds into the store.

https://youtu.be/LSXcbQTf-6M(ways of harvesting) (access date 19/01/2023)

2.Handling; It is important that the produce does not get dirty or damaged during handling. Careful handling should be the rule. The best option is for the produce to be prepared for storage in the field and placed carefully in the storage containers used in the cold store.



Figure 1.1 handling of fruit and vegetable

3.Preliminary cooling (precooling): Dipping the produce in cool water to remove field heat can reduce the energy requirements of the store. However, this can spread fungus spores throughout the produce. A suitable alternative is to pick the produce either early in the morning when it is cool or late in the evening and leave it overnight to cool down.

1.1. 3.Storage conditions

1. Temperature Control

All fruits and vegetables have a 'critical temperature' below which undesirable and irreversible reactions or 'chill damage' takes place. The storage temperature always has to be above this critical temperature. One has to be careful that even though the thermostat is set at a temperature above the critical temperature, the thermostatic oscillation in temperature does not result in storage temperature falling below the critical temperature. Even 0.5°C below the critical temperature can result in chill damage.

- Safe refrigerator temperatures are between 0 – 4ºC. Freezer temperature is –18ºC or less
- Refrigerated storage slows the growth of bacteria that may be present in your perishable or potentially hazardous foods.

2.Relative humidity:

For most produce, a high but not saturated, relative humidity is required, eg 85 - 95%. There is always some moisture loss during cold storage but excessive moisture loss is a problem. It is essential that the relative humidity is kept above 85%. This can be done by:

- Allowing the produce to reach storage temperature and then covering in plastic
- Sprinkling the produce with water, this should be done before storage since if the vegetables are sprinkled during storage condensation occurs at the refrigeration unit.

COMMODITY	STORAGE TEMPERATURE (^{0}C)	RELATIVE HUMIDITY (%)	SHELF LIFE
Asparagus	0-2	95	2-3 weeks
Beans (green)	5-7	90-95	7-10 days
Carrot	0	90-95	2-5 months
Cauliflowers	0	90-95	2-4 weeks
Cucumbers	7-10	90-95	10-14 days
Cabbage	0	90-95	3-6 weeks
Pepper	7-10	90-95	2-3 weeks
Couregettes,	0-10	90	5-14 days
Eggplants, Brinjals	7-10	90	1 week
Melons	0-4.4	85-90	5-14days
Okra	7-10	90-95	7-10 days
Onion (dry)	0	65-70	1-8 months
Potatoes (white)	5-10	93	2-5 months
Potatoes (sweet)	12-16	85-90	4-6 months
Tomatoes (ripe)	7-10	85-90	4-7 days
Tomatoes (green)	12-20	85-90	1-3 weeks
Watermelons	4.4-10	90	2-3 weeks
Apples	1-4.4	85-90	3-8 months
Avocados	4.4-12.5	85-90	2-4 weeks
Mangoes	12	85-90	2-3 weeks
Pineapples	7-12.5	85-90	2-4 weeks
Pawpaw	7.0	85-90	1-3 weeks
Carnations	0-2	90-95	3-4 weeks

Source: FAO 1989

FAO (Food and agriculture organization)

Table 1. 1. Temperature, relative humidity, and shelf life of store some fruit and vegetable

3. Insulated Portable Coolers

If you're using portable coolers, make sure that you have enough packaged ice or frozen gel packs to maintain proper temperatures, especially for potentially hazardous foods.

An insulated portable cooler will prevent foods from thawing during the day but is not capable of freezing



Figure 1.2. Insulated Portable Coolers

- Ways to cooler stay cold for a longer period of time:
  - ✓ Pre-chill the food and drinks you plan on packing.
  - ✓ Fill the cooler to the top with food and drinks.
  - ✓ Freeze bottled water to store in empty spaces.
  - ✓ Store your cooler out of the sun.
  - ✓ Put the ice in last.

- ✓ Don’t drain the water when the ice melts.
- ✓ Pack all the essentials on top.
- ✓ Keep the lid closed.

1.1.4. Store food at safe temperatures

Temperature control depending on the nature of the food operations undertaken, adequate facilities should be available for heating, cooling, cooking, refrigerating and freezing food, for storing refrigerated or frozen foods, monitoring food temperatures, and when necessary, controlling ambient temperatures to ensure the safety and suitability of food.

Microorganisms can multiply very quickly if food is stored at room temperature. By holding food at temperatures below 5°C or above 60°C their growth is slowed down or stopped.

- Do not leave cooked food at room temperatures for more than 2 hours.
- Refrigerate all cooked and perishable foods promptly
- Do not refreeze frozen food after thawing or cooking

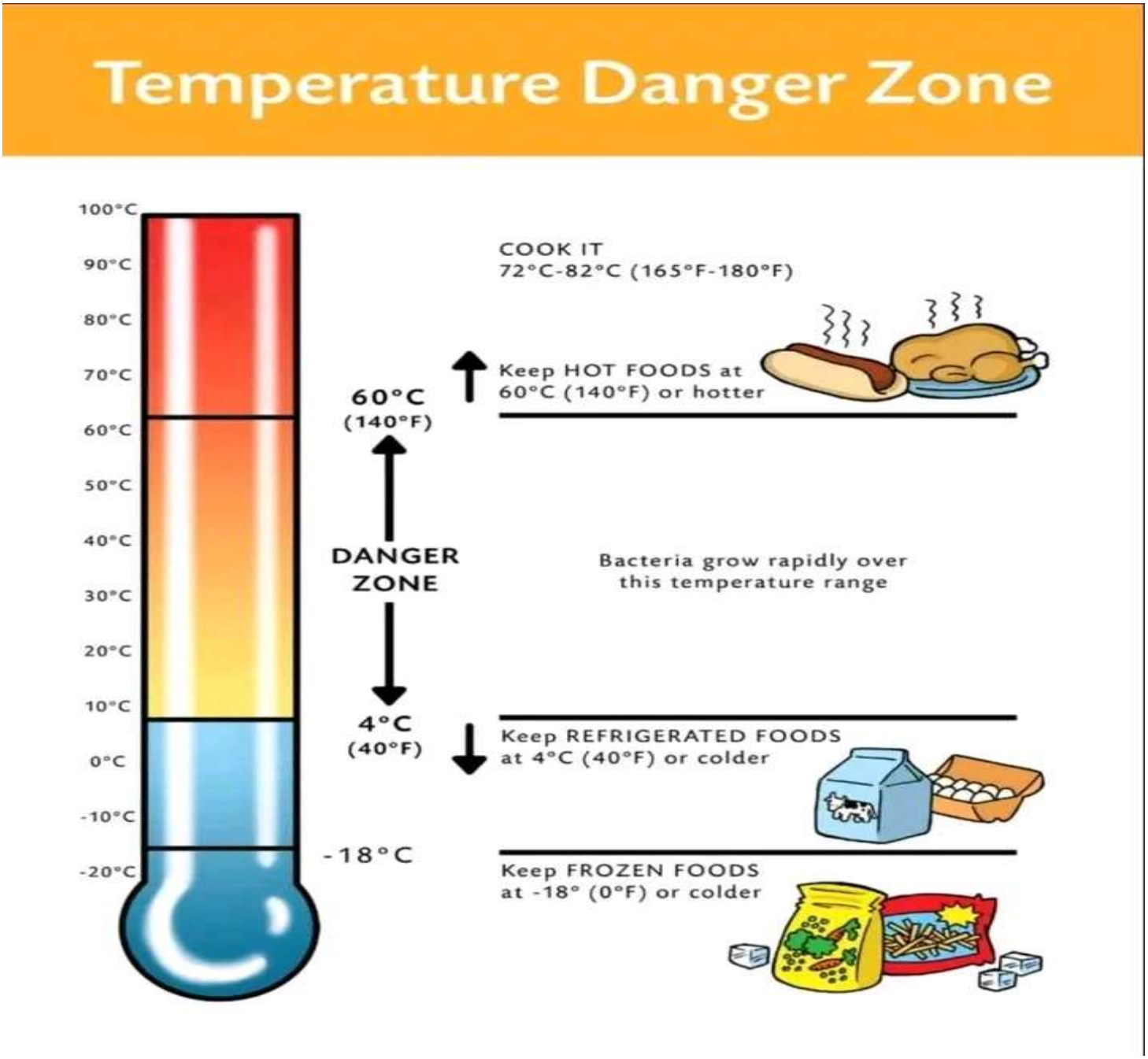


Figure 1.3. Danger zone temperature identification

https://www.youtube.com/watch?v=W8hZNvtrns0 (access date 19/01/2023)

1.2. Locating goods in correct storage areas

Most fruits and vegetables have a very limited life after harvest if held at normal harvesting temperatures. Postharvest cooling rapidly removes field heat, allowing longer storage periods.

- Proper postharvest cooling can:

✓ Reduce respiratory activity and degradation by enzymes.

✓ Reduce internal water loss and wilting.

✓ Slow or inhibit the growth of decay-producing microorganisms.

✓ Reduce the production of the natural ripening agent, ethylene.

In addition to helping maintain quality, postharvest cooling also provides marketing flexibility by allowing the grower to sell produce at the most appropriate time.

The Storage area can be

- Ensure satisfactory conditions of temperature, humidity and stock rotation
- Storage facilities for ingredients and packaging materials should be clean, dry and well-ventilated spaces that are free from dust, condensation, fumes, odours and any other source of contamination
- Ensure that packaging is stored separately from other raw materials and finished product.
- Ensure chemicals are received and stored where there is no possibility of contamination food products.
- Waste materials, cleaning chemicals, lubricants and pesticides should be stored separately from products.
- Store all materials and products off the floor. Materials should be stored 0.3 m from the floor and a distance of 0.5 m should be kept around walls or partitions of stores.
- The separates areas for storage of raw material, processed foods, packaging materials and wastes should be used.
- The containers and areas used for each of them should be labelled for easy identification.

Proper handling and storage practices can help protect your investment by preserving the quality and ensuring the safety of your food.

- General Tips for Food Handling and Storage

✓ Always choose foods that are at their peak quality

✓ Select produce that is just ripe and unblemished

- ✓ Avoid products with signs of spoilage such as mold growth or insect damage
- ✓ Check dates on product packages you purchase from the store
- ✓ Check to see that packages are clean, dry and show no signs of product tampering
- ✓ Check to see that cans are intact, with no bulging, dents, excessive rust or signs of leaking
- ✓ Handle foods properly in preparation for storage
- ✓ Pick up cold foods last at the store and get them home quickly
- ✓ Immediately refrigerate or freeze cold foods
- ✓ Never leave potentially hazardous foods
- ✓ Always handle foods with clean hands and clean utensils in clean work areas
- ✓ Package foods securely for storage
- ✓ Make sure storage areas are clean and correct storage temperatures are maintained
- ✓ Cupboards or pantries should be clean, cool and dry
- ✓ Refrigerators should be set at 35 to 38 °F so that foods stay at or below 40 °F
- ✓ Freezers should be set to keep foods at 0 °F or below
- ✓ Observe recommended storage times.
- ✓ Label and date packages of food
- ✓ Use a system of “first in, first out” when it comes to rotating stored food

1.2.1 Low temperature storage

Low temperature storage is further divided into three types based on temperature requirement.

Refrigerated storage is a storage space maintained at temperature between 3 to 10°C. It is used to store perishable foods for short term say 3-5 days.



Figure 1.4. Refrigerated

https://youtu.be/-3iQpzYqxLE (how to store Refrigerated**)** (access date 18/01/2023)

Freezer storage is apt for long term storage of perishable foods and the temperature ranges from -20°C to 0°C. Pre-treatments like blanching, quick cooling to freezing temperature and packing in air tight containers are necessary for successful freezing. Rotating stock is extremely important with frozen foods. FIFO (first in, first out) ensures proper rotation of foods in storage.

1.2.2 Safe Storage Practices

Farm direct marketers need to consider three primary food safety storage issues:

- Maintaining proper temperatures during storage
- Protecting food from contamination through the use of appropriate packaging
- Following recommended procedures for storing non-food items

Temperature control is critical to keep your foods safe and extend their shelf life. Problems with food spoilage and foodborne illness can result if satisfactory conditions of cleanliness, temperature, humidity and stock rotation aren't provided during storage. Any of your employees with poor personal hygiene or

improper food handling practices can also contaminate food during storage.

Avoid storing food and food handling products with hazardous materials or under pipes carrying liquid waste. Keeping your food well away from non-food items significantly reduces the risk of contamination.

1.2.2. Good Storage and handling practices

- Do not mix raw materials and finished products together
- Store up from the surface
- Recommended that where products are stacked
- Separation for chemicals (cleaning agents, lubricants,
- Separate area for identified as non-conforming
- Specified stock rotation systems (FIFO/FEFO)
- Regular inspection
- clean, dry, well-ventilated spaces
- protected from dust, condensation, fumes, odours or
- other sources of contamination

Clean, cold temperature storage facility with product off the floor, packaged and separated by type is essential.



Figure 1.5. Proper Storage Facility

Food Types and Storage Conditions

Depending on the type of food, you can store it in one of three ways:

- Use cool, dry, well-ventilated storage for shelf stable, nonperishable non-hazardous items such as jams, jellies and pickles.
- Refrigerate (4ºC or less) for short-term storage of fresh, perishable items and potentially hazardous foods. The only exception is eggs which may be stored at 7ºC or less.
- Freeze (-18ºC or colder) for long-term storage (6 to12 months) of perishable and potentially hazardous foods.
- Freezing simply extends the shelf life and quality of potentially hazardous foods

.

1.3. Recording and storing information to workplace requirement

1.3.1. Recoding work place information

Collection of information is timely and relevant to organizational needs. Each organization must have access to information and data if it is to function efficiently. This information needs to be collected (or created), stored and cared for and be easily accessed or retrieved. Records, then, are sources of information (documents or other items) which the organization wants or needs to retain.

The overall objective of any records management system is to provide the right information, at the right time, to the right person(s) at an affordable cost. Information is stored so that specific information is available when it is needed and in such a way that security and confidentiality is maintained. Business equipment/technology available in the work area is used to obtain information effectively. Types of technology or business equipment can assist in the effective collection of information Such as

- Photocopier
- Computer
- Printer
- Binder
- Filing systems – manual, computerized or electronic
- Answering machine
- Fax machine
- Telephone

Standard Operating Procedures, or SOPs, are documents that outline how to complete a task. An SOP doesn't need to be complicated – in fact, it should be as concise as possible and provide step-by-step instructions for a specific task.

How to develop an SOP: Accurately capturing all of the steps to even a simple process does require an investment of time.

A general format for an SOP might consist of the following parts:

- Title
- Objective/purpose—what task are you accomplishing and why?
- Scope—where and to whom does the SOP apply?
- Responsibility—who is responsible for making sure the task is completed?
- Materials—what specific items are needed to complete the task?
- Procedure—what are the steps to the task, in order?
- Verification/documentation—how will you verify that the procedure was completed correctly and what records will you keep?

General Recording and storing information to workplace requirement

- specifications
- Production schedules and instructions
- Manufacturers' advice
- Standard forms and reports
- Apply workplace procedure relevant to own responsibility

1.4. Identifying appropriate clothing and foot wear

Personal Protective Equipment (PPE) is clothing or equipment designed to reduce employee exposure to chemical, biological, and physical hazards when on a worksite. Consequently, workers in frozen storage facilities gear should wear clothing, boots, headgear and gloves that protect against the cold..

1.4.1. Appropriate clothing and footwear

Recommended Personal protective equipment in freezer storage environment

Head protection equipment	 Hair-nets
Face protection equipment	
Eye protection equipment	
Hand protection equipment	 Gloves
Foot protection	 safety shoes
Body protection equipment	

Table 1.2 PPE

It should be designed to ensure that the body and clothing itself does not contaminate food or surfaces likely to come into contact with food.

Dirty clothing is one of the leading causes of cross contamination in the kitchen as is can carry bacteria from one place to another.

Always use good quality cleaning products and be sure to store clean clothes in a clean, dry place, away from any possible sources of contamination.

1.4.2. Personal Cleanliness

Personnel should maintain a

- high degree of personal cleanliness and, where appropriate, wear suitable protective clothing, head and beard covering, and footwear



Figure 1.6 Identification how wear persona protective equipment



Figure 1.6. Personal protective equipment for food handlers

Personal protective equipment for food handlers(access date 19/01/2023)

1.5. clothing and footwear fit to enter a freezer

1.5.1. Comply with personal hygiene standard

Food handlers are required to comply with workplace and legislated requirements to ensure the safety of food prepared and served for human consumption. Make Personal hygiene to meet the requirements of the food safety process.

Personal Hygiene: The word hygiene means using sanitary principles to maintain health. Personal hygiene refers to the cleanliness of a person's body and clothes.

To ensure that those who come directly or indirectly into contact with food:

- Maintain appropriate personal health
- Maintain an appropriate degree of personal cleanliness
- behave and operate in an appropriate manner

To understand why employees, need good personal hygiene, it helps to look at different parts of the body that can be sources of microbial contamination.

1. Skin

- The skin constantly deposits sweat, oil, and dead cells on its outer surface. When these materials mix with dust, dirt, and grease, they form an ideal place for bacteria to grow. Therefore, bacteria from skin can contaminate food.
- Food handlers may rub or scratch the area and then transfer bacteria to food when they touch it.
- Contaminated food has a shorter shelf life or may cause food borne illness

2.Fingers

- Bacteria may be picked up by the hands when they touch dirty equipment, contaminated food, clothing, or parts of the body.
- Employees should wash hands frequently and use a hand-dip sanitizer after touching these things so that they do not contaminate food.
- Plastic gloves can be used, although food can be quickly contaminated if good hand washing and other hygienic practices are not used.

- Plastic gloves help prevent pathogenic bacteria on the fingers and hands from reaching the food.

Single-service disposable gloves in combination with proper hand-washing

- ✓ Gloves must fit properly
- ✓ Should not have any holes or be torn
- ✓ Should not be replaced for proper hand-washing



Figure 1.7 glove

3.Hair: Hair carries microorganisms, especially staphylococci. Employees should wear a hairnet or hat while handling food and use a hand dip after scratching their heads.

4.Health Status

Sick persons suffering from illness transmitted through food, should not be allowed to enter any food handling area. Monitor the health of staff. Conditions to be reported for medical examination and/or possible exclusion from Handling Food



Figure 1.8 sick person

Hand Washing: Personnel should wash hands with soap and water maintain appropriate personal health;

- At the start of food handling activities
- When returning to work after breaks
- Immediately after using the toilet; and

After handling any contaminated material, (waste or raw and unprocessed foods)



Figure 1.9 hand wash

1.6. Confirming materials to meet operating requirements

1.6.1. Raw material used for freezing

Raw materials, including ingredients, processing aids, and packaging, are the foundation of finished food products. As such, they must meet regulatory requirements and your specifications contribute to the functionality and quality of your process and product. Raw materials used should be safe, sound and suitable for further processing. Procedures should be in place to ensure quality and safety of incoming materials. Freezing cannot improve quality, and it is necessary to use raw materials of optimum quality. Many raw materials and food products are highly perishable and should be handled carefully to maintain their quality until the freezing process is initiated. Initial microbial levels in raw materials to be frozen should be kept as low as possible, both for food safety and quality reasons. Temperatures and duration of storage should be appropriately and regularly controlled to minimize adverse microbial effects. Most quality deterioration, including the development of off odours and flavours and changes in colours and texture are due to microbial growth or enzymatic activity.

Appropriate procedures should be in place for sorting and segregating raw materials that are unsuitable for further processing.

For highly perishable products, product temperature control at receiving may be considered a critical control point (CCP). Additionally, the receipt temperature may also be considered an essential quality provision.

1.7. Identifying and confirming Cleaning and maintenance requirements

1.7.1. Maintenance

- A preventive maintenance programmed should be in place to cover all plant and equipment
- Where corrective maintenance is performed, adjoining lines or equipment should not be at a risk of contamination.
- Maintenance should give priority to requests impacting product safety.
- Temporary fixtures should be avoided.

- After maintenance, inspection should be performed prior to releasing equipment back into production.

1.Types of maintenance

Basically, there are two types of maintenance: -

- **Preventive or proactive maintenance:** is carried out to keep something functional. This type of activity is usually planned and scheduled.
- **Corrective or reactive maintenance:** is repairing something to get it working again. This is an unscheduled, unplanned task, usually associated with greater hazards and higher risk levels. Routine maintenance tasks refer to: On-going, scheduled tasks that are performed in order to keep hand tools and basic equipment functioning properly.

2. Maintenance requirements

Maintenance is a general upkeep and repair of equipment, buildings and grounds, heating and air-conditioning; removing toxic wastes; parking; and perhaps security.

Food premises and equipment that are not kept in good repair and condition are a potential source of microbiological and physical contamination of food.

Poor maintenance may allow the entry of other sources of physical, microbiological and chemical contaminants such as water, pests and dust. Poor maintenance can have health and safety implications for workers. Maintenance may include:

- Hand sharpening
- Cleaning
- lubricating
- Tightening
- Simple tool repairs and adjustments

3.Perform maintenance safely

- Always disconnect powered tools before servicing, adjusting, oiling, cleaning or repairing them, sharpening or changing accessories such as blades.
- Follow the manufacturer's instructions in user's manual for maintenance and servicing (e.g. lubrication, cleaning) and changing parts and accessories.
- Use appropriate tools and equipment while carrying out maintenance
- When maintenance is complete workers have to check if the maintenance has left the portable tools in a safe and functioning condition:
- Replace all guards and safety devices

Record your inspection and actions, sign out and pass the tool to the worker or store it safely

1.7.2 Cleaning

Cleaning is the complete removal of food soil using appropriate detergent chemicals under recommended conditions.

1.7.2.1. Cleaning Methods

There are a number of methods which can be used to apply detergents and disinfectants.

1.Manual cleaning

Manual cleaning using cloths, mops, brushes, pads, etc. It is normally used in small areas, equipment that is non-water proof or requires dismantling or areas which are difficult to clean by other methods. To ensure cleaning is effective the method must be clearly defined and staff trained to an appropriate level.

2.Foam cleaning

This is the common method for cleaning most food operations. Large areas such as floors, walls, conveyors, tables and well-designed production equipment are ideal for foam cleaning. Foam is a carrier for the detergent. The foam should be applied in an even layer. Coverage rates are quick and chemical usage is economical.



Figure 1.10 Spray

https://youtu.be/8Y7PZ-XHlys?t=52 (access date 21/01/2023)

3. Machine washing

This is normally an automatic or semi-automatic washing process conducted within a purpose-built machine. There are many machine designs depending on the application. But failure to maintain them correctly can lead to a contamination risk to the product. Chemicals used in these machines should be low foaming. An effective system for controlling the dose of chemical should be employed and temperature control systems should be used were critical.

4. Cleaning in place (CIP)

Cleaning-in-place (CIP) is an automatically performed method of cleaning, applied to remove residues from complete items of plant equipment and pipeline circuits without dismantling or opening the equipment.

1. Cleaning procedure

Cleaning is a complex process. To ensure it is conducted correctly a defined and systematic approach is required that takes into account a number of factors previously covered. This approach takes the

form of a Procedure and this is usually a legal requirement in addition to a fundamental requirement of global food standards. A collection of these cleaning procedures forms a Cleaning Plan or Program which is plant specific.

The correct sequence of a general cleaning procedure for surfaces in a food plant is:

- Gross Clean/Preparation
- Pre-rinse
- Detergent application
- Post-rinsing
- Disinfection
- Terminal rinsing

2. Cleaning and sanitation of working area and Equipment's

- established and validated
- Working area and equipment are cleaned and/or sanitized to a defined schedule, including the
- cleaning of cleaning equipment.

Area	Frequency Of Cleaning					Precautions	Method of cleaning	Cleaning agent to be used	Responsible
	After Use	Every Shift	Daily	Weekly	Other				

Legal cleaning requirements

- Compliance regarding cleaning of food premises
- Make sure that processing rooms are designed and laid out so as to permit good food hygiene practices

The lay out, design, construction, sitting and size of food premises, including facilities for cleaning and storing working utensils and equipment and refuse stores, allow for adequate cleaning.
In rooms of processing the design and laid out are to permit good food hygiene practices, including protection against contamination between and during operations.

1.8. Fitting and adjusting machine components

1.8.1 Machine Adjustment

Before starting any operation, the operator should be checking the main parts of the equipment appropriately and identify faulty and unfit parts or components of the machine then adjust and fit all parts or components of the machine identified based on operation procedure standards.

1.8.2. Adjustment of Machine operation

Safety check:

- The materials should be safe
- Durable, corrosion resistant
- Resistant to deterioration and wear and tear of parts.

1.9. Meeting safety and production requirements in operating parameters.

Food Safety: is the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (Codex Alimentarius).

Safe Food: Safe food is food which is free from contaminants and will not cause illness or harm. Food safety is the overriding umbrella term that is concerned with all aspects of keeping food safe for us to eat, throughout all processes, from 'farm-to-fork'.

A food safety management system is an active managerial control focused on controlling food safety hazards to ensure that food is safe at the time of human consumption. Process Hazard Analysis is a systematic examination and assessment of data and facts about some process to uncover and understand risks existing in the process environment. Its purpose is to identify and classify exposure points according to their estimated degree of hazard.

1.9.1. Food safety hazard

Food hazards Refers to any agent with the potential to cause an adverse health effect. That is reasonably likely to cause illness or injury in the absence of its control

- Biological,
- Chemical
- Physical agent in food, or condition of food, with the potential to cause an adverse health effect.

Hazard Analysis and Critical Control Point

Hazard Analysis and Critical Control Point (HACCP) is a systematic approach in identifying, evaluating and controlling food safety hazards. Food safety hazards are biological, chemical or physical agents that are reasonably likely to cause illness or injury in the absence of their control. A HACCP system is a preventive system of hazard control rather than a reactive one. HACCP systems are designed to prevent the occurrence of potential food safety problems. This is achieved by assessing the inherent hazards attributable to a product or a process, determining the necessary steps that will control the identified hazards, and implementing active managerial control practices to

ensure that the hazards are eliminated or minimized. Essentially, HACCP is a system that identifies and monitors specific food borne hazards – biological, chemical, or physical properties – that can adversely affect the safety of the food product. This hazard analysis serves as the basis for establishing critical control points (CCPs). CCPs identify those points in the process that must be controlled to ensure the safety of the food. Further, critical limits are established that document the appropriate parameters that must be met at each CCP. Monitoring and verification steps are included in the system, again, to ensure that potential hazards are controlled. The hazard analysis, critical control points, critical limits, and monitoring and verification steps are documented in a HACCP plan. Seven principles have been developed which provide guidance on the development of an effective HACCP plan. The United States National Academy of Science recommended in 1985 that the HACCP approach be adopted in food processing establishments to ensure food safety.

The following terms are used in discussion of HACCP that must be clearly understood to effectively develop and implement a plan.

- ***Acceptable Level*** means that the presence of hazard which does not pose the likelihood of causing an unacceptable health risk.

- **Control point** means any point in a specific food system at which loss of control does not lead to an unacceptable health risk.
- **Critical control** point, as defined in the food Code, means a point at which loss of control may result in an unacceptable health risk.
- **Critical Limit**, as defined in the Food Code, means the maximum or minimum value to which a physical, biological, or chemical parameter must be controlled at a critical control point to minimize the risk that the identified food safety hazard may occur.
- **Deviation** means failure to meet a required critical limit for a critical control point.
- **HACCP plan**, as defined in the Food Code, means a written document that delineates the formal procedures for following the HACCP principles developed by The National Advisory Committee on Microbiological Criteria in Foods.

- **Hazard**, as defined in the Food Code, means a biological, chemical, or physical property that may cause an unacceptable consumer health risk.
- ***Monitoring,*** means a planned sequence of observations of measurement of critical limits designed to produce an accurate record and intended to ensure that the critical limit maintains product safety. Continuous monitoring means an uninterrupted record of data.
- ***Preventive,*** measure means an action to exclude, destroy, eliminate, or reduce a hazard and prevent recontamination through effective means.
- ***Risk,*** means an estimate of the likely occurrence of a hazard.
- ***Sensitive ingredient*** means any ingredient historically associated with a known microbiological hazard that causes of contributes to production of a potentially hazardous food.

1.9.2. Principles of Hazard Analysis Critical Control Point (HACCP)

1. Conduct a hazard analysis

Identify the potential hazard(s) associated with food production at all stages, from primary production, processing, manufacture and distribution until the point of consumption. Assess the likelihood of occurrence of the hazard(s) and identify the measures for their control.

2. Determine the Critical Control Points (CCPs).

Determine the points, procedures or operational steps that can be controlled to eliminate the hazard(s) or minimize its (their) likelihood of occurrence. A "step" means any stage in food production and/or manufacture including the receipt and/or production of raw materials, harvesting, transport, formulation, processing, storage, etc.

3. Establish critical limit(s).

Limits must be specified and validated, if possible, for each Critical Control Point. In some cases, more than one critical limit will be elaborated at a particular step. Criteria often used include measurements of temperature, time, moisture level, pH, A_w, available chlorine and sensory parameters such as visual appearance and texture.

4. Establish monitoring procedures.

Monitoring is the scheduled measurement or observation of a CCP relative to its critical limits. Monitoring should ideally provide this information in time to make adjustments to ensure control of the process to prevent violating the critical limits. Where possible, process adjustments should be made when monitoring results indicate a trend towards loss of control at a CCP. The adjustments should be taken before a deviation occurs. Data derived from monitoring must be evaluated by a designated person with knowledge and authority to carryout corrective actions when indicated. If monitoring is not continuous, then the amount or frequency of monitoring must be sufficient to guarantee the CCP in control.

5. Establish corrective actions.

Specific corrective actions must be developed for each CCP in the HACCP system in order to deal with deviations when they occur. The actions must ensure that the CCP has been brought under control, Actions taken must also include proper disposition of the affected product. Deviation and product disposition procedures must be documented in the HACCP record keeping.

6. Establish verification procedures.

Verification and auditing methods, procedures and tests, including random sampling and analysis, can be used to determine if the HACCP system is working correctly. The frequency of verification should be sufficient to confirm that the HACCP system is working effectively. Examples of verification activities include:

- Review of the HACCP system and its records
- Review of deviations and product dispositions
- Confirmation that CCPs are kept under control.

Where possible, validation activities should include actions to confirm the efficacy of all elements of the HACCP plan.

7. Establish record-keeping and documentation procedures.

Efficient and accurate record keeping is essential to the application of an HACCP system. HACCP procedures should be documented. Documentation and record keeping should be appropriate to the nature and size of the operation.

Documentation examples are:

- Hazard analysis
- CCP determination
- Critical limit determination

Record examples are:

- CCP monitoring activities
- Deviations and associated corrective reactions
- Modifications to the HACCP system as defined in the Food Code

1.9.3. Stock control and packaging

- Have a stock rotation system based on dates of manufacture and shelf life. (FIFO RULE: First in First Out). There is also FEFO Rule.
- The packaging material should be of food grade with no strong odor of chemicals or colors.
- The packaging material should not be stored directly on the floors.
- Every package must have complete labelling along with nutritional labelling as per provisions of Food Safety and Standards Act, 2006.
- Every package of Food must have the batch no. and a unique bar code for tracing back the item in case there is a customer complaint in future.

1.9.4. Product identification and traceability

- Traceability means the ability to track any food, feed, food-producing animal or substance that will be used as an ingredient at any stage of production, processing or distribution with the help of records.
- Traceability enables tracking the path of a product or ingredient from the initial supplier through all processing and distribution stages, right to the end consumer.

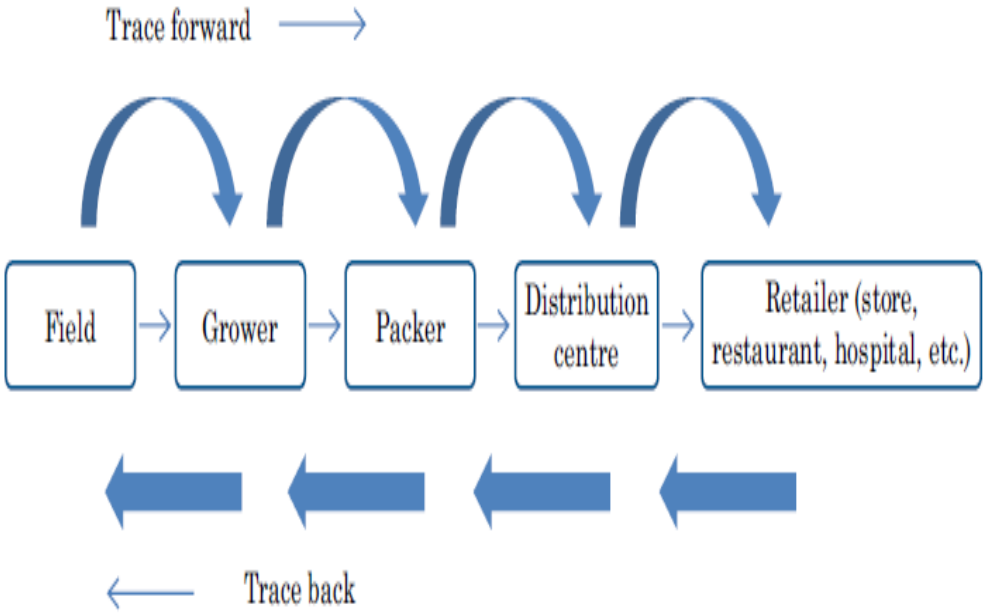


Figure 1.11. Traceability of process

1.9.5. labelling, weights and measures and legibility

Weights and measures: Suppliers must label food products with accurate weights and measures information (the quantity of food contained in a package).

Legibility requirements; The Food Standards Code requires that labels must be legible and prominent so they are distinct from the background, and in English. The size of the type in warning statements must be at least 3 mm high, except on small packages where the size of the type must be at least 1.5 mm high

Labeling: Most regulatory agencies, depending on the location of production, require that some specific information be included on the label of the frozen food package.

Several basic requirements are recommended for labeling of frozen products:

- The common or usual name of the ingredients
- The form (or style) of vegetables or fruits, such as whole, slices, or halves. If the form is visible through the package, it need not be stated.
- For some vegetables and fruits, the variety or color
- Liquid in which a vegetable is packaged must be listed near the name of the product.
- The total contents (net weight) must be stated in grams for containers holding 1 kilogram or less. Other information required on the label, although not on the front panel:
- Ingredients, such as spices, flavoring, coloring, or special sweetener, if used
- Any special type of treatment
- The packer's or distributor's name and place of business
- Nutritional information
- Expiration date
- Storage requirements
- Heating instructions

1.10. Checking and adjusting equipment performance.

1.10.1. Evaluation of performance of freezing machinery

Measure the freezing line efficiency, its throughput, if the equipment is operating at maximum speed, and so on. These data points give you a measure of a piece of the system but not necessarily an overall view of how effective the equipment is.

1.10.2. Overall equipment effectiveness (OEE)

Overall equipment effectiveness (OEE) is a measure of how well a manufacturing operation is utilized (facilities, time and material) compared to its full potential, during the periods when it is scheduled to run. It identifies the percentage of manufacturing time that is truly productive.

1.10.3. Total effective equipment performance (TEEP)

Total effective equipment performance is a closely related measure which quantifies OEE against calendar hours rather than only against scheduled operating hours. A TEEP of 100% means that the operations have run with an OEE of 100% 24 hours a day and 365 days a year (100% loading).

1.10.4. Factors Affecting Overall Equipment Effectiveness (OEE)

Freezing machinery manufacturers institute (FMMI's) Primary freezing Line Play book explains that Overall Equipment Effectiveness is a combination of three factors:

- **Availability** - Making things at the right time (keeping the machine up and running, minimizing downtime)
- **Performance** - Making the right thing
- **Quality** - Making things the right way (no defects, rework, or waste)

1.11. Conducting checks and inspection.

1.11.1. Inspecting and Checking Condition of Equipment and Machines

Before any equipment or machine is used, it must first be checked to make sure that it is very functional and in good condition. Checking and inspecting equipment and machines will guarantee that all their parts are intact and that no part is missing or defective. Religiously checking and inspecting equipment and machines will facilitate Preventive Maintenance which include checking the following:

- Machine temperature
- Hydraulic fluid
- Wear and surface condition
- Crack
- Leak detection
- Vibration

- Corrosion
- Electric insulation

Performing pre operation activities ensures that all the tools, equipment and utensils assembled, checked, inspected, sanitized, readied and stowed after use are the appropriate devices required in processing the food based on the method of processing that will be undertaken like salting, curing, smoking, fermentation, pickling, canning, bottling, processing using sugar, drying, and dehydration

1.11.2. Inspection of production process

Quality assurance system enables better control over raw materials, processes and finished products' quality and safety. It is also possible to validate the methods of control mechanisms that can mitigate the hazard and verify them with different monitoring approaches



Figure 1.12 Inspection

SELF-CHECK 1	Written test

Name…… ID…… Date…….

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

TEST I: Choose the best answer among the given alternative (1pts each)

1.Which one of the following is not true about safe refrigerator temperatures

A. Its storage is slowing the growth of bacteria B. Temperature between 0 – 4ºC.

C. Temperature is –18ºC or less D. It is cold temperature

2. At which temperature bacterial is rapid growth?

A. At room temperature B. At high temperature C. At low temperature D. all

3. Temperature control Depending on the

A. Nature of the food operations undertaken B. Monitoring food temperatures

C. storing refrigerated or frozen foods, D. all

4.Proper cleaning and disinfecting leads to:

A. Minimizing product rejection C. Lengthening product shelf life

B. Reduction of the risk on food poisoning D. All

5.Identify the low temperature of store fruit and vegetable

A. Pasteurization B. Chilling C. Sterilization D. All

6.Proper postharvest cooling can be

A. Reduce respiratory activity and degradation by enzymes.

B. Reduce internal water loss and wilting.

C. Slow or inhibit the growth of decay-producing microorganisms;

D. Reduce the production of the natural ripening agent, ethylene. E. All

7.Which of the following is not true about good Storage and handling practices

A. mix raw materials and finished products together B. Store up from the surface

C. Separation for chemicals. D. (FIFO/FEFO) E. All

8.Which one of the following is not true regarding of proper storage?

A. Protects food from flies and dust. B. Prolongs its shelf life.

C. Ensures that the kitchen is clean and well organized. D. The shelf life of a food is the length of time E. Food remains safe and

9._____ Is a food safety action or activity that can be used to prevent or eliminate a food safety hazard to an acceptable level.

A. Preventive B. Control Measure C. Risk D. Hazard process

10. Which one of following is important of GMP?

A. Create awareness of food quality and safety among the staff B. Increases confidence in product safety. C. Provides a starting point for the HACCP program D. Recognition internationally E. All

11. Which one is critical limit in food processing?

A. Temperature B. Time C. Moisture level D. Ph E. All

12. ISO 22000 specifies the characteristics of a management system designed to carry out?

A. Design the HACCP plan B. Identify the prerequisite programmers (PRP)

C. Select the operational prerequisite programmers D. All

13.A general format for an SOP might consist

A. Title B. Objective/purpose C. Scope D. Responsibility E. All

Test II: Short Answer Questions (2. point each)

1.Write the difference refrigerator and freezer temperature?

2. At which temperature Microorganisms can be multiply very quickly?

3.What is the difference Sanitizing and disinfecting?

4. What is purpose of proper cleaning and disinfecting?

5. Mention what we check during maintenance of equipment and machines?

4.Write the relationship between HACCP and ISO?

OPERATION SHEET 1

1.1. Techniques/Procedures of fitting PPE

A. Tools and equipment

- Glove
- Mask
- Goggles
- Apron/gown
- Safe shoes

B. Procedures/Steps/Techniques

I. When you enter cold room, you will be directed to sanitize your hand and rub your hands together until sanitizer has fully dried about 20 seconds.

II. Put on gown. Check neck and waist ties security

III. Put on mask. place mask over nose and under chin

IV. Put on protective eye wear. Put eye protection and adjust to fit

V. Put on glove

VI. Wear safety shoes

LAP TEST-1	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 50 minutes. The project is expected from each student to do it.

Task-1 perform fitting PPE

LG #11	Lo #2- Identify and Monitor Equipment Operation in a Freezer Storage Environment

Instruction Sheet

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

- Monitoring and confirming stock temperature.
- Monitoring residence time in temperature-controlled stores.
- Identifying and correcting out-of-specification storage temperatures.
- Identifying effects of freezing temperature on equipment
- Ensuring and monitoring equipment in operational order

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:

- Monitor and confirm stock temperature.
- Monitor residence time in temperature-controlled stores.
- Identify and correct out-of-specification storage temperatures.
- Identify effects of freezing temperature on equipment
- Ensure and monitor equipment in operational order

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
4-Accomplish the Self-checks
5-Perform Operation Sheets
6-Do the "LAP test

INFORMATION SHEET 2

2.1. Monitoring and confirming stock temperature

Monitor temperatures to avoid produce being destroyed by any exposure to low or high temperatures, which can happen in extreme cases. Thermometers should be placed inside and outside the storage facility. Stored produce will give off heat during storage making it necessary to regulate temperatures by use of the ventilation windows.

2.1.1 Monitoring storage areas

The purpose of proper storage is to ensure the security and quality of products stored until they are needed. Storage areas should always must be maintained at the proper temperature to ensure product quality, and locked to ensure product security. As a result, the products in storage areas have been stored according to store policies such as,

- Store items using FIFO (First In, First Out).
- To do this, store new supplies behind old supplies so that the old supplies are used first.
- Store food and chemicals in separate areas.
- Date foods and place new foods behind current stock.
- Keep food in clean, sturdy containers to prevent pest and rodent infestation.
- Keep food off the floor and away from the walls.
- Keep the shelving and floor clean.

2.1.2. Low-temperature treatment

- The foods are stored at temperatures 0–5 °C.
- It causes minimal changes to the nutritional properties of food.
- The main objective of chilling is to reduce the rate of microbial growth and its enzymatic activities which extends the shelf life

.

Temperature Monitoring using a Thermometer

Temperature of food can be checked using a probe thermometer. Ideally, hand-held digital thermometer should be used when probing foods and checking air temperatures. Probe thermometers should be sanitized/disinfected before/after each use. Under no circumstances should a mercury in glass thermometer be used as it would present contamination risk if it breaks. It is important that you regularly check that the probe thermometer you are using is working correctly.



Figure 2.1. Thermometers

https://youtu.be/jMg4ijTSBAo (access date 19/01/2023)

2.2. Monitoring residence time in temperature-controlled stores.

Consolidated orders are stored in chillers and freezers before being transferred to Load Out. The dispatch operator must ensure that the product is at the required temperature before it is transferred to the delivery agent. Transporters are designed to maintain the temperature of the product. They are designed to chill or freeze a product that is above the required temperature. Orders must not be loaded uncooled into a transport. The product should already be at the correct storage temperature before being transferred to the transporter for delivery.

2.2.1. Time & Temperature Tolerance (TTT)

The integrated effects of time and temperature on frozen foods affect their color, flavor and texture, commonly referred to as quality. The degree to which individual products tolerate the time & temperature effects is called the **Time-Temperature Tolerance (TTT)**. Regulations or company quality-assurance standards must specify and control both the time and temperature factors to guarantee product quality.

2.2.2 Practical Storage Life (PSL)

Attempts have been made to determine how long certain categories of products can be effectively stored without creating undue quality damage to the products. This storage period is commonly called the Practical Storage Life (PSL), or shelf life which is about equivalent to the duration of consumer acceptability.

The following are general conclusions pertaining to Practical Storage Life:

- There is no reason for maintaining freezer storage at -20 °F (-29 °C) for any commodities except for unpackaged fat fish and some high-fat ice cream products.
- A temperature of -10 to -15 °F (-23 to -26 °C) may be desirable for lean fish and precooked foods without gravy if they are to be held for well over 6 months in storage.
- All other commodities may be stored at 0 °F (-18 °C) or colder even if they are to be held for longer than 1 year.
- Rapid pre-cooling and ultra-rapid freezing are of particular benefit to fruits, vegetables, and fat meats, and of least benefit to lean meats.
- Regulations requiring all frozen foods to be stored colder than 0 °F (-18 °C) and for not more than 1 year may be unrealistic. Specific products may benefit from colder storage temperatures.
- Quality of product entering storage, method of processing and handling, and method of packaging have a profound influence on storage life of the frozen product. The warehouse therefore should
- be aware of these pre-storage conditions when receiving products in order to protect against claims that quality has deteriorated during storage

Steps in taking temperatures

A method is described below involving either a dial thermometer with stem or a thermocouple (electrical devices for measuring temperature).

- Open top of case and remove top corner package.
- Make hole through the case from inside in line with the second layer of product. Use an ice pick or similar tool. Do not use the stem of the thermometer.
- Place the thermometer or thermocouple in the hole from the outside, so that the end of the stem, the sensing element, is about 3 inches (8 cm) in from the case wall. Make sure the sensing element is held firmly between packages.
- Place package back in its normal place and close top of case. Do steps 1 to 4 as

quickly as possible.

- Place two or more cases on top to assure contact of stem with packages of product.
- Read temperature after 5 minutes.
- Check the accuracy of the thermometer or thermocouple regularly and keep a record of the checks and any recalibrations.

This method supplies approximate measurements of product temperature rather than temperatures of air around the packages. It is simple, fast, and does not require puncturing of individual package

After the temperatures are taken

The following advice is offered as a guide. Practice will vary somewhat with commodities and with other factors. It is important, however, that refrigerated warehouses and other handlers of frozen foods have well defined policies in the matter of action following the taking of temperatures.

If the highest reading is 25°F (-3.9°C) or higher	Damage to quality is occurring rapidly and immediate steps should be taken to prevent further damage. Product should be placed in a blast freezer or equally rapid freezer with spacers between cases to permit air circulation and rapid temperature drop. Cases should not be removed to storage room or restacked until product is at 0°F (-18°C) or lower. Product which has been above 25°F (-3.9°C) should be evaluated after it has been returned to 0°F (-18°C) or below. It may no longer have acceptable quality. Even if quality is still acceptable, the remaining shelf life has
If the highest reading is 10°F (-12°C) or higher, but below 25°F (-3.9°C)	Damage to quality is occurring slowly but at an unacceptable rate. To prevent further damage, it is necessary to place the product in 0°F (-18°C) or lower temperature within an hour. If this is not done, damage to quality can be expected. If the product has risen above 10°F (-12°C), air circulation should be provided between cases. Even if the quality is still acceptable, the life of product with readings above 10°F (-12°C) is
If the highest reading is 0°F (-18°C)	This temperature is satisfactory for most, but not all, products. Thus, for most products it can be assumed that the quality achieved after the initial freezing has been retained. Every effort possible should be made to protect that quality.
General Rule	If frozen foods are at a desired low temperature, they may be stacked tightly to prevent air movement between cases to reduce the effects of a possible undesired increase in air temperature. If frozen foods are at an undesired high temperature that needs to be lowered without delay to preserve quality, cases should be stacked to allow circulation of colder air between cases to hasten the lowering of product temperature. Other products should be protected during this procedure to avoid inadvertent warming by the product under treatment.

2.2.3. Freezing Time

Again, freezing time is one of the most important parameters in the freezing process, defined as time required to lower product temperature from its initial temperature to a given temperature at its thermal center

Freezing time depends on several factors, including the initial and final temperatures of the product and the quantity of heat removed, as well as dimensions (especially thickness) and

shape of product, heat transfer process, and temperature.

The most important are:

- Dimensions and shape of product, particularly thickness
- Initial and final temperatures
- Temperature of refrigerating medium Surface heat transfer coefficient of product
- Change in enthalpy
- Thermal conductivity of product

2.2.4. Time as a food safety control

After four hours in the danger zone, most Time Control for Safety Food will contain enough bacteria to cause a risk for foodborne illness. Therefore, hot/cold ready-to-eat foods that are not temperature controlled should be consumed or reheated/chilled within 4 hours. After that, they should be discarded.

Time alone, at ambient temperatures, may be used to control the safety of products, but requires great care and attention. The duration should not be greater than the **"lag phase"** of the pathogen in the product. During this lag phase, the microorganisms assimilate nutrients and increase in size.

The lag phase of a microorganism depends on temperature; therefore, for a specific time control product, the shelf life or use period required for safety may vary depending on the temperature at which the product is stored. Generally, as storage temperature decreases, the lag phase extends and the rate of growth decreases.

Hour/4 Hour Rule: The 2 Hour/ 4 Hour Rule tells you how long freshly potentially hazardous foods, can be safely held at temperatures in the danger zone; that is between 5° C and 60° C. It takes time for food poisoning bacteria to grow to unsafe levels. Apply the following time limits to ensure these risky type foods remain safe to eat. The total time includes all the time the food has been at room temperature, for example during delivery, preparation and transportation.

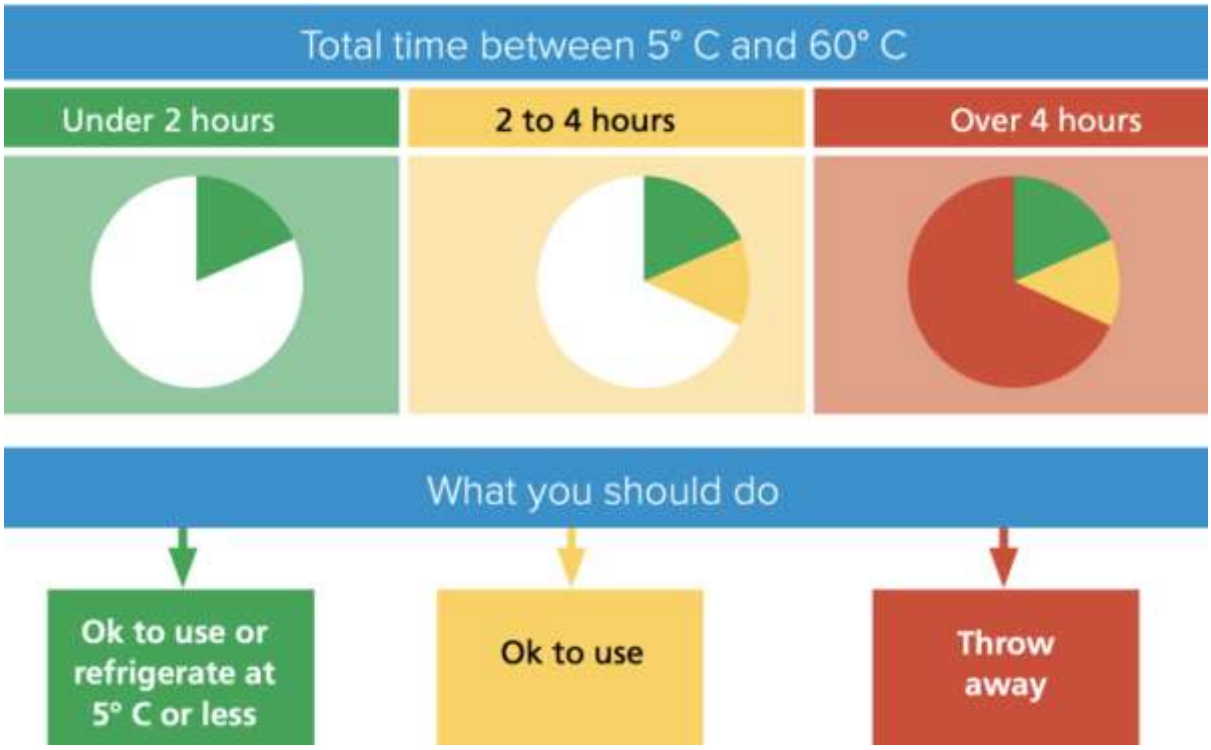


Figure 2.2. Rule of 2 Hour/4 Hour

Criteria for using time as a control

If time is used as the public health control, the following criteria must be met:

- The food must be marked or otherwise identified to indicate the time that is four hours past the time when the food is removed from temperature control
- The food must be cooked and served, served if ready to eat, or discarded within the four hours
- Food that is unmarked, or marked to exceed a four-hour limit, must be discarded.

2.3. Identifying and correcting out-of-specification storage temperatures

Documentation and recording are crucial elements when dispatching products. Recording product dispatch enables the company to check stock leaving the plant, and monitor delivery of the product. The dispatch operator is responsible for monitoring stock levels as goods are dispatched. In a manual system stock levels are calculated using information supplied on the dispatch dockets. If the dispatch system is computerized then stock levels

will be automatically calculated out when dispatch documents are produced. This process is activated by the dispatch control clerk.

Accurate records and documentation must be kept to assist:

- Product recall
- Monitoring product costs
- Ordering
- Monitoring and controlling product movement
- Stock rotation
- Meeting government regulatory requirements
- Quality assurance
- Checking correct weight of product

1. Expired use-by dates: Expired use-by dates may be due to incorrect stock rotation. Products with expired use-by dates must be reported to the appropriate personnel according to workplace procedures. Product with expired use-by dates must not be dispatched.
2.Incorrect temperature of product: Checks and recording of chiller temperatures in the dispatch area must be monitored according to workplace procedures.
3.Off product: Molds, discoloration and odours may be caused by unhygienic production, handling, storage or packaging procedures. Any defect should be rectified and/or reported to the responsible person as per workplace procedure.
4.Product Returns: Finished products may be returned to your plant for several reasons. These include:

- expired shelf life
- customer complaints
- company product withdrawals
- recalls

Out Of Specification may be observed due to the following errors but is not restricted to these factors Error related to the analytical laboratory

- ✓ Analytical instruments or equipment used for analysis are not in a valid calibration state.
- ✓ Analytical test procedure not followed properly
- ✓ Analyst Error
- ✓ Error while doing calculations
- ✓ Error due to the instrument failure
- ✓ The test sample is not uniform or homogenous
- ✓ Sampling error i.e., sample is not uniform or proper
- ✓ Pooling of samples is not appropriate
- ✓ Error at the time of sample handling
- ✓ Manufacturing process-related error
- ✓ Quality of used excipients, raw materials or intermediates
- ✓ Operator error
- ✓ The validated procedure was not followed correctly or Deviation from the standard procedure
- ✓ At the time of manufacturing in-process checks or control is not done properly
- ✓ Error due to equipment failure

Action plan for the OOS Investigations

Phase I: Investigation includes primary investigations and extended laboratory investigations.

Phase II: Investigation includes comprehensive manufacturing investigations.

Phase III: Investigation includes extended manufacturing evaluation, resampling, and reanalysis of the samples.

2.3.1. Rejection of materials & exceptions

Have a documented policy that describes when incoming material should be rejected and how to do it. It should also describe when to make exceptions and how to handle those situations. For example, if the delivery vehicle was dirty but the ingredients or packaging was sufficiently protected and intact, you can still receive the material if you:

- send a report to the supplier and the transporter documenting the conditions under which the materials were received
- document what you had to do to make sure it would not contaminate other materials or your product (for example, cleaning dust and debris off the outer wrap or the containers)

2.3.2. Reporting out-of-specification product/process outcomes

Reporting is providing information about serious wrong doing that you have become aware of at your workplace/ place of study.

The significance of the reports includes:

- A rule and balanced report also help in problem solving.
- Reports communicate the planning, policies and other matters regarding an organization to the masses.
- Reports present adequate information on various aspects of the business.
- All the skills and the knowledge of the professionals are communicated through reports.
- Reports help the top line in decision making

2.4. Identifying effects of freezing temperature on equipment

2.4.1. Freezing equipment

As mentioned earlier in the section on freezing equipment, production rate is an important consideration in selection of proper equipment for the freezing operation.

To simplify the process parameters of the selected prototype formulations, a lower production rate is used. Several types of domestic freezers are available on the market but the selection was based on economic considerations.

- **Freezing of fruits and vegetables**
  - ✓ By freezing microbial growth is inhibited completely.
  - ✓ The action of food enzymes greatly retarded.
  - ✓ The lower the storage temperature the slower will be the rate of chemical and enzymatic reaction.
- **Rate of freezing depends on factors such as**:
  - ✓ method employed
  - ✓ temperature
  - ✓ circulation of air
  - ✓ size and shape of package
  - ✓ Kind of food etc.

2.4.2. Method of freezing used in fruit and vegetable processing

1. Contact freezers

Contact freezing is the one of the most efficient ways of freezing in terms of heat transfer mechanism. In the process of freezing, the product can be in direct or indirect contact with the freezing medium. For direct contact freezers, the product being frozen is fully surrounded by the freezing medium, the refrigerant, maximizing the heat transfer efficiency.



Figure 2.3 contact freezing

2.Air blast freezers

Air-blast freezers recirculate air over foods at between -30^{o}C and -50^{o}C at a velocity of 1.5-6.0 ms^{-1}. The high air velocity reduces the thickness of boundary air films. Air flow is either parallel or perpendicular to the food and is ducted to pass evenly over all food pieces. Air freezing may result in

- Excessive drying
- Costly
- More efficient & more rapid heat transfer
- Less product dehydration & less frequent requirement of frosting.
- Short freezing time so less moisture loss.

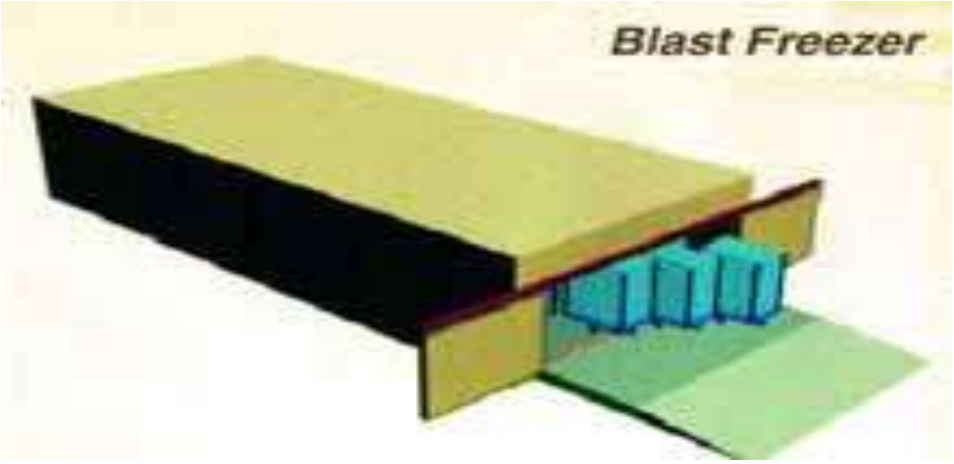


FIGURE 2.4. Blast freezer

3.Belt freezer

Have a continuous flexible mesh belt which is formed into spiral tiers and carries food up through a refrigerated chamber. Cold air or sprays of liquid nitrogen are directed down through the belt stack in a counter current f low, which reduces weight losses due to evaporation of moisture.

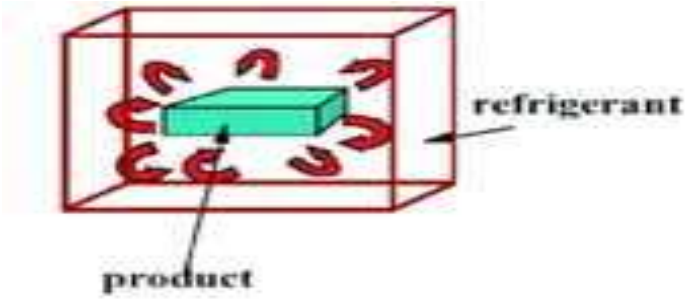


Figure 2.5. belt freezer

4. Plate freezer

It consists of a vertical or horizontal stack of hollow plates, through which refrigerant is pumped at 40ºC. Slight pressure is applied to improve the contact between surfaces of the food and the plates and thereby increases the rate of heat transfer.

5.Cryogenic Freezer

Cryogenic freezing is a relatively new method of freezing in which the food is exposed to an atmosphere below -60 °C through direct contact with liquefied gases such as nitrogen or carbon dioxide. This type of system differs from other freezing systems since it is not connected to a refrigeration plant; the refrigerants used are liquefied in large industrial installations and shipped to the food-freezing factory in pressure vessels.

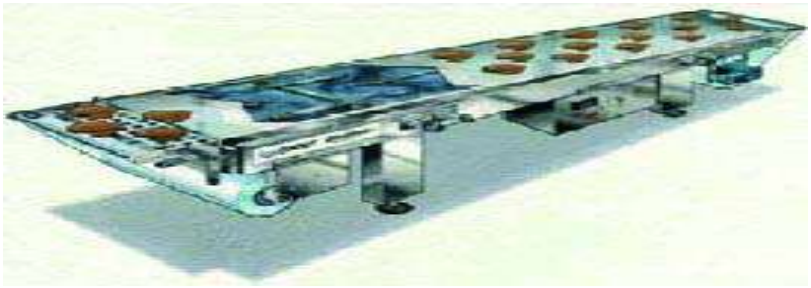


Figure 2.6. Cryogenic freezer

6. Immersion freezer

The immersion freezer consists of a tank with a cooled freezing media, such as glycol, glycerol, sodium chloride, calcium chloride, and mixtures of salt and sugar. The product is immersed in this solution or sprayed while being conveyed through the freezer, resulting in fast temperature



reduction through direct heat exchange.

Figure 2.7. Immersion freeze

7.Trolley in a tunnel freezer

Freezing is one of the easiest, quickest, and most versatile and most convenient methods of preserving foods. Properly frozen foods maintain more of their original color, flavor and texture and generally more of their nutrients than foods preserved by other methods. Temperature of the food is reduced below its freezing point generally to -18 °C or below.

2.4.3. Effects of freezing temperature on machines and equipment

Many equipment failures occur when temperatures fall below freezing. Without proper maintenance, machines and equipment may not function optimally in such conditions. Expensive repairs are then required or replacement of the machinery. Any company operating in sub-zero climates must take extra steps to care for their machines and equipment.

Some machines must be shut down and stored temporarily during freezing temperature. If you need to store and/or relocate machines and equipment, contact a professional machinery moving company.

Protecting Machinery when Temperatures drop

Freezing air can fundamentally alter the efficiency of lubricants and how machinery operates. However, winter does not need to unnecessarily slow or delay operations or compromise the safety of your operators. Taking necessary precautions to prevent the negative effects of cold temperature will protect your machines and equipment. Additional measures can keep them in peak working condition. Check the owner's manual for each of your machines and contact your local dealer before making any modifications to a machine's regular maintenance practices.

2.5. Ensuring and monitoring equipment in operational order

2.5.1. Boiling pans/pasteurizers

There are two types of boiling pans: at smaller scales of operation, a simple stainless steel (or less desirably aluminum) pan can be placed directly over the heat source. However, viscous products such as sauces, syrups, jams and chutneys, are likely to burn onto this type of pan unless great care is taken to control the heat and thoroughly stir the mixture as it is being heated.

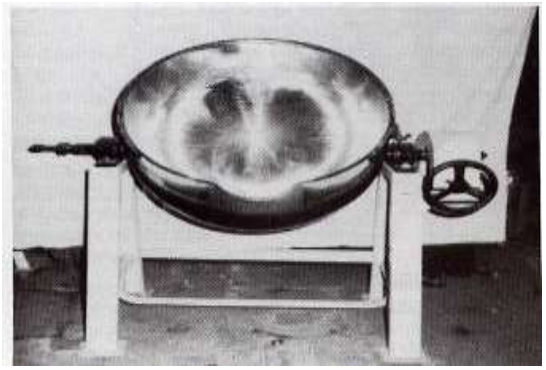


Figure 2.8. Boiling pans

https://youtu.be/7dA_WOS0dYs(access date 20/01/2023)

2.5.2. Fruit presser

Manual fruit presses have a stainless-steel cage in which a press plate is raised and lowered by a screw. The screw should be made from a harder grade of steel than the bearing to prevent the more expensive screw from wearing down (the bearing can be replaced more cheaply than the screw). Layer plates made from stainless steel, nylon or painted mild steel may be needed in larger presses to promote efficient pressing.

In operation a muslin or cotton bag is placed in the cage and pulp is poured in. The bag is

closed and the press plate is lowered. After a few minutes, additional turns of the screw increase the pressure further. Juice is collected via a pipe. The screw is then raised and the bag is removed.



Figure 2.9 Fruit presser

2.5.3. Fruit crushers

Powered machines that are used to crush pineapples or other hard fruits consist of a rotating screw inside a casing. Juice/pulp drains from an outlet in the base of the casing and skin is ejected from the end of the casing down a chute. In operation, pineapples are cut into large pieces and fed into the hopper. Routine maintenance consists of: weekly checks on the belt tension (maximum 2cm sideways movement midway along the belt) weekly checks of electrical connections monthly greasing of bearings. A spare drive belt and fuse should be kept.

2.5. 4. Peelers

Manual peelers are available for round, thin-skinned fruits such as apples. Other more irregular shaped fruits are peeled by hand using a sharp stainless-steel knife.

2.5.5. pH meters

They should be calibrated against buffer solutions that are supplied with the instrument and also calibrated for the ambient temperature. pH can also be measured using pH papers, which are cheaper but less accurate than meters.



Figure 2.9 HORIBA B-712 PH Meter

https://youtu.be/8IaQwvHQNqc(access date 20/01/2023)

2.5.6. Pressure cookers

These heat foods to either 110^{O}C or 120^{O}C, depending on the setting of the pressure valve. Foods are place in the pan and the lid is securely sealed. The pressure valve is place on the pipe in the lid, following the manufacturer's instructions to set the required position. The pan is heated until steam escapes from the pressure valve and the heat is then reduced to maintain this pressure. If steam emerges from under the lid, immediately remove the pan from the heat and when cool, replace the gasket seal around the lid.

2.5.7. Monitoring freezing equipment

Use the freezer in accordance with purpose described in the user's manual. Properly install the freezer in accordance with installation requirements. Switch control to OFF before unplugging. Unplug the freezer before cleaning, before repairing any parts by a qualified repairman. Always grip plug firmly and pull straight out from the outlet, when unplugging. When moving the freezer away from the wall, be careful not to roll over or damage the power cord.

Immediately repair or replace all electric service cords that have become frayed or otherwise damaged. Do not use a cord that shows cracks or abrasion damage along its length or either the plug or connector end. After the freezer is in operation, do not touch the cold surfaces, particularly when hands are damp or wet. Skin may adhere to these extremely cold surfaces.

Operate freezer away from explosive fumes.

Follow the same procedure for cleaning the door gasket, wire basket, and all plastic parts. Clean exterior surfaces with warm water and dish washing detergent. Dry and polish with a soft cloth. Do not wipe with soiled dish washing cloth or wet towel. This may leave residue that may corrode the paint. Do not use scouring pads, bleach or cleaners because they scratch and weaken the paint finish. In case of brownouts, turn the temperature control to OFF and unplug your freezer to avoid overloading your compressor when power is restored.

SELF-CHECK 2	Written test

Name…… ID…… Date…….

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

TESTI: Choose the best answer among the given alternative (1ptseach)

1.The degree to which individual products tolerate the time & temperature effects is called

A. freezing B. Refrigerator C. Time-Temperature Tolerance D. All

2. Which of the following is low temperature?

A. Pasteurization Sterilization C Freezing D. None

3. Freezing time depends on

A. Initial and final temperatures of the product C. the quantity of heat removed,

B. dimensions (especially thickness) and shape of product D**.**all

4. Rate of freezing depends on factors such as:

A. method employed B. temperature C. circulation of air

D. size and shape of package E. All

5. What are the main advantages of cryogenic freezing?

A. Short freezing time due to high heat transfer C. Reduction in flavor loss

B. Reduction in drip loss D. Reduction in oxidative changes E. all

6.Freezing of fruits and vegetables

A. microbial growth is inhibited completely. C. The action of food enzymes retarded.

B. Slower the rate of chemical and enzymatic reaction. D.All

Test II: Short Answer Questions (3. point each)

1. Write Method of freezing used in fruit and vegetable processing with explanation?
2. Write the advantage of Freezing of fruits and vegetables?
3. write general conclusions pertaining to Practical Storage Life?
4. Write Steps of taking temperatures?
5. What is 2hour/4hour rule means?

OPERATION SHEET 2.

2.1. Procedures and Action plan for the OOS investigations

Equipment**:** laboratory analytical depending on product

. **A. Procedures error occurs**

I. Error related to the analytical laboratory

II. Analytical instruments or equipment used for analysis

III. Analytical test procedure not followed properly

IV. Analyst Error

V. Error while doing calculations

VI. Error due to the instrument failure

VII. The test sample is not uniform or homogenous

VIII. Sampling error i.e., sample is not uniform or proper

IX. Pooling of samples is not appropriate

X. Error at the time of sample handling

XI. Manufacturing process-related error

XII. Quality of used excipients, raw materials or intermediates

XIII. Operator error

XIV. The validated procedure was not followed correctly or Deviation from the standard procedure

XV. At the time of manufacturing in-process checks or control is not done properly

XVI. Error due to equipment failure

B. Action plan for the OOS Investigations

I. Phase I: Investigation includes primary investigations and extended laboratory investigations.

II. Phase II: Investigation includes comprehensive manufacturing investigations.

III. Phase III: Investigation includes extended manufacturing evaluation, resampling, and reanalysis of the samples.

LAP TEST-2

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1hr. The project is expected from each student to do it.

Perform; Take Corrective action out of specification

LG #12	LO #3- Operate and Monitor the Freezing Process.

INSTRUCTION SHEET

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

- Operating processing procedure.
- Monitoring and identifying equipment variation in operating conditions.
- Identifying and maintaining variation in equipment operation.
- Monitoring the process to confirm specification.
- Identifying and rectifying out of specification process outcomes.
- Maintaining the work area to housekeeping standards.
- Conducting work with environmental guideline.
- Maintaining workplace records.

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:

- Operate processing procedure.
- Monitor and identify equipment variation in operating conditions.
- Identify and maintain variation in equipment operation.
- Monitor the process to confirm specification.
- Identify and rectify out of specification process outcomes.
- Maintain the work area to housekeeping standards.
- Conduct work with environmental guideline.
- Maintain workplace records.

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

4-Accomplish the Self-checks

5-Perform Operation Sheets

6-Do the “LAP test

Information sheet 3

3.1. Starting and Operating processing procedure

3.1.1 Start and operate process according to workplace *procedures*

A food processor, however, must know the essential information regarding the equipment in terms of how they must be operated or used in accordance with the manufacturer's specifications. Before operating any equipment, it is important to be familiar with the manufacturer's specifications, which include:

- Handling requirements
- Operating requirements
- Discharge label
- Reporting
- Testing
- Positioning
- Refilling

3.1.2. The Relationship Between Processes, Procedures and Work Instructions

When a company documents its QMS, it is an effective practice to clearly and concisely identify their processes, procedures and work instructions in order to explain and control how it meets the requirements of ISO 9001:2015. This begins with a basic understanding of the hierarchy of these terms and how to efficiently categorize the workings of a management system within them. Simply put:

A **process** states *what* needs to be done and why.

A **procedure** states *how* the *process* needs to be done.

A **work instruction** explains *how* to carry out the *procedure*.

Consider a process as a high level, strategic method of control, in effect a summary of objectives, specifications, and broad resources needed. The procedure adds more specifics such as responsibilities, specific tools, methods, and measurement. And a work instruction is a step-by-step guideline to implement the process and procedure, often segmented in some way to focus those who are doing the actual work.

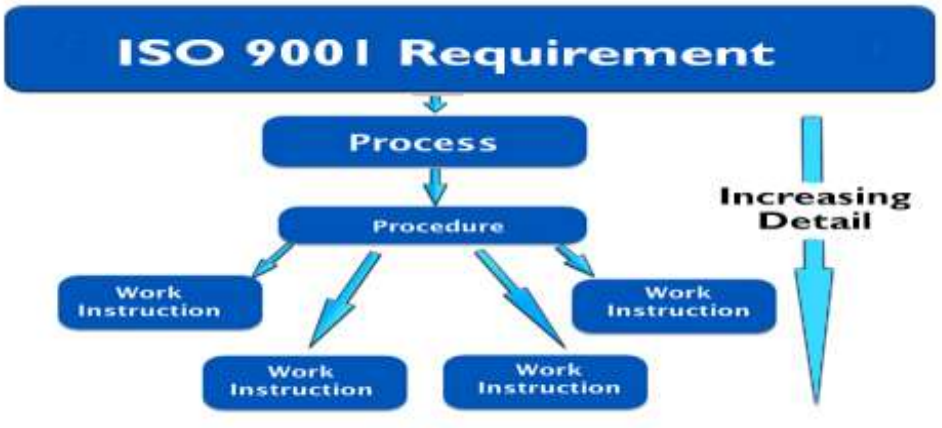


Figure 3.1 work place requirement

The ISO 9001 Process, Procedure and Work Instruction Hierarchy

Some basic guidelines for remembering the differences between these terms when documenting your quality management system:

1. Begin with the ISO 9001 **processes** you are required to document. The number of processes will typically determine the number of procedures.
2. In most cases, you will create an ISO 9001 **procedure** for every process. Many companies write too many procedures when, in fact, they should be documenting these directives as more specific work instructions.
3. When appropriate, create detailed ISO 9001 **work instructions** for each task that is needed to support each of your procedures.

Product: Documentation Templates

Process

A process is any activity or set of activities that use resources to transform inputs into outputs. The ISO 9001 standard is based on a process approach. (Establishing effective and efficient processes that are consistently followed and improved upon is the basis for most management standards.)

Processes must have defined (and hopefully measurable) objective(s), input(s), output(s), activities, and resources. These key elements should be present when defining a process:

- Inputs/Resources:

✓ Specified requirements (needs), for example:

✓ What information do you need to start work?

✓ Where does that information come from?

- Activities:

✓ Interrelated or interacting activities that use resources needed to achieve a specific output

✓ All of the operations, activities, and sub-processes carried out to produce the desired result, for example:

✓ What are the basic jobs carried out in your department?

✓ Can you explain to me your operations here?

- Outputs:

✓ Satisfying requirements (results), for example:

- ✓ Who receives the result of your work?
- ✓ How do you know if you've done your job correctly? (met objectives)

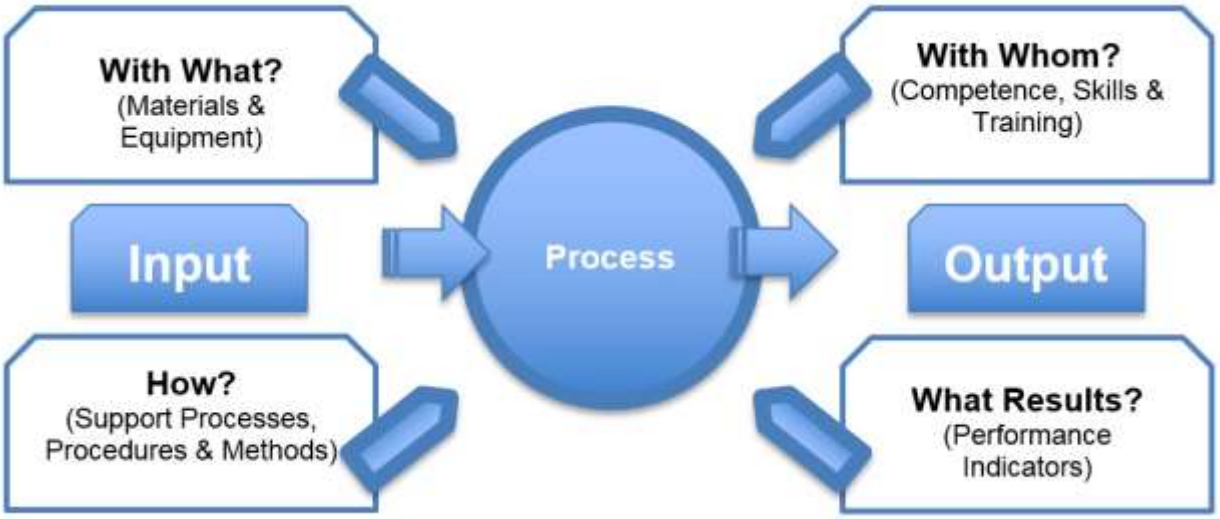


Figure 3.2. Product documentation

3.1.3. What is risk assessment in work place

A risk assessment is simply a careful examination of what, in the work place, could cause harm to people. It enables a weighing up of whether enough precautions are in place or whether more should be done to prevent harm to those at risk, including workers and members of the public. Accidents and ill health can ruin lives as well as affecting businesses, for example if output is lost, machinery is damaged, insurance costs increase or other financial penalties. In many countries employers are legally require red to assess the risks in their workplace so that they can put in place a plan to control these risks.

Basic safety precautions to follow when using the equipment

- Warning labels which specify how to properly operate an equipment
- Instructions on the proper care of the equipment/machine
- Instructions on the correct operation of the equipment

The manufacturer's specifications must be thoroughly read and understood by the food processor and sees to it that he interpreted them in such a way that a food processing equipment can be properly operated. The following are the chief requisites for keeping the freezer operating properly:

- Keep the ammonia jacket clean and free from oil, water and non-volatile ammonia fractions.
- Keep the scarper blades sharp and straight.
- Keep the mix pumps in proper working condition
- Make certain that there is always a plentiful supply of ammonia at the freezer.

Provide a steady suction pressure at all times, at which the freezer must operate to give product of the proper temperature.

3.2. Monitoring and identifying equipment variation in operating conditions

3.2.1. Monitoring equipment

In order to regulate the flow of freezing, maintain design operating conditions and allow equipment to be operated safely and economically, a number of controls are used with refrigeration systems.

Some of the controls used for the size of plant more likely in the food industry are listed below. A brief indication is given of the requirement.

1. Pressure gauges

Pressure gauges are used to indicate plant-operating conditions and they are therefore useful for routine inspections and, also, when fault-finding. Gauges are normally positioned at the compressor to indicate pressures on the high- and low-pressure sides of the system with additional gauges, as necessary, to indicate the intermediate pressure in a two-stage system and the delivery pressure of the compressor lubricating oil pump.

2.Temperature gauges

Like pressure gauges, temperature gauges, or pocket thermometers, are used to monitor plant-operating conditions and to assist with fault-finding. Thermometers used with the freezing compressor are used to monitor temperatures at the same positions as the freezing pressure gauges since both readings are normally required to assess the plant-operating condition.

Additional temperature gauges are also helpful to measure cooling water temperature, the temperature of a secondary freezing or the temperature of a low pressure, primary freezing, and liquid reservoir.

3.Refrigerant flow

Control of refrigerant flow is probably the most important control to be exercised in a refrigeration system.

The following are four examples of control likely to be used:

- Hand expansion valve: A valve which accurately controls the flow of refrigerant to exactly match the refrigeration load. Hand expansion would only be used when the refrigeration load is constant or the inertia of the system means that changes would only be small and progress slowly; a large cold store with constant attendance is the type of application suited to this method.
- Thermostatic expansion valve: This is an automatic device which gives a modulated control of refrigerant flow and it is the most widely used method with a variety of individual designs to suit particular requirements.
- The valve senses pressure and temperature at the evaporator and uses the information to supply only sufficient liquid refrigerant to match the evaporator's requirement

3.3.Identifying and maintaining variation in equipment operation

The technical meaning of **maintenance** involves functional checks, servicing, repairing or replacing of necessary devices, equipment, machinery, building infrastructure, and supporting utilities in industrial, business, and residential installations

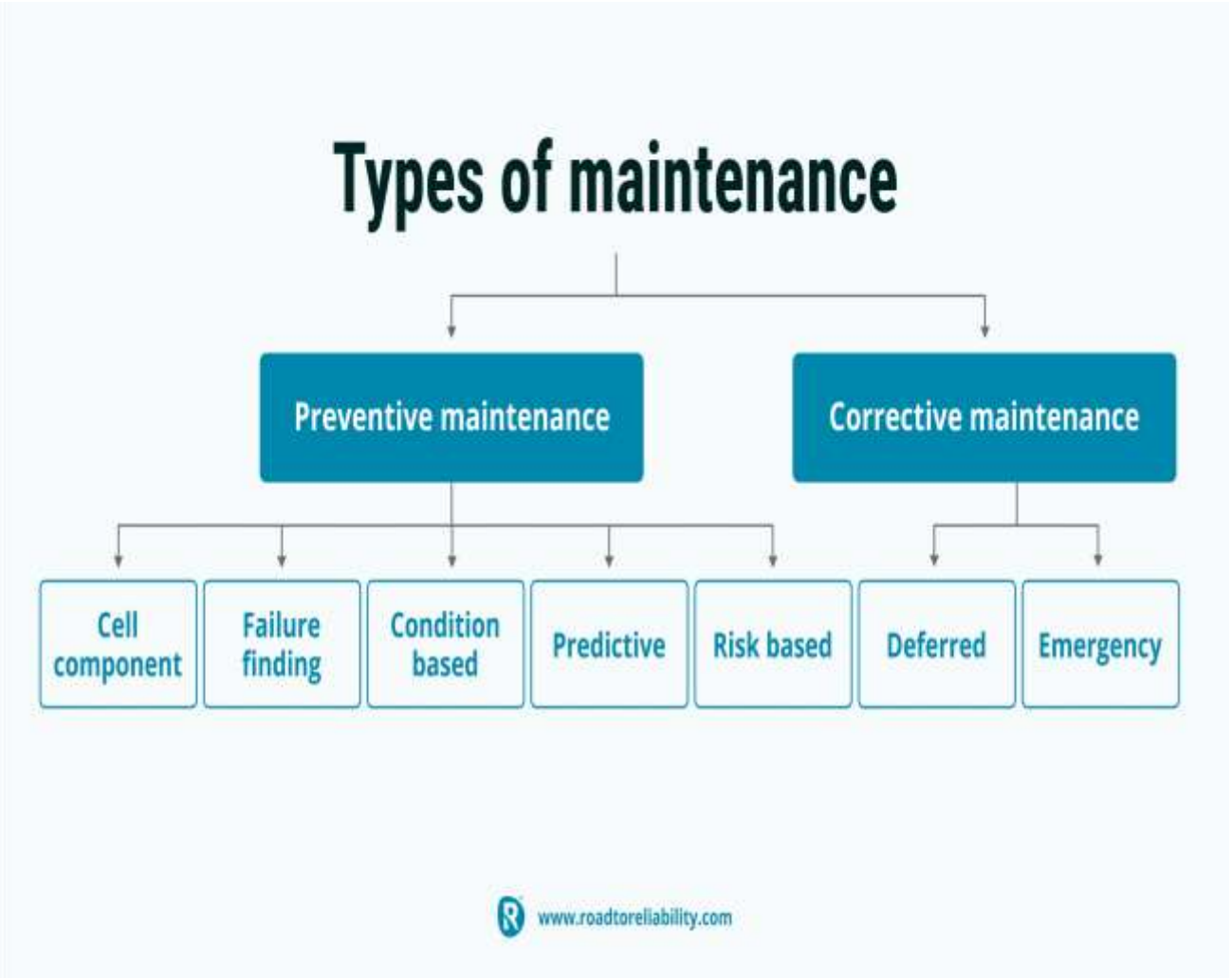


Figure 3.3 type of maintenance

3.3.1. Food processing operations

Food Processing is the conversion of agricultural product to consumable substances which have particular textural, sensory and nutritional properties using commercially feasible methods

3.3.1.1 Process Control System

A process is broadly defined as an operation which uses resources to transform inputs into outputs. The dynamic behavior is determined by the physical and chemical properties of the inputs, the resource, and the process itself.

There are two main reasons for process control.

- The first reason for process control is to maintain the measured variable at its desired value when disturbances occur.
- The second reason for process is to respond to changes in the desired values of the process parameters.

The desired values are those values which are needed for the process to run in stable form to produce specified product in an economic and safe way without adversely affecting the environment.

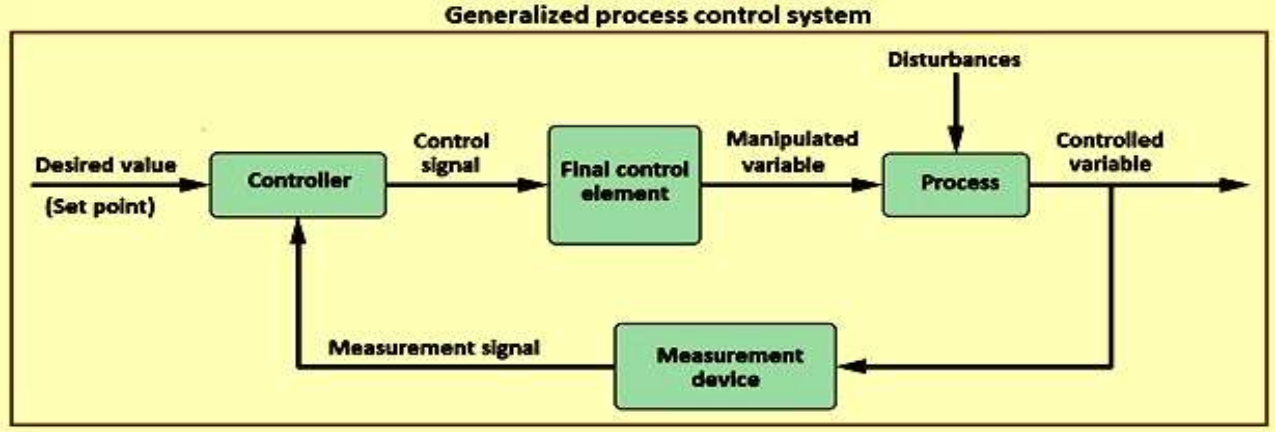


Figure 3.4. process control system

A process control system has two major control structures. These are

- single input-single output (SISO) control structure
- multiple input-multiple output (MIMO) control structure.

In SISO control structure for one control (output) variable there exist one manipulated (input) variable which is used to affect the process. In MIMO control structure, there are several control (output) variables which are affected by several manipulated (input) variables used in the given process. The terminology used in the process control system is described below.

Cascade control – It is a control system with two or more controllers, with a 'master' and a 'slave' loop.

Controllers – Controllers carry out the function of brain. Controllers can be pneumatic, electronic, or digital computers.

Dead time – It is the quantity of time which is taken by the process to start changing after a disturbance in the system.

Derivative control – It is the 'D' part of a PID (proportional integral derivative) controller.

Error – In the process control systems, error is defined as the difference between set point and process variable and is given by the equation 'Error = set point – process variable'.

Final control elements – Final control elements carry out the function of muscles. These are control valves, pumps, compressors, conveyors, and relay switches etc.

Integral control – It is the 'I' part of a PID controller.

PID controller – PID controllers are designed to eliminate the need for continuous operator attention.

Sensors – Sensors are those instruments which carry out the functions of vision, hearing etc. These instruments measures temperature, level, flow, composition etc.

Set point – The set point is where the operator likes a controlled process variable to be set.

Transmitters – Transmitters are like neurons. They transmit signals like air signals or electric signal etc.

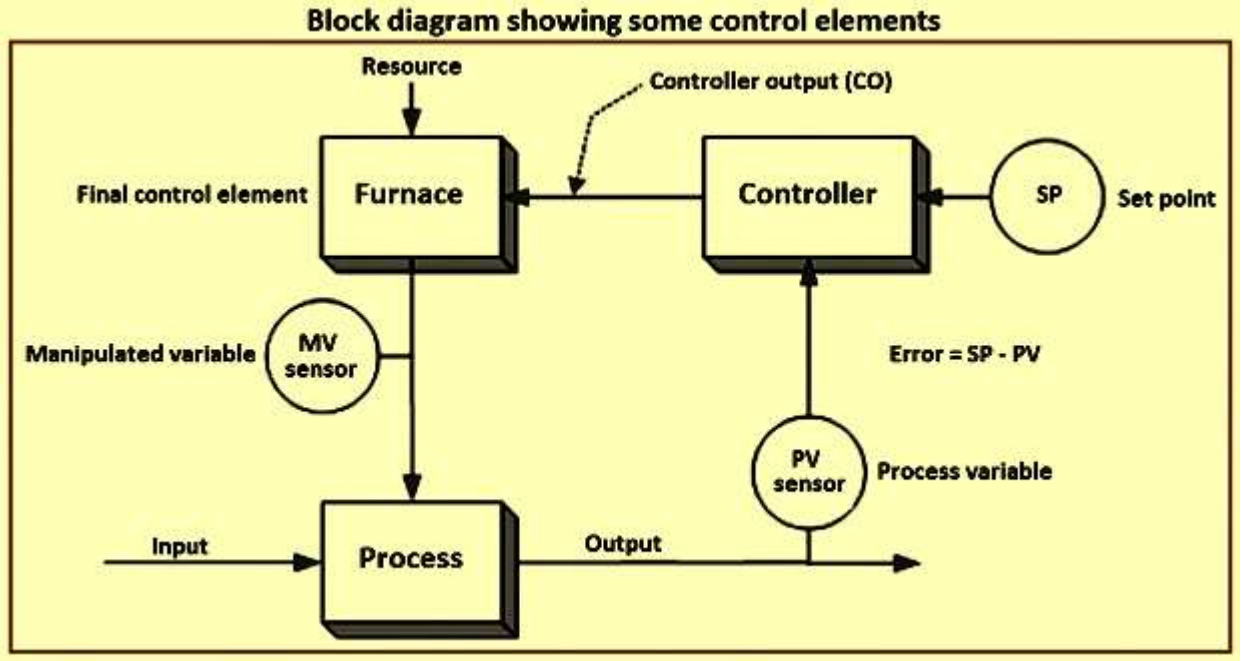


Figure 3.5. Block diagram showing some control elements

3.4. Monitoring the process to confirm specification

3.4.1. Sampling

Quality control takes place by assessing bulk samples taken at random from different points in the lot to be inspected.

1. Determination of total soluble solids or sugar (TSS) by refractometer

Some refractometers automatically compensate for changes in temperature, whereas others may be calibrated to read accurately at a fixed temperature (usually 20°C).



Figure 3.6. HAND-HELD MODEL

Measurement

An equal number of drops from the prepared fruit juice or the prepared fruit are placed onto the refractometer prism plate. The reading on the prism scale is noted to one decimal place. After each test the prism plate must be cleaned with (distilled) water and wiped dry with a soft tissue.

2.Determination of fruit acids by titration and calculation of the sugar/acid ratio

It is the sugar/acid ratio which contributes towards giving many fruits their characteristic flavor and so is an indicator of commercial and organoleptic ripeness. At the beginning of the ripening process the sugar/acid ratio is low, because of low sugar content and high fruit acid content, this makes the fruit taste sour. During the ripening process the fruit acids are degraded, the sugar content increases and the sugar/acid ratio achieves a higher value. Overripe fruits have very low levels of fruit acid and therefore lack characteristic flavor.

Titration is a chemical process used in ascertaining the amount of constituent substance in a sample, e.g., acids, by using a standard counter-active reagent, e.g. an alkali (NaOH).

There are two methods specified for the determination of the titratable acidity of fruits:

Method using a colored indicator;

Potentiometric method, using a pH meter, which should be used for very colored juices.

Material

- A laboratory burette, pipette, beaker
- a filter (muslin cloth or fine filter) and an extractor or homogenizer.
- A bottle of distilled water.
- Sodium Hydroxide (NaOH): The Standard Laboratory solution of 0.1M which is used in the actual titration is considered to be dilute, and can readily be purchased in this form.
- Phenolphthalein: This is only required for the method using a colored indicator.
- Indicator stripes: To check the exact point of neutrality an indicator stripe should be used. Not necessary if pH Meter is used.

3.Determination of the juice content

The juice content is an essential parameter to determine the quality of different fruits, especially for citrus fruit.

Material

Extractor or juice press (simple household press, citrus press, household centrifuge)

Filter (muslin cloth, fine filter or strainer), Scale, Beaker

Sample preparation

Cut the fruit in half crosswise and squeeze each half to extract all the juice with an extractor or a juice press. The squeezing of each half should be done as thorough as possible in order to extract all the juice.

The extracted juice is then filtered through muslin cloth, fine filter or strainer.

3. Determination of dry matter content by laboratory reference method

This method allows to determine the loss of mass during the process of desiccation of the fruit.

Materials and instruments

- Analytical scale with gradation of 0.01g (error factor of around 0.1 - 0.3% dry matter)
- (Vacuum) Oven with air flow of 60°C - 105°C

- Desiccator
- Spatula or spoon
- Petri dishes (8 cm in diameter)
- Knife
- Slicer, vegetable peeler or grater
- Food processor with chopping blade or cheese grater
- Calculator, data sheet

Sampling

To evaluate the lot selected for inspection, take a sample of at least 15 fruits at random from the reduced sample.

However, fruits should be firm and free from defects such as sun scorch and pest or disease damage, which may have affected the normal ripening process.

Procedure

Each time that samples are weighed, they must be controlled until the nearest centigram.

Weight and number each Petri dish (one for each chosen fruit) and take note of the weight.

3.4. Monitoring freezing process of the product

Freezer thermometers are available to help monitor the temperature inside the appliance. Keep your freezer at zero degrees (0°F) or below to maintain the quality of frozen foods. Most foods will maintain good quality longer if the freezer temperature is -10°F to -20°F. At temperatures between 0°F and 32°F, food deteriorates more rapidly. Even foods stored properly will lose color, texture, flavor and nutritional quality but will not cause food-borne illness.

Freezer temperatures, however, do not destroy pathogenic or spoilage microorganisms, which will begin growing under warmer temperature conditions.

Time is an important factor in maintaining high-quality frozen foods. Frozen foods will not last forever. The chart on the associated page lists the maximum length of storage times to help you maintain quality food products.

- Label frozen food items, maintain a rotation system and use the items with the oldest dates first.
- Allow proper air circulation in the freezer.



Figure 3.7. Freezer

Freezer Burn

Evaporation occurs during the freeze-thaw cycle resulting in dehydration of the product. This is termed freezer burn, the dry, greyish/brown spots on the surface of the food. Freezer burn occurs when frozen food is damaged by crystal growth and dehydration exposing the food to oxygen. Oxygen has a bleaching effect on the food. Freezer burn produces a loss of texture, color, flavor, and aroma.

To prevent freezer, burn:

- Freeze food quickly and at as low a temperature as possible. Zero degrees F or lower is recommended.
- If you are freezing a large quantity of food at one time, set the freezer temperature 10 degrees lower than normal until the food is frozen.
- To avoid fluctuating temperatures do not open the freezer more than necessary.
- Select plastic bags labelled specifically for freezing; storage bags are not vaporing proof.
- Squeeze air out of bags before sealing and seal tightly. Vacuum seal bags also remove air.
- Minimize headspace in plastic containers.
- Freezer paper has a coating that prevents the transfer of air.

3.5. Identifying and rectifying out of specification process outcomes

Out of specification of product/process

The term out of specifications, are defined as those results of in process or finished product testing, which falling out of specified limits. The out of specifications (OOS), may arise due to deviations in product manufacturing process, errors in testing procedure, or due to malfunctioning of analytical equipment. When an out of specifications (OOS) has arrived, a root cause analysis has to be performed to investigate the cause for OOS. The reasons for OOS can be classified as assignable and non-assignable. When the limits are not in specified limits called out of specifications. When OOS has occurred, the analyst should inform to quality control (QC) manager. Each out of specification will be identified with a unique identification number.

- E.g., Freeze food quickly and at as low a temperature as possible.
- Zero degrees F or lower is recommended. When above this recommended it is out of accepted limit
- Bananas stored in the freeze turn black quickly. Bananas should be stored under conditions where the temperature range is 10°C to 15°C (50°F to 59°F).
- Soft fruits should not be stored too long. It is often best to buy soft fruit as you need it, keeping very little on hand

Phase: laboratory investigation (refer information sheet 2)

The purpose of the laboratory investigation is to identify the cause for OOS result. The reason for the OOS may be defect in measurement process or in manufacturing process. Irrespective of the rejection of batches, the OOS results must investigate for their trend. The investigation can be done to only those batches that are resulted in OOS, or also to other batches and even other products associated with OOS. The OOS investigation should be thorough, timely, unbiased, well documented and scientifically sound.

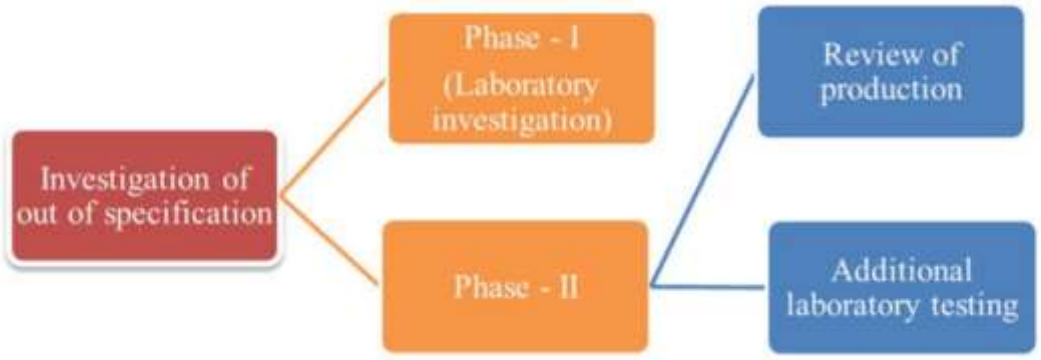


Figure 3.7. Investigation of out of specification result

3.6. Maintaining the work area to housekeeping standards.

Housekeeping is relevant in all workplaces—whether at the office, factory, shipyard, construction site, storage facility, hospital, laboratory, retail shop or industrial kitchen.

Effective housekeeping can eliminate many workplace hazards and help get work done safely and properly. A clean and tidy workplace also enhances a company's image and provides immediate visible evidence of its commitment towards workplace safety and health (WSH).

Good housekeeping entails the effective organization of the workplace and it contributes to better WSH performance, increased productivity and better-quality control.

Good housekeeping can result in:

- more effective use of space
- better inventory control of tools and materials
- reduced handling to ease the flow of materials;
- more efficient equipment clean-up and maintenance
- reduced equipment and property damage through better preventive maintenance
- more hygienic workplace conditions that would lead to improved workers' health
- improved overall look and feel of work environment and
- improved staff morale and wellbeing.

3.6.1 Good Housekeeping Basics

There are three key factors to good housekeeping. They are:

1. **Overall cleanliness and orderliness**

No matter the level of occupancy, a company can improve the conduciveness, hygiene and safety of its work environment by keeping all its work areas clean, organized and uncluttered.

2. **Adequate space and proper layout**

Work activity requires space and the presence of people, equipment and materials tend to obstruct orderly movement throughout the premises. A careful review of space requirements based on actual operations may suggest ways for a better layout. A well- designed work space with equipment arranged for optimum workflow will improve efficiency and productivity, as well as the ease with which work activities can be carried out.

3. **Correct storage and materials handling**

Proper storage and handling equipment are necessary to facilitate the movement and placement of materials in a factory, construction site or storage facility. This will prevent hazard storage which can lead to blocked exit paths and/ or obstructed access to fire control equipment (e.g., fire extinguishers, fire hose reels). Poorly organized storage may also result in the accumulation of unwanted items, debris and/ or waste materials especially in any available vacant space.

Good housekeeping will ensue once all the above factors are addressed. A neat and tidy workplace can be achieved and sustained when a routine is established for each factor.

3.6.2 Responsibility for Housekeeping

Good housekeeping is everyone's responsibility.

Housekeeping Responsibilities	
1. Prevent slips, trips and falls.	Do not stack items along walkways or passageways; Put away electrical cords and water or air hoses; and Put away tools and keep drawers closed.
2. Limit spills.	Clean up spills immediately; Repair leaks as soon as possible; and Sweep up debris.
3. Ensure machine safety.	Inspect machines and ensure that all guards are in place before use; Keep area around machines clear; Put away tools; and Clean machines regularly.
4. Prevent fires.	Store flammable or combustible liquids in labelled and closed containers; Keep flammable or combustible materials away from sources of ignition; Keep electrical equipment clean; and Inspect electrical cords before use.
5. Ensure exits and access routes to fire equipment are clear.	Do not block emergency exits; Keep evacuation routes clear; Check that fire extinguishers are accessible; and Ensure that electrical panels can be opened.

Sanitation Standard Operating Procedure – Processing Equipment Cleaning and Sanitation

Clean and sanitized processing equipment and utensils are essential to the manufacture of safe food products. Items that cannot be cleaned with the cleaned-in-place (CIP) system must be cleaned and sanitized after each use by hand or in a COP (cleaned out-of-place) tub.

Operation of the raw CIP circuit

The necessary line connections are made and the raw CIP program is activated.

The first step is a water rinse. Then water is heated and a chlorinated alkaline detergent is added. This solution is circulated throughout the circuit while valves and agitators are periodically pulsed to aid in soil removal. The wash cycle is followed by a water rinse which cools down the circuit.

Finally, an acid sanitizer is added, circulated throughout the circuit, and allowed to drain to the floor.

The line connections are returned to their original configuration. Prior to the equipment's next use a CIP sanitation step is performed using an acid sanitizer.

Operation of the pasteurized CIP circuit

- The pasteurized CIP circuit is used to clean the all of the pasteurized storage tanks, filler lines, and the bottle and bag filling equipment.
- If needed, the equipment is pre-rinsed with water to remove most of the residual product.
- The necessary line connections are made and the pasteurized CIP program is activated.
- ✓ The first step is a water rinse. Then water is heated and a chlorinated alkaline detergent is added. This solution is circulated throughout the circuit while valves and agitators are periodically pulsed to aid in soil removal.
- ✓ The wash cycle is followed by a water rinse which cools down the circuit.
- ✓ Finally, an acid sanitizer is added, circulated throughout the circuit, and allowed to drain to the floor.

- The line connections are returned to their original configuration.
- Prior to the equipment's next use a CIP sanitation step is performed using an acid sanitizer

Materials

1. Supplies
    a. Cleaning and sanitizing agents
    b. Cleaning equipment such as gloves, brushes, buckets, and foam sprayers
    c. COP tub
    d. Sanitation test records

Cleaned out-of-place procedure

- Dismantle equipment to be cleaned and rinse with water.
- Place the parts in a COP tub and fill the tub with approximately 150 to 200 gallons of water.
- Turn the circulation pump on and heat the water to 170°F.
- Slowly add the necessary amount of chlorinated alkaline cleaner.
- Collect a sample of the cleaning solution and test the alkalinity and chlorine concentrations.
- Circulate hot water and cleaner for at least 30 minutes.
- Allow the COP tub to empty into a floor drain.
- Rinse the equipment with an approved sanitizer. Visually inspect each piece of equipment for possible damage and the presence of residual cleaner.
- Reassemble the equipment and return it to its storage area

3.7. Conducting work with environmental guideline.

3. 7.1. Introduction

Having a safe and healthy physical work environment, including amenities and facilities, is critical to eliminating and controlling risk in the workplace. This includes ensuring the work environment, facilities and amenities are compliant with legislative and other identified requirements.

3.7.2. Conducting work in accordance with workplace guideline

A safe work environment including:

- Facilities,
- Amenities and accommodation.

Facilities refer to toilets, washrooms, showers, lockers, dining areas, drinking water, etc. These facilities must be in good working order, clean, safe and accessible. When considering how to provide and maintain facilities that are adequate and accessible, a person conducting a business or undertaking must consider all relevant matters including:

- The nature of the work being carried out at the workplace
- The nature of the hazards at the workplace
- The size, location and nature of the workplace
- The number and composition of the workers at the workplace.

During Conducting work in accordance with workplace guideline a person should ensure the following requirements.

- Legislative Requirements
- Responsibilities
- Need assessment
- work environment
- Welfare Facilities

Inspect and Monitoring

Legislative Requirements

A person conducting a business or undertaking at a workplace must ensure so far as is reasonably practicable, the following:

- The layout of the workplace allows, and the workplace is maintained so as to allow, for persons to enter and exit and to move about without risk to health and safety, both under normal working conditions and in an emergency,
- Work areas have space for work to be carried out without risk to health and safety,
- Floors and other surfaces are designed, installed and maintained to allow work to be carried out without risk to health and safety,

Facilities Management Division (or Equivalent)

The Facilities Management Division (FMD) is responsible for ensuring that workplace amenities and facilities:

- Are designed and installed according to company legislative and requirements
- Are inspected and maintained to ensure a safe level of hygiene.

Company Management and Supervisors

Management and supervisors of faculties, divisions and units are to ensure that amenities and facilities in the workplace do not expose workers, or visitors to health and safety risks. This includes:

- Ensure, so far as is reasonably practicable, that the layout of the workplace, lighting and ventilation enables workers to carry out work without risks to health and safety
- Ensure, so far as is reasonably practicable, the provision of adequate facilities for workers, including toilets, drinking water, washing and eating facilities
- Manage risks associated with remote and isolated work
- Prepare local area emergency response procedures
- Implement risk control measures for any unsafe facilities or amenities within their responsibility to ensure the workplace is safe
- Consult with workers on health and safety issues pertaining to facilities and amenities.

Size and Location of the Work Area

Consideration should be given to the location such as the work area being in a building, remote area or outdoors. The work area may be multiple locations/sites over an extensive area. The workplace may not be in proximity to physical amenities.

The Composition of the Workforce

The workforce may be comprised of people of different sexes, religious beliefs and those people with special needs. This will influence the provision of amenities and facilities to accommodate the various needs.

3.8. Maintaining workplace records

8.1. Record Keeping Systems

Workplace information may include:

- Standard Operating Procedures (SOPs),
- Specifications for raw material and ingredient
- production schedules
- sampling and tests requirements
- reporting arrangements
- certificate of analysis
- recording freezing temperature

The purpose of records

Accurate record keeping is essential to the application of a preventive control plan. Your records should be sufficient to enable you to confirm easily and with confidence that your preventive control plan is implemented and working effectively.

Records can also help you improve your preventive control plan by providing a means for you to, for example:

- Identify the root cause of an issue
- Analyze and improve a process or procedure
- Identify gaps in training and in training needs
- The following make up the records of a Hazard Analysis and Critical Control Point (HACCP) Plan
- List of HACCP team and their assigned responsibilities
- Flow diagram for each menu item indicating CCPs
- Critical limits
- Monitoring procedures
- Corrective actions plan
- Record keeping procedures
- Procedures for verification of the HACCP plan
- Variation of results

SELF-CHECK 3	Written test

Name…… ID…… Date…….

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

TESTI: Choose the best answer among the given alternative (1ptseach)

1.Which of the is true good housekeeping.

A. more effective use of space. B. better inventory control of tools and materials.

C. reduced handling to ease the flow of materials. D. more efficient equipment clean-up and maintenance. E. all

2.During Conducting work in accordance with workplace guideline a person should ensure

A. Legislative Requirements B. Responsibilities C. Need assessment D.all

3.Instrument which determine total soluble solids or sugar (TSS)?

A. Ph meter B. Refractometry C. Thermometer D. all

4. Time and temperature is an important factor in maintaining high-quality frozen foods

A. True False

5.A person conducting a business or undertaking must consider all relevant matters including:

A. The nature of the work being carried out at the workplace B. The nature of the hazards at the workplace C. The size, location and nature of the workplace D. The number and composition of the workers at the workplace. E. all

Test II: Short Answer Questions (3. point each)

1. Write the three key factors to good housekeeping?
2. Explain CIP and COP procedures?
3. Write how to prevent freezer burner**?**

OPERATION SHEET 3

3.1 **Techniques/Procedures Use and maintenance of a freezer**

Equipment and materials

- Glove
- Goggles
- Apron/gown
- Safe shoes

B. Procedures/Steps/Techniques

The freezer should be installed and operated in accordance with the specific manufacturer's manual. Specifically:

I. leave the freezer in the upright position for some hours before connecting it to the electricity supply.
II. Do not install the freezer close to heat sources.
III. Locate the freezer in a dry, well-ventilated area.
IV. Ensure that the freezer is placed on a level surface.
V. To prevent loss of valuable cultures, chemicals, etc. in case of a power failure, the freezer should ideally be connected to a suitable UPS system

LAP TEST-1

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1hr. The project is expected from each student to do it.

Task-1 Use and maintenance of a freezer

LG #13	LO #4- Shut down the freezing Process

INSTRUCTION SHEET

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

- Identifying the appropriate shutdown procedure.
- Shutting down the process.
- Identifying and reporting maintenance requirements.

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 the appropriate shutdown procedure.
- Shut down the process.
- Identify and report maintenance requirements.

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

4-Accomplish the Self-checks

Information sheet 4

4.1. Identifying the appropriate shutdown procedure

4.1.1. Introduction

Normal shutdown includes steps to render the systems safe, such as removal of hazardous process materials and inert gases. The systems might be cleaned as part of the shutdown; cleaning is often a process on to itself requiring its own set of startup, operation, and shutdown procedures.

The types of shutdowns

- Scheduled shutdown
- Maintenance shutdown
- Emergency shutdown
- Shut down to a standby condition.

Scheduled shutdown

A scheduled shutdown is initiated by the operator during normal operation of the unit when:

- Maintenance is required or
- Feed supply is low or exhausted.
- The shutdown procedure will depend on the type of equipment and the process chemistry.
- Some steps taken in a unit shutdown may include:
- Shutting off the feeds to stop processes and heat generation particularly if processes are exothermic (produce heat)
- Re-circulating feeds from supply tanks so they do not enter the unit

- Shutting off heating or cooling to the unit or feed preheat system
- Shutting off mixing and other mechanical operations
- Cooling and flushing materials from the unit

4.1.2. Maintenance shutdown

When maintenance to the unit equipment is required, the equipment may need to be entered so that work can take place. The shutdown should be a scheduled or planned shutdown as per Standard Operating Procedures where equipment is:

- Isolated (process, mechanical and electrical)
- Cooled and depressurized
- Purged and gas freed
- Cleaned
- Gas tested on a continuous basis prior to and during entry.
- A planned unit shutdown will prevent:
- Plugging of lines or equipment
- Possible damage to equipment
- Possible injury.

To prepare the unit for shutdown, the unit may need to be:

- Thoroughly drained and pumped out to remove chemical liquids
- Purged with steam or inert gas to remove vapors
- Solvent washed to remove deposits that build up on the equipment's internal surfaces
- Flooded with water or a solvent to remove any remaining chemicals any chemicals trapped in the unit must be flushed out.
- Isolated to prevent the entry of hazardous chemicals

Emergency shutdown

An emergency shutdown is initiated in the event of a fire, major spill, instrument failure, power failure, or total loss of control of chemical or physical processes. Emergency shutdown procedures must be followed during a shutdown sequence.

Shutting down to a standby condition

When a unit is to be shut down for a short period of time for maintenance on auxiliary equipment, the unit is shut down to a standby condition. A standby shutdown allows a quick startup of the unit after maintenance is completed in order to minimize lost production time and off material.

Standard Operating Procedures must be referred to when shutting down each type of unit to a standby condition. A typical standby condition may include:

- Re-circulating material upstream and downstream
- Reduced heating or cooling (sufficient to maintain a safe process condition)
- Slow-rolling compressors
- Venting process gases to flare
- Diverting process streams to temporary storage.

4.2. Shutting down process

The point of a shutdown is to create a plan for a complete cessation of all plant activities in order to perform necessary maintenance, repairs, equipment replacements, and to perform internal maintenance. The shut-down procedure is just as important as the start-up procedure for both an extruder and an injection molding machine. By properly shutting down the equipment, the start-up will be much quicker and most effective. Shut down the line can have a major impact on your capacity to restart production promptly. In an upcoming article, we will help you restart your machinery, taking the best steps and precautions.

1. **End of production sequence**

The end of the production sequence clears the manufacturing equipment without loading new products into the cycle. This cycle finishes components in a machine and automatically removes most of the glue, parts, liquid, and powder from the production path. There are, however, certain elements that will not be automatically emptied until a later stage of the manufacturing processes. This first step is crucial. For instance, we had experience with a temporary equipment shutdown where oil was left inside certain containers. This oil froze and hardened during the production disruption. When we wanted to restart the line, the oil had become like a resin, gumming up the machine and requiring cleaning that was more labor-intensive and time-consuming than if it was completed at the time of the shutdown.

2. **Air purge**

Once the machine is out of service, the next thing we recommend is to purge any air that may be present in the equipment. Machines often use compressed air to activate the different cylinders, and most machines have an air purge valve that allows for bleeding off any accumulated air. Why is it important? Because the air can crystallize and eventually wear out pneumatic components.

3.Cleaning of the machine

Beyond clearing the line of product and residue, purging air, and cleaning filters, you should take the time to clean the machinery thoroughly during shutdown. Cleaning now will avoid unpleasant surprises at startup. During cleaning, they had to dismantle pipes and small components, resulting in broken parts because it was so “jammed”.

4. **Preventive maintenance**

Whether the shutdown affects all of your manufacturing lines or just a portion, we recommend you use the disruption as an opportunity to perform preventive maintenance on your equipment. The manufacturer’s operation and maintenance manual are the best source for guidance on how to care for your equipment and how to identify issues that need repair. Dealing with repair needs today will help you to be better able to restart quickly.

5. Protection

When your equipment is in an industrial environment, certain activities such as cutting materials, welding, generate dust and debris. This poses the risk of generating contaminants and damaging all

that is mechanical, such as seals. Accumulated metal shavings, for example, can cause internal damage and pose a risk to operators when the machine is switched back on after the shutdown period.

6. Electricity

We highly recommend you to start by making a backup of all of machines. There is a very specific procedure to change the batteries of robotics to ensure that programming does not get lost or altered. When you have backed up everything and replaced the parts and batteries that are needed, you should determine if you should cut off the power source, or maintain power during shutdown. It may be preferable to cut off the power to avoid any power surge. Electrical components must also be protected during dormancy. If there is dust, contaminants, oil, grease that go under the sensors, you will have issues when it comes time to start the machine again.

4.3 Identifying and reporting maintenance requirements

4. 3.1. Maintenance

Maintenance can be defined as working on something to keep it in a functioning and safe state and preserving it from failure or decline.

Maintenance procedures are written instructions that, when followed by the maintenance personnel, will ensure that equipment operates as designed within safe operating limits.

- Maintenance may include:
- Sharpening the cutter
- cleaning,
- lubricating,
- Tightening
- Simple tool repairs and adjustments.

Types of maintenance

1. **Preventive or proactive maintenance**: is carried out to keep something functional. This type of activity is usually planned and scheduled.

2. **Corrective or reactive maintenance:** is repairing something to get it working again. This is an unscheduled, unplanned task, usually associated with greater hazards and higher risk levels.

Routine maintenance tasks

Routine maintenance tasks refer to:

On-going scheduled tasks that are performed in order to keep hand tools and basic equipment functioning properly.

- It could include tasks
- unblocking pipes and nozzles
- sharpening blunt tools
- cleaning nozzles on sprayers
- checking, cables and plugs
- Some tips on routine maintenance
- Use the correct tool for the job
- Keep tools in good condition.
- Handles should be tight and free from defect.
- Cutting tools should be kept sharp.
- Use and maintain power tools according to their operator instructions.
- Make sure power tools are properly grounded or are double insulated.
- Switch off and unplug power tools before changing blades or servicing and repairing.
- Wear clothing that is free of strings or loose ends that could catch.
- Wear appropriate personal protective equipment (PPE), such as glasses, goggles, dust masks, face shields, hearing protection, etc.

Table 1. Maintenance check list

	Tool	Yes	No	Remark
1	Are tools in safe condition?			
2	Are instruction manuals available?			
3	Are power tools properly grounded?			
4	Are guards and shields in place?			
5	Is Personal Protective Equipment available?			

6	Are tools properly stored?			

If necessary:

- Tighten nuts and bolts.
- Smooth off splinters and sharp points.
- Tighten shafts.
- Unblock pipes and nozzles.
- Sharpen blunt tools.
- Clean nozzles on sprayers.
- Check and maintain cables and plugs.

Scheduling routine maintenance

Reporting faults and problems:

Every work shop has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the work shop where you work.

A maintenance schedule assigns a specific date to specific maintenance tasks. It states what has to be checked and will require that the assigned person signs off the document assuring that the checks were done. If faults are found, the tool must be sent for maintenance and the assigned person that fixes the tool has to report on exactly what was done and when it was completed.

An example of checklist is given below

Table .2. Maintenance schedule

Date	Tool	Maintenance check points	Signature	Maintenance required	Signature

Maintenance Performed	Date	Signature
Splinters shaved off		

Examples for how to fill or document maintenance required and report performed maintenance is given below:

Date	Equipment	Maintenance check points	Signature	Maintenance required	Signature

Maintenance Performed	Date	Signature
Splinters shaved off	20-10-2023	Mr. X

SELF-CHECK 4	Written test

Name…… ID…… Date…….

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

TESTI: Choose the best answer among the given alternative (1ptseach)

1._____ is carried out to keep something functional usually planned and scheduled.

A. Corrective maintenance B. reactive maintenance C. proactive maintenance

2. Routine maintenance tasks refer to:

A. It could include tasks. C. Unblocking pipes and nozzles.

B. sharpening blunt tools D.all

3.A scheduled shutdown is initiated by the operator during normal operation of the unit when:

A. Maintenance is required B. Feed supply is low or exhausted.

C. Re-circulating feeds from supply tanks D. All

Test II: Short Answer Questions (3. point each)

1.Write types steps of shutdown?

2.Explain emergency shut down?

3. Write down steps to follow for proper shutdown?

4. List at list five points in some tips on routine maintenance?

LG #14	LO #5- Handle frozen product Safely

INSTRUCTION SHEET

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

- Identifying handling requirements for frozen products.
- Handling frozen product safely.
- Conducting work with workplace environmental guideline.

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 handling requirements for frozen products.
- Handle frozen product safely.
- Conduct work with workplace environmental guideline

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

4-Accomplish the Self-checks.

5.1. Identifying handling requirements for frozen products

5.1.1. Handling requirements for frozen product

Frozen food is a food that has been subjected to rapid freezing and is kept frozen until used. Making sure your frozen foods are handled properly in all the stages of storage and thawing can help prevent bacteria breeding grounds in your kitchen, keeping your customers healthy and coming back for more.

1. Receiving frozen food

Speed is of the essence when receiving frozen foods; you want to move the product through the unrefrigerated receiving area as quickly as possible. However, there are some steps you should follow as you receive frozen food, or even refrigerated food you will be storing in your freezer until you need it. All cold food should be at 41^{o}F or lower, and frozen foods should be frozen solid. For frozen products, look for evidence it may have thawed and refrozen, such as fluid stains on the packaging or frozen fluids on the packaging or product.

2. Storage

The most important thing to keep in mind when storing frozen foods is a constant temperature must be maintained, as fluctuating temperatures can allow bacteria growth. Having a properly calibrated thermometer that is checked regularly can help assure temperatures inside the freezer are holding steady at 0 degrees ^{o}F or lower

Food is safe to store at 0 degrees indefinitely, but after a certain point the quality will start to deteriorate. Look up how long each of your products can be frozen without a reduction in quality, and order accordingly to minimize product loss.

- **Keep these factors in mind when handling frozen foods:**
  - ✓ Fruit and vegetables that are received frozen will keep for months if they are properly wrapped.
  - ✓ Freezing fresh fruits and vegetables on the premises is time consuming and may be too expensive to consider.
  - ✓ Fresh fruit must be properly prepared for freezing or it will not store well.
  - ✓ All freezer products not properly wrapped will develop freezer burn, which is a loss of moisture that affects both the texture and the flavours of the food.
  - ✓ A common sign of freezer burn is a white or grey dry spot developing on the surface of the frozen product. Meat is particularly susceptible to freezer burn.
  - ✓ Rotating stock is extremely important with frozen foods. Such rotation is difficult in standard chest freezers as it often means that old stock must be removed before new stock is added.
  - ✓ The temptation with frozen foods is to develop the unacceptable habit of using the last item bought first, instead of FIFO (first in, first out).

5.2. Handling frozen product safely

5.2.1. Handling of frozen food

Food handlers can carry bacteria that can cause illness in people who eat the food handlers prepare. In fact, people are the most common source of food contamination. Even if a food handler does not feel sick, he or she could still be carrying microorganisms that can cause illness if they get into food. Food borne disease outbreaks are very bad for business

Personnel should always wash their hands when personal cleanliness may affect food safety, for example:

- At the start of food handling activities;
- Immediately after using the toilet; and
- After handling raw food or any contaminated material, where this could result in contamination of other food items; they should avoid handling ready-to-eat food, where appropriate

5.2.2. Five keys to safe

- Food Germs are widely found in soil, water, animals and people.
- They are carried on hands, wiping cloths and utensils, especially cutting boards, and surfaces like door handles and switches.
- Even the slightest contact can transfer them to food and cause food borne diseases.



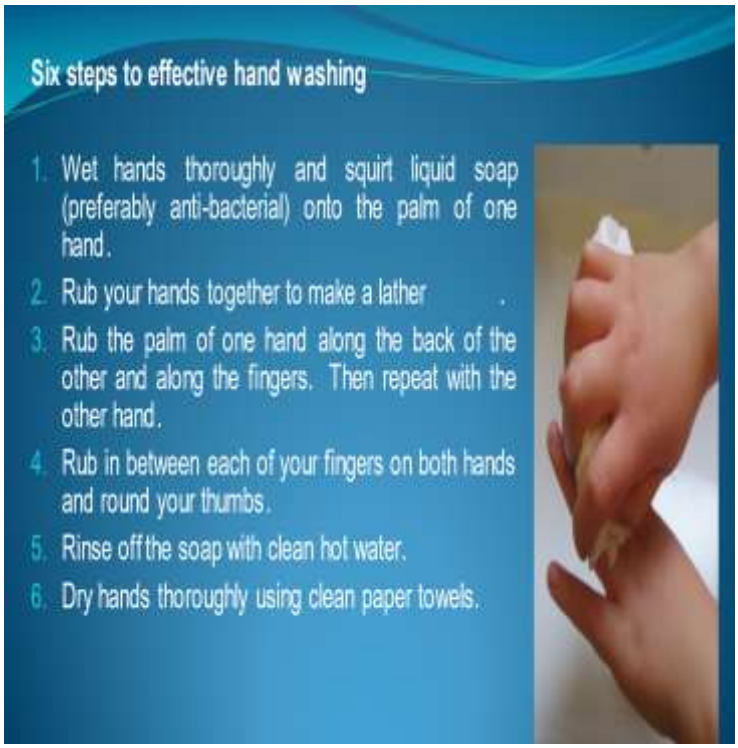
Figure 5.1. Keys of food safely

https://youtu.be/LVntgtoTLrY(accessed date 19/01/2023)

1. **Keep clean**

Wash your hands before handling food and often during food preparation. Wash your hands every time they are exposed to germs (after going to the toilet, blowing your nose, smoking, handling raw meat/poultry/eggs, touching unclean surfaces, handling trash etc.)





- Wash your hands before handling food and often during food preparation.
- Wash, and sanitize all surfaces and equipment used for food preparation.
- Keep food covered, in closed containers and wherever needed, refrigerated.
- Clean and dry all equipment (including the cleaning equipment) as germs can grow fast in damp places.

2.Separate raw and cooked

Raw food, can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.

- Separate raw meat, poultry and seafood from other foods at all stages from cleaning, storing, preparation, and cooking.
- Use separate equipment, utensils (including washcloth) for handling raw foods meats, poultry

and sea foods. Use them for other foods always only after washing with hot water and soap.

- Do not let juices or liquids from raw meats, poultry and sea foods to spill or seep onto other surfaces or come into contact with cooked or other raw foods.
- Store foods in covered containers to avoid cross-contamination between raw and prepared foods

3.Cook thoroughly

Proper cooking can kill almost all dangerous microorganisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption.

- Ensure food is thoroughly cooked through, especially meat, poultry, eggs and seafood.
- Juices from meats, seafood and poultry should not be pink, and should be clear.

4. **Store food at safe temperatures**

Microorganisms can multiply very quickly if food is stored at room temperature. By holding food at temperatures below 5°C or above 60°C their growth is slowed down or stopped.

- Do not leave cooked food at room temperatures for more than 2 hours.
- Refrigerate all cooked and perishable foods promptly
- Do not refreeze frozen food after thawing or cooking

5. Use safe water and raw materials

Raw materials, including water and ice, may be contaminated with dangerous chemicals or microorganisms. Toxic chemicals may be formed in damaged and mouldy foods. Select raw materials with care. Simple measures such as washing and peeling may reduce risk.

- Use safe water or treat it (by boiling, chlorination, and filtration) to make it safe for cooking, washing hands or utensils, and making drinks or ice.
- Select fresh and wholesome foods (not damaged or rotting) from clean stores / places
- Wash fruits and vegetables, especially if eaten raw
- Cut away damaged or bruised parts of fruits and vegetables, since bacteria can thrive in these places.
- Do not use food beyond their expiry date

Refrigeration equipment used to transport frozen foods is designed to remove heat that may leak into the load compartment of the railcar, truck, or container. It should be noted that the refrigeration capacity does not provide for removal of much heat from the load. Therefore, if products are loaded with the temperature warmer than 0 °F (-18 °C), there is little or no opportunity for the product temperature to be reduced to the desired level during transit.

5.3. Conducting work with workplace environmental guideline

5.3.1Conduct work in accordance with environmental policies and procedures

The maintenance of cleanliness in a working area requires frequent or continuous cleaning as well as a clean-up at the end of each day. The purpose of this is to keep waste from accumulating during the operating day. It involves:

- careful organization
- training work scheduling and
- the best available equipment
- method and materials.

5.3.2. Hazard Analysis Critical Control Point (HACCP):

HACCP allows processors/regulator to look at what happens during the process to ensure safety.

Major Concepts of HACCP

A preventive system of control particularly on biological hazards. A system approach for estimating the risk in producing a food product. Universally recognized system as the most effective way to prevent food borne illness. Science - based systematic, identified specific hazards and measures for their control to ensure food safety. Capable of accommodating change, such as advances in equipment design, processing procedures, or technological developments that can be applied throughout the food chain from the primary producer to the final consumer. Applicable to establishments that produce, process, treat, pack, trade, transport, serve, or involve in food production

Seven (7) HACCP Principles

1. Hazard analysis
2. Identify critical control points

3. Establish Control limits
4. Monitor critical limits
5. Establish corrective actions in case of deviation from established critical limits
6. Establish verification procedure to ensure that the system is consistent
7. Establish record keeping procedures.

HACCP Pre-Requisite Programs

1. Good Manufacturing Practices (GMP)
   - This provides the sanitary infrastructure for Food Safety that the:
   - Plant grounds and building facilities emphasize pest control;
   - Equipment design provides ease in cleaning and maintenance;
   - Personal hygiene practices and facilities are set;
   - Storage and warehousing are free from contamination.
2. Sanitation Standard Operating Procedures (SSOP): SSOP are components of GMP that emphasize sanitation procedure. They include:
   - Safety of water that gets in contact with food and food surfaces;
   - Measures to prevent contamination;
   - Employee hygiene practices;
   - Control of employee health conditions that could result in contamination of food and food surfaces;
   - Protection of food and food contact surfaces from adulteration with toxic and other harmful components;
   - Proper labelling and storage and use of toxic; and Control of pests

SELF-CHECK 5	Written test

Name…… ID…… Date…….

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

TESTI: Choose the best answer among the given alternative (1ptseach)

1.Which of the following is not true about Store food at safe temperatures

A. Microorganisms cannot multiply if food is stored at room temperature.

B. Do not leave cooked food at room temperatures for more than 2 hours.

C. Refrigerate all cooked and perishable foods promptly

D. Do not refreeze frozen food after thawing or cooking

2.Personnel should always wash their hands when personal

A. start of food handling activities B. Immediately after using the toilet

C After handling raw food or any contaminated material. D.all

3. Good Manufacturing Practices (GMP)

A. provides the sanitary infrastructure

B. Plant grounds and building facilities emphasize pest control;

C. Equipment design provides ease in cleaning and maintenance;

D. all

Test II: Short Answer Questions (3. point each)

1.Write and explain HACCP Principles?

2.Define Good Manufacturing Practices (GMP)?

3. write and justify five keys of food safely?

4. Write the steps of effective hand washing?

LG #15	LO #6- Respond to emergencies

INSTRUCTION SHEET

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

- Identifying signs and symptoms.
- Taking appropriate action to minimize effects of exposure.

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:

- Identifying signs and symptoms.
- Taking appropriate action to minimize effects of exposure

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

4-Accomplish the Self-checks

6.1. Identifying signs and symptoms.

6.1.1. Signs and symptoms of exposure in workplace accidents and injuries

It is critically important that workers are aware and recognize the signs and symptoms of accident exposure. Prior to work, the accident should be reviewed for associated signs and symptoms.

Signs and symptoms of accident exposure may include (these symptoms may also be associated with conditions other than accident exposure):

- Slow, shallow breathing.
- Confusion and memory loss.
- Stress, anxiety and tension
- Feelings of social isolation at work
- Loss or deterioration of personal relationships
- Headaches, backaches, stomach cramps, depression
- Deterioration of work performance

Accidents may be the result of:

- careless staff
- fault, incorrect or unstable equipment
- inappropriate work spaces
- incorrectly stored items
- lack of safety precautions
- lack of training
- lack of use of personal protective equipment
- obstructions over exits
- poor maintenance of equipment
- poor supervision
- rushing to get a job done

6.2. Taking appropriate action to minimize effects of exposure.

6.2.1. Appropriate action to accident

1.Reporting emergency incidents

All employees are required to report hazards and emergency incidents that occur in the workplace, in the form of a verbal report and completing a hazard or incident report.

Many organizations conduct regular drills where staff practice responding to an emergency.

2.Immediate response

In emergency situations it is important to act quickly to protect your personal safety and safety and health of other people around you. An emergency should be reported to an appropriate person or department including the following:

- Communications officer
- Emergency services (police, ambulance, fire service)
- Fire warden
- First aid officers
- Floor wardens
- Health and safety officer
- Internal security staff
- OHS representative
- Owner-manager
- supervisor

SELF-CHECK 6	Written test

Name…… ID…… Date…….

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

TESTI: Choose the best answer among the given alternative (1ptseach)

1.Accidents may be the result of?

A. careless staff C. fault, incorrect or unstable equipment

B. inappropriate work spaces D.all

2.Signs and symptoms of accident exposure

A. Slow, shallow breathing. B. Confusion and memory loss.

C. Stress, anxiety and tension D. All

3.An emergency should be reported to?

A. Communications officer B. Emergency services

C. First aid officers D.all

Test II: Short Answer Questions (3. point each)

1.Define Signs and symptoms of exposure in workplace accidents and injuries?

2. How to reporting emergency incidents

3. Write Signs and symptoms of accident exposure?

REFERENCE

Books:

Arthey, D. 1993. Freezing of vegetables and fruits. In: Mallett, C.P. ed., Frozen Food Technology Chapman and Hall, London, UK.

Beck, P. 1996. Freezing fruits. NDSU Extension Service, North Dakota State

University of Agriculture and Applied Science.

Dietrich, W.C., Olson R. L., Nutting, M.D., Neumann, H.J., and Boggs, M. M. 1959. time-temperature tolerance of frozen food.

George, R.M. 1993. Freezing process used in food industry. Trends in Food Science and Technology. 4, pp. 134.

Gut Schmidt, J. 1968. Principles of freezing and low temperature storage, with particular reference to fruits and vegetables, Low Temperature Biology of Foodstuff, Recent Advances on Food Science, Vol 4, Pergamon Press, London.

Enochian, R.V. and Wool rich, W.R. 1977. The rise of Frozen Foods, Principles of Food Freezing, the Technology of Food Freezing, 4th ed., AVI Publishing Co. Inc. Westport CT, USA.

Workplace Safety and Health Act

Van den Berg. L. 1981. The role of humidity. temperature. and atmospheric composition in main- taining vegetable quality during storage, p. 95-107. Tn: R. Tcranishi and H. Barrera-Benitez (eds.), Quality of selected fruits and vegetables of North America. ACS Symposium Series

170. Am. Chem. Soc .. Washington, DC.

Watada, A.E .. N.P. Ko. and D.A. Minott. 1996. Factors affecting quality of fresh-cut horticultural products. Postharv. BioI. Technol. 9: 115-125.

Web addresses

(http://www.inspection.gc.ca/english/reg/rege.shtml).

(http://www.msue.msu.edu/msue/imp/mod01/01600506.html.

https://youtu.be/LSXcbQTf-6M

https://youtu.be/-3iQpzYqxLE

https://youtu.be/-3iQpzYqxLE

Personal protective equipment for food handlers

https://youtu.be/8Y7PZ-XHlys?t=52

https://youtu.be/jMg4ijTSBAo

https://youtu.be/7dA_WOS0dYs

https://youtu.be/8IaQwvHQNqc

https://youtu.be/LVntgtoTLrY

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