FRUIT AND VEGETABLE PROCESSING -Level-II

Based on May 2019, Version 2 Occupational standards

Module Title: Working in a Freezer Storage Environment

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Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Identifying appropriate clothing and footwear • Fitting clothing and footwear • Confirming available materials • Identifying and confirm cleaning and maintenance requirements • Fitting and adjusting machine components and related attachments • Entering processing/operating parameters • Checking and adjusting equipment • Conducting checks and inspections 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 appropriate clothing and footwear • Fit clothing and footwear • Confirm available materials • Identify and confirm cleaning and maintenance requirements • Fit and adjust machine components and related attachments • Enter processing/operating parameters • Check and adjusting equipment • Conduct checks and inspections
Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Identifying appropriate clothing and footwear

1.1. Introduction

Food handlers should maintain a high degree of personal cleanliness and wear suitable protective clothing, head covering, and footwear. Cuts and wounds, where personnel are permitted to continue working, should be covered by suitable waterproof dressings. 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. Food handling uniforms are designed for hygiene, comfort and function. They are meant to protect the employee from the products and machinery, as well as keeping themselves clean and contaminant-free when handling food.

1.2. Appropriate clothing and footwear

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. Examples of clothing designed to prevent contamination by the body include:

- Purpose designed overalls or uniforms
- Hair-nets
- Beard snoods
- Gloves and overshoes

Dirty clothing is one of the leading causes of cross contamination in the kitchen as is can carry bacteria from one place to another. It is important that all clothing be laundered and stored correctly to prevent the spread of bacteria. Clothing must also be microbial clean, meaning that the microbes on the garment have been reduced to a safe level. 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. Many protective items such as gloves and hairnets are designed to be used once

only, and must be disposed of after use and never re-used. Long hair should always be tied back and preferably contained using a hair net and Jeweler should also be kept to a minimum.

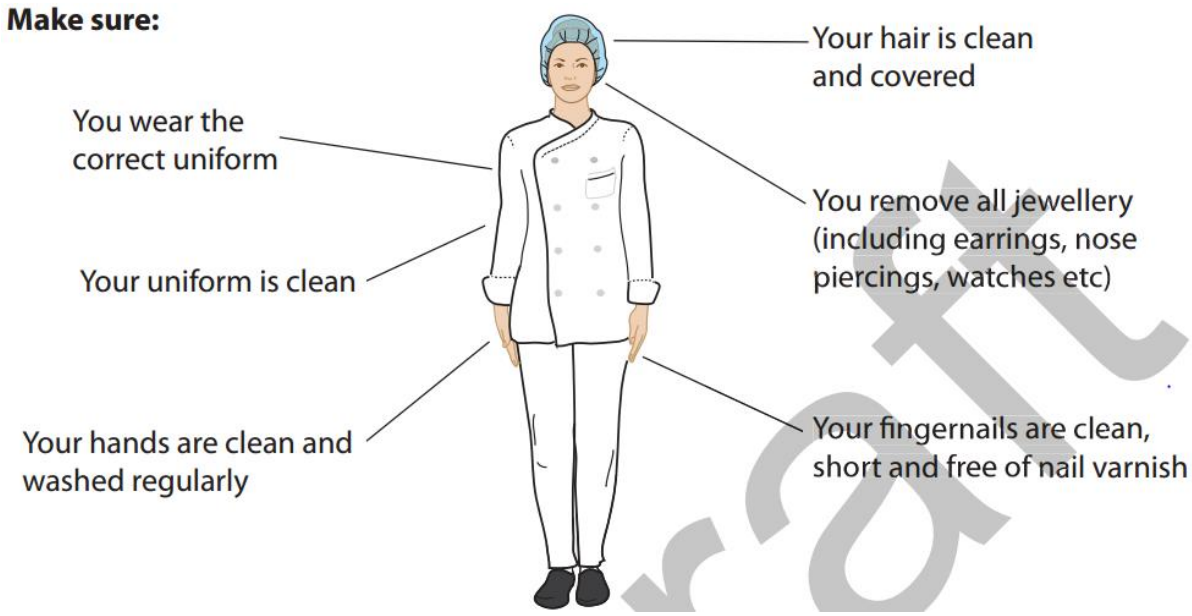

Figure 1.1. Good practice for all staff working in the food area

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Write true if the statement is right and false if it is wrong

1. Dirty clothing causes of cross contamination in the kitchen as carry bacteria from one place to another (5 point)

Test II: Short Answer Questions

2. What are the good practice for all staff working in food area (5 point

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2- Fitting clothing and footwear

2.1. Fit and comfort

The Food business shall provide to all food handlers adequate and suitable clean protective clothing, head covering, face musk, gloves and foot wear and the food business shall ensure that the food handlers at work wear only clean protective clothes, head covering and footwear every day. Clothing mandated for food protection or hygiene purposes shall not be used for any other purpose. Work wear shall provide adequate coverage to ensure that hair, perspiration, etc. cannot contaminate the product. Hair, beards, and moustaches shall be protected (i.e. completely enclosed) by restraints. Laundry facility shall be provided for washable garments in the establishment but where this facility is not available, outside contractors should be engaged.

Shoes for use in processing areas shall be fully enclosed and made from non-absorbent materials. Boots or foot wears shall be cleaned inside and outside, kept in inverted position to maintain them dry and free of any foul odour or slime. Shoes worn outside food handling area shall not be allowed to enter food handling area. Clothing should be easy to put on and take off. It should not interfere with normal movement required for the job. For example walking, climbing stairs or ladders, sitting, standing, and operating plant or machinery.

It should not be too loose or baggy. Loose or baggy clothing could get snagged on objects or cause tripping. Pants and sleeves should not hang down over hands or feet. Rolled up sleeves and trousers could get caught in machinery. Protective clothing should cover an entire area, even when a worker is moving. For example, if a person raises their arms or leans over, clothing should not leave parts exposed. Head protection should be snug. It should not be able to slide around or tip forward.

Clothing should not be so tight that it restricts blood flow. Clothing should not have sharp edges or rough surfaces that could harm the worker or others near them. Where possible, protective clothing should be made of breathable materials to avoid thermal discomfort (workers becoming too hot or sweaty while working).

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Write true if the statement is right and false if it is wrong

1. Protective clothing should cover an entire area when a worker is moving (5 pts)
2. Shoes use in food processing areas shall be fully enclosed and made from non-absorbent materials (5 pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 3- Confirming available materials

3.1. 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. Raw materials for processing and quick freezing should be prepared without delay and appropriate temperature control should be applied in order to minimize possible microbiological, chemical or biochemical changes that might affect safety and quality. To minimize deterioration, raw materials should be cooled and stored under appropriate conditions (e.g. pre-cooling) or transported and frozen in the shortest time possible. 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

Self-check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What are the key raw material characteristics? (5 pts)
2. What are the technical and food safety information during raw material specification? (5 pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 4- Identifying and confirming cleaning and maintenance requirements

4.1. Cleaning

Cleaning is the complete removal of food soil using appropriate detergent chemicals under recommended conditions. It is important that personnel involved have a working understanding of the nature of the different types of food soil and the chemistry of its removal.

4.2. Cleaning Methods

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

4.2.1. 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. It is a labor intensive method and may limit the use of certain chemicals for safety reasons. To ensure cleaning is effective the method must be clearly defined and staff trained to an appropriate level.

4.2.2. Foam cleaning

This is the common method for cleaning most food operations. A foam blanket, created using a wide range of available equipment is projected from a nozzle and allowed time to act on the soil. It is then rinsed off with the released deposits. 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 4.1. Foam cleaning

4.2.3. Spray

Spray cleaning uses a lance on a pressure washer with chemical induction by venture. This method can be wasteful of chemical and can be slow to produce foam. It should be used where foaming properties are not essential for the cleaning action.

4.2.4. Fogging

Aerial fogging uses compressed air or other equipment to generate a fine mist of disinfectant solution which hangs in the air long enough to disinfect airborne organisms. It will also settle on surfaces to produce a bactericidal effect. The system can come in a small portable device or built in automatic central systems. Fogging should never be used as a primary sanitizing method. It should be used in conjunction with other methods. It is also important to ensure that coverage and saturation is sufficient and the mist is fine to allow proper action.

4.2.5. 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 where critical.

4.3. 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. It is a system of cleaning engineered to provide fast, productive, consistent and reproducible high quality cleaning of all product contact surfaces to a predetermined level of cleanliness, by circulating chemical (detergent and disinfectant) solutions and rinsing water through tanks and piping of a food processing plant that remains assembled in its production configuration, and by jetting or spraying of the product contact surfaces under conditions of increased turbulence and flow velocity.

4.4. 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

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.

In particular floor surfaces, wall surfaces, doors are to be easy to clean and where necessary, disinfect. Windows and other openings fitted with insect proof screens which can be easily removed for cleaning.

4.5. 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. Poorly maintained premises and equipment cannot be cleaned effectively. 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

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.

Perform maintenance safely

Do 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

Self-Check – 4	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. Define cleaning? (5 points)
2. Write methods of cleaning? (5 points)
3. What is the correct sequence of general cleaning procedures? (5 points)
4. Mention types of maintenance? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 5- Fitting and adjusting machine components

5.1. Machine Adjustment

Before allowing someone to start using any machine you need to think about what risks there are and how these can be managed. Before starting any operation the operator should be check 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.

5.2. Adjustment of Machine operation

Safety check:

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

Switch on the power:

Open the door of the cabinet and connect the main breaker, close the cabinet, check to see if all thermostats and power supply indicator lamp on the control board are normal, and see if the display of the human-machine interface is normal.

Self-Check – 5	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. What is the main purpose of safety checks? (5 points)
2. Write down the main parts of the machine to be check? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 6- Entering processing/operating parameters

6.1. Operation procedure of freezing equipment

Operating procedures are followed to start and operate equipment to achieve required outcome. Provision of clear, concise and accurate operating procedures is the most effective measure to prevent, control and mitigate accidents.

This procedure aims to:

- Increase employee awareness on the safe use of equipment used in the workplace;
- Ensure that work equipment is suitable for the purpose for which it is to be used or has been provided;
- Ensure that work equipment is inspected at regular intervals;
- Ensure that work equipment is maintained in good working order and kept in a good state repair;
- Ensure employees receive relevant information, instruction and training (where this is required and/or appropriate) in relation to using work equipment.

Comprehensive written operating procedures should be generated where applicable that address:

- Standard operating procedures and operating philosophy;
- Abnormal operating procedures;
- Temporary operating procedures;
- Plant trials;
- Emergency operating procedures;
- Commissioning;
- Plant Start-up;
- Plant Shut-down;
- Bulk loading and unloading;
- Process change;
- Plant change.

These procedures should cover the following:

- Material safety data control of substances hazardous to health (COSHH) states that general requirements on employers to protect employees and other persons from the hazards of substances used at work.);
- Plant operatives should have an awareness and understanding of material safety data for raw materials, intermediates, products and effluent / waste;

N.B: material safety data sheet (MSDS) is the document that list information relating to OHS for the use of various substances and products. These include:

- Control measures and personal protective equipment;
- Location of plant where process to be undertaken;
- Roles and responsibilities of individuals involved in plant operations;
- Plant fit for purpose;
- The condition of main process plant and equipment (clean, empty etc. as appropriate) should be established as being fit for purpose;
- The condition of ancillary process plant and equipment (clean, empty etc. as appropriate);
- Plant correctly set-up for processing;
- Process monitoring and recording;
- Monitoring and recording of key process parameters (temperature, pressure etc.) in plant logs;
- Quality;
- Sampling of raw materials, intermediates, products and effluent/waste;
- Packaging of final product.

Self-Check – 6	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. What is the aim of operational procedure during operating the machine or equipment? (5pts)

2. What is the comprehensive written operating procedures was generated which were applicable to address? (5pts)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 7- Checking and adjusting equipment

7.1. Checking equipment performance

7.1.1. 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.

7.1.2. Overall equipment effectiveness (OEE)

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. An OEE of 100% means that only good parts are produced (100% quality), at the maximum speed (100% performance), and without interruption (100% availability). Measuring OEE is a manufacturing best practice. By measuring OEE and the underlying losses, important insights can be gained on how to systematically improve the manufacturing process. OEE is an effective metric for identifying losses, bench-marking progress, and improving the productivity of manufacturing equipment (i.e., eliminating waste)

7.1.3. 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). The generic form of OEE allows comparison between manufacturing units in differing industries. It is not however an absolute measure and is best used to identify scope for process performance improvement, and how to get the improvement. OEE measurement is also commonly used as a key performance indicator (KPI) in conjunction with lean manufacturing efforts to provide an indicator of success. OEE can be illustrated by a brief discussion of the six metrics that comprise the system.

7.1.4. 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)

Overall Equipment Effectiveness (OEE) is a measure of exactly where you can improve in your freezing line. Each of the three components of the OEE points to an aspect of the process that can be targeted for improvement. OEE may be applied to any individual Work Center, or rolled up to Department or Plant levels. This tool also allows for drilling down for very specific analysis, such as a particular Part Number, Shift, or any of several other parameters. It is unlikely that any manufacturing process can run at 100% OEE. Many manufacturers benchmark their industry to set a challenging target; 85% is not uncommon.

OEE is calculated with the formula (Availability)*(Performance)*(Quality)

Using the examples given below:

Availability x Performance x Quality = OEE

7.2. Performance

Every piece of freezing machinery has an ideal cycle time (the time it takes to complete one finished product). Performance is measured against that ideal cycle time. So for the calculation of Overall Equipment Effectiveness (OEE) performance represents the speed at which the machine is currently running as a percentage of its ideal speed. Idle time, minor stoppages, and overall reduced operating speeds will negatively affect freezing machine performance.

In the freezing equipment world, a changeover is adjusting a machine to accommodate different products. Changeovers mean the machine is offline and not

producing, which equals money down the drain. So put away your tools, you won't need them.

Self-Check – 7	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. Define overall equipment effectiveness? (5 points)
2. Write down factors that affect overall equipment effectiveness? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 8- Conducting checks and inspections

8.1. 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. This will also assure that electrical plugs and wirings are not defective and will not in any way cause problems on short circuits, electrocution or any form of accident. 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 or artificial drying. Doing this will prevent the use of inappropriate devices as well as the occurrence of accidents due to the use of faulty or defective tools, equipment and utensils.

Sanitizing and disinfecting the tools, equipment and utensils will destroy all germs and microorganisms which were not removed after washing with soap and water. Proper cleaning and disinfecting leads to:

- Minimizing product rejection, return and complaints due to defects resulting from the use of defective or inappropriate tools, equipment and utensils
- Lengthening product shelf life due to the reduction of contamination resulting from the use of properly sanitized and disinfected tools, utensils and equipment
- Reduction of the risk on food poisoning due to the use of un sanitized tools, equipment and utensils.
- Facilitating preventive maintenance which include checking the machine temperature, hydraulic fluid, wear and surface condition, crack, leak detection, vibration, corrosion, and electric insulation.

Self-check 8	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What is purpose of proper cleaning and disinfecting? (5 point)
2. Mention what we check during maintenance of equipment and machines (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

LG #77	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: • Identifying effects of freezing temperatures on equipment • Monitoring equipment to ensure it is 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: • Identify effects of freezing temperatures on equipment • Monitor equipment to ensure it is 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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them. 4. Accomplish the “Self-checks” which are placed following all information sheets. 5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Identifying effects of freezing temperatures on equipment

1.1. Freezing

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 colour, flavour 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.

Freezing method chosen for each product will depend on:

- Product quality and freezing rate desired
- Type and shape of product, package, etc.
- Flexibility required in freezing operations.
- Costs of freezing

1.2. Method of freezing used in fruit and vegetable processing

The three basic methods of freezing food are:

- Blowing a continuous stream of cold air over the food - air blast freezers.
- Direct contact between the food and a refrigerated surface - contact or plate freezers.
- Immersion in or spraying with a refrigerated liquid - immersion or spray freezers.

1.2.1. 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.

1.2.2. 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.

1.2.3. Plate freezer

It consist 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.

1.2.4. Cryogenic freezer

Freezers of this type use a change of state in the refrigerant (or cryogenic) to absorb heat from the freezing food. The heat provides the latent heat of vaporization or sublimation of the cryogen. The cryogen is in intimate contact with the food and rapidly removes heat from all surfaces to produce high heat transfer coefficients and rapid freezing. The two most common refrigerants are liquid nitrogen and solid carbon dioxide. The main advantages of cryogenic freezing are as follows:

- Short freezing time due to high heat transfer
- Reduction in flavour loss
- Reduction in drip loss
- Reduction in oxidative changes
- Improved texture of the product
- Suitable for freeze sensitive products
- The main disadvantage of cryogenic freezing is relatively high cost of cryogens.

Figure 2.1. Cryogenic freezer

1.2.4. 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 2.2. Immersion freezer

1.3. Effects of freezing temperature on machines and equipment

It can cause mechanical components to malfunction causing operational delays. Such impediments can dramatically affect timelines and profits. However, there are ways to avoid such slowdowns and stoppages.

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.

1.3.1. Lubrication and Machine Reliability

Machines always work more efficiently when lubricated. However, it becomes even more imperative in cold weather. Application of the right fluids prevents chemical degradation and contamination. Lubricants reduce premature wear, improve machine reliability, and lower your operating costs.

Operating temperatures can affect the practical limits of both machines and lubricants. In freezing conditions, fluids can become congealed and no longer flow properly throughout the machine. This limit is known as the “pour point,” and affects the circulating system of the machine. When lubricant viscosity becomes high, it restricts the proper flow of oil. This reduces the ability of components to move properly, leading to premature metal-on-metal death.

Temperatures also affect other systems that rely on oil flow. Take for example, the splash-lubricated gearbox. A properly designed and well-maintained gearbox brings oil up to the gear tooth interface and shaft bearings. When the fluid viscosity is too high, the submerged gear pushes the lubricant chunks away and causes insufficient oil distribution within the housing. High viscosity can also lead to higher start up

torque. This results in an increased load, causing machine failure or high energy consumption due to excessive friction.

Extremely cold weather causes blended base oil to separate into various states. This process is known as stratification. The additives turn insoluble when exposed to cold. The base oil separates and forms deposits at the bottom of the sump. Insoluble additives can affect the performance of lubricant and cause damage to the machine.

Most machine lubricants can withstand moderate changes in temperature (i.e. from zero to negative ten degrees Celsius) without any significant reduction in performance. However, some lubricants reach their pour point at beyond negative 20 degrees Celsius. Polyalphaolefin (PAO) synthetic oil is a good alternative to regular lubricants when the temperature reaches below negative -20^{o}C

1.3.2. 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.

Keep these parts of all machines in optimal condition:

Engine

Take extra care when fuelling machines and equipment to prevent water and other particles from getting into the tank.

Check the fuel, air, and hydraulic filters regularly so equipment can start easily. This measure also prevents power loss during operation.

Starter

Handling, using, and storing highly volatile ether starting aids in pressurized cans is a major safety concern. If handled improperly, the engine may seize, or crank/bend the valve stems.

Safety measures are crucial, especially when two or more workers are involved when starting a machine. Before proceeding to jump-start any machinery, assign each person a specific role and discuss the entire process in detail beforehand.

Machine Warm-Up

Freezing temperatures can make hoses and wires brittle. Take time to warm up machines before operating.

Warm hydraulics quickly by holding the control valve to open the relief valve.

Operation

Before winter arrives, inspect atmospheric systems (defrosting devices and operator compartment heaters) to ensure they are in good working condition. This helps prevent unexpected problems that can cause operational delays.

Make sure to regularly inspect your machinery to detect damage, leaks, and other problems. Fix them immediately and avoid downtime. Also, check the auxiliary hydraulic connections, hoses, belts, attachment connections, and fluid levels for any signs of damage.

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Define freezing (5point)
2. Freezing method chosen for each product will depend on (5 point)
3. What are the three basic methods of freezing food (5 point)
4. What is the main advantages of cryogenic freezing (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2- Monitoring equipment to ensure it is in operational order

2.1. 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. Refrain from using electrical devices or sharp instruments in defrosting your freezer. The freezer must be properly grounded when installed. Defrost regularly. Clean the interior to prevent food from being contaminated during storage. Remove detachable parts and wash in warm water and baking soda solution (Use 1 tablespoon of baking soda per litter of water). 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.

Test I: Write true if the statement is right and false if it is wrong

1. Monitoring freezing equipment is switch control to OFF before unplugging (5 point)

Test II: Short Answer Questions

1. Mention at list 3 the monitoring system of freezing equipment (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

LG #78	**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:

- Starting and operating process
- Monitoring equipment
- Identifying and reporting variation in equipment operation
- Monitoring process
- Identifying and rectifying out-of-specification product/process outcomes
- Maintaining work
- Conducting work
- Maintaining workplace

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:

- Start and operate process
- Monitor equipment
- Identify and report variation in equipment operation
- Monitor process
- Identify and rectify out-of-specification product/process outcomes
- Maintain work
- Conduct work
- Maintain workplace

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Starting and operating process

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

Interpreting Manufacturer's Specifications

Food processing equipment when sold are provided with a manual containing the manufacturer's specifications and a necessary reminder to the processor in the form of a sticker or Warning Label is attached to the equipment itself as an assurance that the equipment/machine or tool is in excellent condition for it has passed quality control in its construction.

The specification usually gives a detailed description about the equipment, dimensions, materials, and other relevant information regarding the equipment or machine. The dimension gives the measurement of the size of an object in terms of length, width, or height of the equipment/machine or tool.

The capacity specifies the measurement of the amount, which a device can hold or contain as in boilers, cooker, or steamers or a weighing scale. The manufacturer's specifications are usually contained in the manual, which accompanies the equipment. The food processor must thoroughly read and understand all the information contained in the manual especially if the equipment is to be operated electrically.

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.

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What are the chief requisites for keeping the freezer operating properly (5 pts)
2. What are the basic safety precautions to follow when using the equipment (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2- Monitoring equipment

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.

The complexity of a control system usually relates to the size of the plant, ranging from no more than a capillary device to regulate refrigerant flow in a small hermetic system to complex, computer-based control systems for the more recently installed large, and multiple unit 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.

2.1.1. 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. An additional gauge may be used in a larger system to indicate the pressure at the evaporator and, also, the pump delivery pressure when a secondary refrigerant is used.

To cover all these requirements, three different pressure ranges may be required, and although they are not essential for the plant operation, spares should be available since a reliable gauge would help to reduce both operational and maintenance costs.

2.1.2. 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.

Dial gauges are also used to monitor the temperature in air-blast freezers, but for cold stores a recording thermometer is advisable since this information is often required for checking later.

At least two temperature ranges are required to cover all these requirements, and the availability of spares is not normally critical since thermometers can usually be interchanged without breaking into the system, or a hand-held thermometer, used in an appropriate way, can be substituted.

2.1.3. 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.

Hand expansion valves are often fitted in parallel with other control devices so that they can be manually operated in the case of a failure. Cost depending on size.

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.

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Mention the controls used for the size of plant more likely in the food industry (5 point)
2. What is the thermostatic expansion valve means? (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 3- Identifying and reporting variation in equipment

3.1. Identifying Variation in equipment operation

Assess quality of received components, parts or materials. Continuously check received components, parts, materials, information, service or final products against workplace standards and specifications for conformance. Demonstrate an understanding of how the received components, parts or materials, information or service relate to the current operation and how they contribute to the final quality of the product or service. Identify and isolate faulty components, parts, materials or information that relate to the operator's work. Record and/or report faults and any identified causes in accordance with workplace procedures. Follow machine manufacturers manual

Steps of corrective action in response to variations

Define the Problem

Take time to adequately define the problem (who, what, when, why, where, how much and how often)

Interim Actions

Once a problem as been detected, the first priority should be to contain the problem, and prevent shipment to the customer. If already shipped, the customer needs to be notified to prevent further liability.

Root Cause Analysis

The key to resolving a problem is identifying the true root cause. There may be several underlying causes, a new operator, a change in procedure, or another ‘rush job’ circumventing the system. This is why it is important to find the root cause of the issue and define a permanent solution.

Permanent Actions

The process should be reviewed to arrive at a solution for correcting the root cause. This review should engage the 7 basic quality tools. The solution may involve longer

term planning, requiring milestone dates, capital justification, training, and/or approval from the customer. It is good to review progress in management review to assure accountability after the Interim Actions have 'stopped the bleeding'.

Verification

Checkpoints in the process should be created to verify effectiveness. This could be accomplished by inspection, internal audits, and/or measurement.

Control

If mistake proofing was not part of the solution, then a measurement to detect the root cause early should become part of the system. A procedural change should become part of the system by updating the work instruction and training for accountability. Consider putting a reaction plan in place should the problem reoccur.

Prevention

Very few organizations reach this step. For example, all the above steps are completed, yet the problem returns 6 months later. Perhaps, a new operator shows up who may have been qualified through 'On-the Job' training without verification of their competency. Or the filter was replaced as part of the solution, but it is dirty again and hasn't been placed on the Preventive Maintenance schedule.

Self-check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: short answer

1. What are the techniques used in identifying equipment variations? (5pts)
2. Mention some techniques of identifying equipment variations? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 4- Monitoring process

4.1. 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. Fluctuating temperatures, such as those in self-defrosting freezers, also may damage food quality. Do not plan to store frozen foods for the maximum suggested time if your freezing unit cannot maintain zero degree temperatures. Even foods stored properly will lose colour, texture, flavour 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. When frozen foods are thawed at room temperature, the surface of the food warms enough for microorganisms to grow and multiply. If your freezer does not have a built-in thermometer, check the temperature frequently. One easy way to estimate the freezer's temperature is to check the consistency of ice cream stored inside the compartment. If the ice cream is not brick-hard, the temperature of your freezer is too warm. A warning light or other device may be installed to warn you if the freezer is not operating correctly. A plug protector may be used to keep the electrical plug in the outlet.

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 4.1. 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. It is often more noticeable on meats because they are frequently inadequately wrapped. 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, colour, flavour, 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 vapour proof.
- Squeeze air out of bags before sealing and seal tightly. Vacuum seal bags also remove air.
- Minimize headspace in plastic containers. Place a crumpled piece of plastic wrap or waterproof paper on top of frozen fruit to keep it under the sugar syrup.
- Freezer paper has a coating that prevents the transfer of air. Over-wrap packages of meat with freezer paper or heavy-duty aluminium foil.

Self-check 4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Write the way to prevent burning of freezer (5 point)
2. Write how the freezer burn is occurred 5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 5- Identifying and rectifying out-of-specification product/process outcomes

5.1. 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

The OOS investigation involves 2 phases.

Phase I: (laboratory investigation)

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.

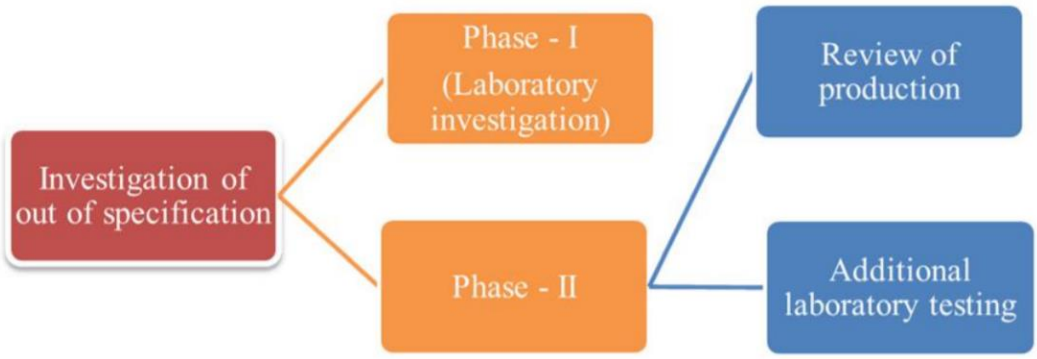

Figure 5.1. Investigation of out of specification result

Phase II investigation

When there is no possible outcome has obtained from the phase I investigation, the phase II investigation should be commenced in context to investigate the errors occurred in manufacturing processes, sampling procedures along with other additional laboratory testing.

Self-check 5	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. Define the term out of specification out comes? (5 points)
2. Explain two phases of out of specification out comes? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 6- Maintaining work

6.1. Maintaining work area according to housekeeping standards

Good housekeeping is the foundation of a safe, healthy and pleasant workplace. It is essential that all areas be kept clean, orderly, and with all necessary things in the proper places. Employees should be aware of hazards arising from poor housekeeping. Good housekeeping improves safety, efficiency and quality at the same time.

- **Housekeeping activities**
  - ✓ Keep work areas neat and clean.
  - ✓ Place tools, equipment and supplies in their correct places.
  - ✓ Implementing cleaning schedules for the area
  - ✓ Removing wrapping and packaging waste
  - ✓ Storing all product as soon as possible after delivery
  - ✓ Remove potential hazards
  - ✓ Keep the area clear for future deliveries
  - ✓ Keeping stores area well and ventilated to deter pests and allow for easy identification of product items and problem issues
  - ✓ Keeping shelves, benches, pallets, bins and other storage containers in good order and inspecting the area and fittings on a regular basis for signs of damage or deterioration or other problems such as stability, security and pest infestation
  - ✓ Maintaining all equipment and storage areas in accordance with the relevant occupational health and safety requirements.
  - ✓ Checking the temperature of refrigerated food storage areas
  - ✓ Initiating preventative maintenance servicing for plant and equipment in the stores area before servicing them
  - ✓ Developing and implementing a proper cleaning schedule for the stores areas including ensuring supplies of all necessary chemicals and equipment exist to get the job done

Self-check 6	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What is the good housekeeping? (5 point)
2. List at least 5 housekeeping guideline?(5)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 7- Conducting work

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.

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,

Lighting enables:

- Each worker to carry out work without risk to health and safety, and
- Persons to move within the workplace without risk to health and safety, and
- Safe evacuation in an emergency,
- Ventilation enables workers to carry out work without risk to health and safety,
- Workers carrying out work in extremes of heat or cold are able to carry out work without risk to health and safety,
- Work in relation to or near essential services does not give rise to a risk to the health and safety of persons at the workplace.

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.

Employees

Employees are responsible for reporting any identified hazard in the work environment, facilities or Amenities that they become aware of in accordance with factory or company guidelines.

Nature of Work Performed

The requirements of amenities and facilities will depend on the type of work being performed and the equipment being used. For example, persons handling chemicals or conducting hot and arduous activities may need to access shower and change room facilities. Persons working remotely may require shelter sheds, food and water.

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.

Self-check 7	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. Write things fulfilled in a safe working environment? (5 points)
2. Write work place requirements that the worker should be ensure when conducting the work? (5 points)
3. What are legislative requirements? (4 points)

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

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet 8- Maintaining workplace record

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 plans
- Record keeping procedures
- Procedures for verification of the HACCP plan

- Variation of results

Self-check 8	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Workplace information may include? (5 points)
2. Write the purpose of recording? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

LG #79	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 appropriate shutdown procedure
- Shut down 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 appropriate shutdown procedure
- Shut down 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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Identifying appropriate shutdown procedure

1.1. Introduction

Normal shutdown includes steps to render the systems safe, such as removal of hazardous process materials and inert (asphyxiating) gases. The systems might be cleaned as part of the shutdown; cleaning is often a process unto 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

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

During decontamination, regular sampling of the atmosphere inside a unit vessel is required to ensure toxic or explosive atmospheres do not build up inside the unit that could be a hazard to equipment or personnel. Gas testing must be carried out before anyone enters the vessel to ensure the atmosphere is not toxic, explosive or oxygen deficient.

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.

Self-Check – 1	Written test

Name……ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Write types steps of shutdown? (5 points)
2. Explain emergency shut down?(4 point)
3. Write steps taken in unit shut down of schedule shut down? (5 points)

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

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2- Shutting down process

2.1. Introduction

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.

Steps to follow for proper shutdown of manufacturing line

End of production sequence

When pausing a manufacturing line, it is crucial to allow the machine to empty itself of all the components. 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. It may be necessary to remove these elements manually and thus completely empty the machine of any stray material that can complicate startup. 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.

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.

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. For example, in the previous example where a company left oil in their system, which froze, cleaning it was longer and more complex than just emptying it. During cleaning, they had to dismantle pipes and small components, resulting in broken parts because it was so “jammed”. It added an extra layer of unnecessary work and problems. Invest the time today, and you’ll save time in the long run.

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 is 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. It is also advisable to ensure that you have critical parts and components that need frequent replacement beforehand. Lead times to supply your parts can be unpredictable, so we suggest that you make a list of parts that need changing and share it with your suppliers to anticipate when the product will be available.

Environmental

More generally, we suggest that you keep the equipment in a stable environment, adequate in terms of temperature and ventilation. This will help avoid degrading your production line. For example, in a medical clean room, if the machine is not in production, it may not be necessary to maintain PPM, particles per million, in the air at a level similar to that during production. However, keeping the temperature and humidity level stable is important so that the machine does not start to rust. As for air compressors especially air dryers and filters we highly recommend that you change these components at shutdown so there will be no contamination or blockage of filters. If you have just recently replaced filters, then you may not need to change to new filters at the time of the shutdown process. The main goal here is to avoid letting your machinery be dormant with dirty filters in place, as this could adversely affect the general functioning of your machine.

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. Normally, when the fans in the factory are running, dust or contaminants are filtered. At Orientate, when a machine is on physical hold at the customer's request, we always cover it with plastic wrap to protect the machine and fragile components from contaminants. This simple step can save you from these problems at restart.

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.

Get support

In case you are not comfortable with restarting, or if you have any questions, please do not hesitate to contact your partner company. You may even be able to ask them to reboot with you, online, video or phone. This crisis is unprecedented. Many factors are out of your hands, such as the duration of a shutdown period. It is key to focus on what you actually can control. The approach to maintaining your machine, assembly lines, and manufacturing premises, is something you have the ability to actively manage.

Self-Check – 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What is shut down process? (5 points)
2. Write down steps to follow for proper shutdown? (5 points)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 3- Identifying and reporting maintenance requirements

3.1. Introduction

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 such as
- 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.
- Keep all guards and shields in place.
- Unplug and store tools after use.
- Consider keeping power tools locked up to prevent unauthorized use.

Table 3.1. 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.

There will usually be a routine schedule for particular tools that states how often maintenance checks have to be performed. These will also specify the checks that have to be performed. Some tools may require daily checks and maintenance after use. Other tools, such as power tools, usually must be checked once in 6 months or so. More complicated power tools would need to be serviced on a regular interval; refer to the operation manual.

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 3.2. 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	20-10-2020	Mr. B

Perform safe maintenance

Do 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:

Test the functionality of the tool

Replace all guards and safety devices

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

Self-check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Instruction: I Short answer questions

1. List at list five points in some tips on routine maintenance (5pts)

2. Define the two types of maintenance (5pts)

3. Define maintenance and write what maintenance may include (4pts)

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

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

LG #80	**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 product
- Handling frozen product
- Conducting work

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 product
- Handle frozen product
- Conduct work

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- identifying handling requirements for frozen product

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.

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. Each box and product should be inspected as it arrives. 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. In addition to your own inspection, all sushi-grade foods should come with documentation that the fish has remained frozen throughout its storage and transportation to you. Label and date all product as you place it into your freezer, so you can maintain 'first in, first out' procedures to serve the freshest food possible.

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 F or lower. All boxes and product should be stored in such a way for air to circulate throughout the freezer; boxes should never sit flat on the floor, but on a shelf or pallet so air can flow underneath. Also, be aware of how long products can stay frozen, and keep this in mind when ordering. 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.

Power Outages

Power outages can be costly if you store large amounts of frozen food, but with a little planning, the losses can be alleviated or even prevented altogether. The most important thing is to have written protocols all of your employees are familiar with to prevent panic-induced forgetfulness if a power outage ever occurs. Confirm you have accurately calibrated thermometers. Know a nearby source for dry or block ice. If you choose to use dry ice in an emergency, be sure you and your employees are trained on dry ice safety precautions. Keep the freezer doors closed as much as possible, and do not add hot food in an attempt to save it; this will rapidly raise the temperature of the entire freezer and could end up ruining all of the food in it. Once the power comes back on, discard anything that was at 40 degrees F for more than two hours. A good indicator for frozen foods is ice crystals; if the food still has ice crystals on it, it is generally safe to be refrozen.

Defrosting

There are several safe methods of defrosting to choose from, so you can pick the one that best suits your foodservice operation. The most recommended method of defrosting food is to move food to the refrigerator and let it slowly defrost to a refrigerated temperature. Make sure all thawing foods are placed on the lowest rack, so they do not drip water or juices on product below; this is particularly important when defrosting meat. Additionally, place an empty baking or steam pan below the items, so potentially germ-laden condensate doesn't get all over the floor of the refrigerator. Another defrosting method is cool water. Use running water at around 70 degrees F to envelope the food, slowly defrosting it. If you cannot use running water, the food can be submerged in water, as long as the water is changed every 30 minutes. Food can also be defrosted in the microwave, with the caveat that it must be cooked immediately afterward. Even on the ‘defrost’ setting on the microwave, food can become too warm or begin cooking, which can encourage bacteria growth if the food is not cooked quickly after being thawed. Many foods can

be thawed while they cook by adding about 50% to the normal cooking time. However, with this method it becomes even more important to ensure the food gets to the internal temperature required to kill bacteria for that item. That's because the longer cook time means more time in the temperature 'danger zone.

Temperature Logs

The best way to ensure all frozen foods are being handled properly is to keep a temperature log. This ensures accountability in the kitchen and can also be used as evidence in court, should a customer ever claim improper food handling caused an illness. Make sure all employees are trained to keep the temperature log up to date. The log should record freezer temperatures, checked at specified intervals, and should record defrosting methods and temperatures. If any food is left out too long or if anything goes wrong in the thawing process, record what corrective action was taken? This log can protect you and your employees, and is also a great tool to use in case of a power outage.

- **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 flavour 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).

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What are the methods for handling frozen product (5 point)
2. What are the factors we considered when handling frozen foods? (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2- Handling frozen product

2.1. Handling of frozen food

Exposure to elevated temperatures can be a serious contributing factor to quality loss in frozen foods. Generally, short periods of exposure are not serious, unless often repeated, but prolonged exposure can cause damage. However, for some particularly sensitive products, even a short exposure to temperatures warmer than 10-15 °F will result in marked loss in quality which will only become apparent after further storage.

Temperature fluctuations should be avoided because they will cause migration of moisture from the product or within the package causing formation of ice crystals and partial dehydration of the product. In general, the product temperature is more important than the air temperature. A change in air temperature for a short period may not affect the product temperature significantly.

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. Similarly, retail display equipment cannot be expected to remove significant heat from frozen foods. Therefore, it is imperative that frozen foods be at 0 °F (-18 °C), or colder, when they are loaded for transport or placed in retail cabinets.

Retail and institutional sized packages in standard shipping containers warm up rather rapidly when exposed to elevated temperatures and cool down slowly when placed in the ordinary still air of a storage room. For the duration of the warming up and the cooling down, quality losses are occurring even though the air temperature of the storage room is 0 °F (-18 °C). Large sized products, such as whole turkeys and bulk frozen food containers of 30 lbs. (13.6 kg) and over, warm up much more slowly.

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Write true if the statement is right and false if it is wrong (3 point each)

1. The most important thing to keep in mind when storing frozen foods is a constant temperature must be maintained
2. A good indicator for frozen foods is ice crystals; if the food still has ice crystals on it, it is generally safe to be refrozen
3. Power outages can be costly if you store large amounts of frozen food

Test II: Short Answer Questions

1. What are the steps you should follow as you receive frozen food, or even refrigerated food you will be storing in your freezer until you need it?(5 point)

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

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet 3- Conducting work

3.1. Conduct 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.

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

General Hazards Characteristics

The product contains sensitive ingredients, which can be assumed as potential sources of contamination under normal circumstances. The manufacturing process does not contain controlled processing steps that effectively destroy harmful bacteria. There is substantial potential for microbiological abuse in distribution or in consumer handling that could render the product harmful when consumed. Product is subject to contamination after processing and before packaging. No terminal heat process after packaging.

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 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What is the term of HACCP? (4 point)
2. What are the 7 principle of HACCP? (5 point)
3. Sanitation Standard Operating Procedures (SSOP) are components of GMP that emphasize sanitation procedure. They include (5 point)

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

Note: **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

Answer Sheet

Score = _____

Rating: _____

LG #81	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

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 signs and symptoms
- Take appropriate action

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Identifying signs and symptoms

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

It is critically important that workers are aware of 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

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Write at list three signs and symptoms of accident exposure (5 point)
2. What are the cause or result of accidents (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2- Taking appropriate action

2.1. Appropriate action to accident

2.1.1. 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 organisations conduct regular drills where staff practise responding to an emergency.

2.1.2. 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

2.1.3. Making emergency calls

To report an emergency you will need to know:

- a telephone number for the organisation
- the address of your workplace
- the nature of the emergency
- the nearest cross street to your workplace
- whether people are trapped or injured

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. What you will need to know during report an emergency? (5 point)
2. List where the immediate response carried out when emergency should be occurred (5 point)

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

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

Answer Sheet

Score = _____

Rating: _____

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