Coffee and Tea Processing Level-II

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Module Title: - Operating packaging process

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LG #39	LO 1- Prepare the equipment and process for operation

Instruction Sheet

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

- Confirming type of packaging components
- Identifying and confirming cleaning and maintenance requirements
- Fitting and adjusting machine components and related attachments
- Entering operating parameters
- Load or position Materials, product and packaging components/consumables
- Checking and adjusting equipment performance
- Carrying out pre-start checks

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:

- Confirm types of packaging components
- Identify and confirm cleaning and maintenance requirements
- Fit and adjust machine components and related attachments
- Enter operating parameters
- Load or position Materials, product and packaging components/consumables
- Check and adjust equipment performance
- Carry out pre-start checks

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).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” .
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1	Confirming Type of packaging components

1.1 Introduction

Packaging Is the process of enclosing roasted coffee (whole bean or ground) to protect it from sunlight, moisture, and oxygen, with the goal of preserving the coffee's taste and aromatic characteristics, and also to contain the coffee in controlled portions for ease of sale. Choosing your packaging might seem like a minor part of a roaster's job, but it will have a significant impact on your marketability, your sales, and your coffee freshness.

The tea and coffee manufacturers along with its production and quality are also focusing on the attractive packaging of the product in order to attract the consumers as there is wide competition in the market. In order to reduce the cost associated with recycling and logistics, the manufacturers are focusing on sustainable packaging material.

1.1.1 Materials to be packaged

- Different Green coffee bean
- Roasted bean
- Coffee powder
- Tea powder

1.1.2 Packaging components/consumables

Packaging component : means any individual assembled part of a package such as, but not limited to, any interior or exterior blocking, bracing, cushioning, weatherproofing, exterior strapping, coatings, closures, inks and labels.

1.1.3. Types of Packaging Materials

A. **Paper & Board**

Paper is widely used because it is low cost, holds its shape, and is easily decorated. Commercially-available paper is predominantly made from cellulose fiber from pulped wood, but can also be made from other sources such as cotton, straw, sisal and hemp. All are recyclable. Packaging produced using paper and board includes cartons, labels, leaflets, tubes, corrugated cases, rigid boxes and pulp packs.

Figure 1: paper packaging

B. Glass

Commercially-available glass is made from silica, sodium carbonate and calcium carbonate. Other compounds can be added to give colour, sparkle or heat shock resistance. Glass is a popular and useful packaging material because it is:

- Inert
- Sterilisable
- Barrier to moisture and gas
- Pressure resistant to a degree
- Can be molded into a variety of shapes
- Transparent making the product visible
- Glass is also highly recyclable.

Figure 2: coffee glass package

C. Metal

Tin-plate is tin-plated steel and the most common material used in food cans. Steel can also be used un-plated or with coatings. Aluminum is used for drinks cans, closures, trays, tubs and tubes. As foil it can be used in multi-laminate constructions or as a blister pack or container seal. Metal can be exploited to produce the following packaging characteristics:

- Strong and rigid
- Barrier to gas and moisture
- Pressure resistant
- Temperature and pressure resistant / tolerant
- Corrosion resistance via coatings
- Sterilisable
- Directly decorated or labeled
- The limitations of metal packaging are in weight and shapes achievable, especially when compared to plastics.

Figure 3: metal packaging

D. Plastic

Plastics: the most common packaging material and, at the same time, one of the most difficult to dispose. Plastics can be used as single materials or in combination. Their properties vary considerably but usually include:

- Lightweight
- Easily moldable into almost limitless shapes
- Can produce rigid containers or flexible films
- Can be impact resistant
- Directly decorated or labeled
- Heat sealable

- Common plastic polymers used in packaging

Polyethylene (PE) : Low Density (LDPE): used for flexible tubes, film and some bottles. It has a low melting point and as a film relatively poor oxygen and moisture barrier.

Polypropylene (PP): Widely used for closures for its ability to form a hinge which resists cracking and splitting. Also used for dispensers, actuators, bottles, jars, cartons, trays and as film on its own or within laminations e.g. crisp bags or pouches.

Polyethylene terephthalate (PET): Widely used for stretch blown bottles containing drinks, toiletries and food, it has excellent clarity.

Polyvinyl chloride (PVC): Not widely used even though only has a third of its content is derived from oil. It still has a strong presence in vacuum forming used for inserts, clam packs and blister packs, due to its good production line performance. PVC films have excellent stretch and cling properties for hand wrapping fresh produce.

- **one way valve packing bag**
  One way valve packing: allow air pressure to exit from inside the package while preventing air from entering. Because freshly roasted coffee beans release CO2, one-way degassing valves allow valves allow roasters to package their products immediately without worry of the coffee bag bursting

Figure 4 : one way packing bag

Figure 5: plastic packaging material

- **Aluminum foil packing**

Aluminum foil is an important material in laminates and has wide application in food packaging. Its barrier function against the migration of moisture, oxygen and other gases, and volatile aroma, as well as against the impact of light is generally higher than any plastic laminate material. Therefore, aluminum foil is used in the laminates when insufficient barrier properties are the limiting factor for shelf-life stability of food. The barrier properties of aluminum-coated plastic laminates, which can offer an alternative to aluminum foil laminates, are somewhat less efficient. The use of aluminum foil in rigid, semi-rigid, and flexible package for in-pack thermal processing allows the selection of package geometries that ensure rapid heating and minimum heat damage during processing. On the tightness of packages, the mechanical stability and quality of

sealing is of particular importance. The chemical stability of aluminum foil in contact with food depends on the composition of the food items. With present toxicological knowledge, the use of aluminum in packaging material is considered to be safe, and inner-coating of the foil is recommended in specific cases.

Figure 6: aluminum foil packaging

- **Aluminum can packing**

Aluminum can referred to as a " tin can ", is a single-use container for packaging made primarily of aluminum**.** It is commonly used for foods and drinks such as beer, baked beans and soup but also for products such as oil, chemicals, and other liquid

Tin cans are heavier than aluminum cans and are more durable. Tin cans are also highly resistant to the corrosive properties of acidic foods, like tomatoes. However, tin cans are less efficient for recycling than aluminum. The money saved from recycling aluminum rather than processing new aluminum is enough to pay to recycle and collect aluminum cans, and is enough to help cover the costs of recycling containers that are more difficult to process, such as plastic and glass.

Figure 7: tin can packaging

- **Blister Packaging Or Over Wrapping**

  Blister packaging is a form of plastic packaging that is used for small consumer goods and pharmaceuticals. It is mostly made from thermoformed plastics. Blister packs have a backing of paperboard, aluminum foil, or even other plastic sheets

  Blister packaging used: In blister packaging, a plastic sheet is thermoformed to form multiple cups or blisters that hold the product. Blister packaging is used in multiple areas

  Physical Properties: Blister packaging is made from different types of polymers, such as polyvinyl chloride(PVC), poly vinylidene chloride(PVDC), Poly chloro trifluoro ethylen(PCTFE),Cyclic olefin polymers(COP), and a few others.

Self-Check 1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the below:

Part 1: choose the best answer for the following question(3pt for each)

1. Aluminum foil is an important material in laminates and has wide application in food packaging why aluminum foil is more preferably for coffee packing**?**
   A. Its barrier function against the migration of moisture, oxygen
   B. Prevents other gases, and volatile aroma
   C. as against the impact of light
   D. important for shelf-life stability of food
   E. all are answer
2. what are Common plastic polymers used in packaging?
   A. Polypropylene (PP)
   B. Polyethylene(PE)
   C. Polyvinyl chloride(PVC)
   D. All

3. What are the packaging components

   A. bracing, cushioning
   B. Weatherproofing
   C. exterior strapping, coatings
   D. closures, inks and labels
   E. All answer

4. One of the following is not the purpose of plastic packaging material?

A. Lightweight
B. Easily moldable into almost limitless shapes
C. Strong and rigid
D. Can produce rigid containers or flexible films
E. Can be impact resistant

Note: Satisfactory rating - 12points **Unsatisfactory - below 10**

Points

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

Information Sheet 2	Identifying and confirming cleaning and maintenance requirements

2.1 Definition

Cleaning is the removal of all visible soil in an approved way with the use of mechanical and chemical action or both, so that all areas are cleaned and sanitized to a high standard. Cleaning is an investment in the assets of equipment and machinery.

Maintenance is the upkeep of all machines, equipment and fittings to an exacting standard within the property so that all areas look consistently new and pristine. Regular maintenance of equipment is an important and necessary activity.

The term 'maintenance' covers many activities, including inspection, testing, measurement, replacement and adjustment, and is carried out in all sectors and workplaces. It has a vital role to play in reducing the risk associated with some workplace hazards and providing safer and healthier working conditions.

2.1.1 Benefits of Machine Maintenance and Cleanliness

It is kept clean, lubricated and properly painted to prevent corrosion and deterioration from the elements. I spoke to the technicians about the way they take care of their equipment and they say this type of maintenance makes their jobs much easier and makes servicing the equipment fast and clean. (Their tools and hands stay cleaner and cleanup is faster!) Preventing rust and corrosion helps prevent the hold down bolts from sticking, allows the bases to last longer and minimizes cracking and crumbling of concrete foundations.

We see excessive rust, dirt and debris. The elements have been allowed to deteriorate and corrode the metals to the point where they are very difficult to work on. Services take longer due to excessive cleanup time required before performing any work. The life span of the equipment is greatly shortened and precision shaft alignment is challenging due to rusted hold down bolts and rust build up on the bases. Deteriorating concrete mounting pedestals also make shaft alignment very difficult as this can allow the equipment to move and flex under torque.

Taking a little time to keep the equipment clean and protected from the weather and element will show huge benefits, both in time savings and cost savings. Properly

maintained and cleaned equipment will definitely last much longer and servicing will be easier and faster.

Figure 8 : Cleaning equipment

2.2 Maintenance requirement

Maintenance requirement is one of the workplace activities that can affect health and safety not only of the workers directly involved, but also of other workers if safe procedures are not followed and the work is not done properly.

- Maintenance requirement include
- Replacement of parts,
- Testing and Measurement,
- Repair and Adjustment,
- Inspection and fault detection among other procedures
- Legislative requirements Food Standards Code, including labeling, weights and measures legislation. Legislation covering food safety, environmental management, OHS, anti-discrimination and equal opportunity. Under Standard 3.2.2 Food Safety Practices and General Requirements, food businesses must: only use packaging material that is fit for its intended purpose only use material that is not likely to cause food contamination

Ensure there is no likelihood that the food may become contaminated during the packaging process.

2.2.1 Types of maintenance

There are two types of maintenance:

Routine maintenance is planned and focuses on preventing future problems, while . Some common routine maintenance includes regular inspections or service work. These can be carried out on a time-based schedule or on a usage-based schedule. Typical examples of routine maintenance include:

- Lubricating, cleaning, or adjusting machinery
- Inspecting equipment to ensure proper operation and safety
- Replacing parts that show deterioration
- Checking, testing, and maintaining safety equipment, such as safety barriers, fire extinguishers, or alarm systems
- Checking for and replacing damaged signage or utilities, like light bulbs

General workplace maintenance, such as cleaning floors, and washing windows, trash removal, and landscaping

Advantages of routine maintenance

There are several advantages to performing routine maintenance at your facility.

Routine maintenance can decrease downtime and lengthen the lifespan of equipment when used in conjunction with a well-planned preventive maintenance program.

Regular routine maintenance can reduce the need for reactive maintenance.

Routine maintenance helps assets and equipment working in optimal conditions, leading to fewer failures, better productivity, higher profitability, and improved safety.

A corrective maintenance: is reactive and happens when equipment goes wrong and needs to be fixed. corrective maintenance (CM) involves the replacement or repair of equipment after it fails. In response to equipment failure, CM tasks identify the failure (it may be an equipment component or equipment item) and rectify the failure so that the equipment can be reinstated and the facility production restored.

2.3 **Maintenance requirement status**

- A non-operating condition, deliberately imposed, with adequate personnel to maintain and preserve installations, materiel, and facilities in such a condition that they may be readily restored to operable condition in a minimum time by the assignment of additional personnel and without extensive repair or overhaul.
- That condition of materiel that is in fact, or is administratively classified as, unserviceable, pending completion of required servicing or repairs.
- A condition of materiel readiness that reports the level of operational readiness for a piece of equipment.

Figure 9 : machine maintenance

Self-Check 2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the below:

Part 1: write short answer

1 Define maintenance requirement? (3 points)
2 Describe main purposes of maintenance requirement (6 points)
3 Describe its status of maintenance requirement**?** (6 points)

Note: Satisfactory rating - 15 points **Unsatisfactory - below 10**

Points

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

Information sheet 3	Fitting and adjusting machine components

3.1 **Definition**

Machine components: Are basic operating principles of process control, where relevant, including the relationship between control panels and systems and the physical equipment.

Adjusting means to change something slightly to make it fit, work better, or be more suitable.

Fitting is a part, especially one of a standard size or shape, that goes with a larger system. Fitting that is used to join two or more components together.

3.2 **Adjustment of Machine operation**

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.

1 **Check machine Safty :** Check and make sure the condition of packaging machine and there is no foreign matter on:

- The conveyer belt
- Working table and end sealing knives and there is no other person around the machine.

2 **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 3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the below

1. Describe machine components? (5pts)

2. Define adjusting and fitting? (5pts)

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

Points

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

Information sheet 4	Entering operating parameters

4.1 Definition

Operating parameters: are basic operating principles of equipment, such as main equipment components, status and purpose of guards, equipment operating capacities and applications, and the purpose and location of sensors and related feedback instrumentation.

Production requirement: is containing all the requirements to a certain product. It is written to allow people to understand what a product should do. A PRD should, however, generally avoid anticipating or defining how the product will do it in order to later allow interface product and production to use their expertise to provide the optimal solution to the requirements**.**

4.2. Process parameters/operating parameters

Critical packaging process parameters and normal operating ranges, including justification or reference for these ranges, are to be determined before validation and included in the packaging validation protocol. Some examples of critical process parameters range to be determined before operations may include: -

- Time
- Temperature
- Pressure
- Torque
- Speed
- Count quantity
- Fill Weight and Variation
- Inert atmosphere (liquid)

Environmental Humidity Steps using packaging equipment should be evaluated to determine which steps or pieces of equipment are considered critical. Examples of potential critical packaging steps/equipment systems such as –

- Reject systems (e.g. vision systems, weighing systems)
- Product and/or lot specific labeling systems
- Blister filling equipment
- Filling and capping equipment
- Induction seal units
- Tamper resistant packaging equipment
- Tablet and capsule feeding equipment
- Lot and bar coding equipment (both printing and reading of bar codes)

Self-Check – 4	Written test

Name…… ID…… Date…….

Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the below

Part I: write Short Answer for the Questions

1. Define production requirement and operating parameters? (5 points)

2. Writ some process parameter (5 pt.)

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

Information sheet 5	Load or position materials, product and packaging components

5.1 Introduction

Nowadays, coffee and tea agribusiness represents the largest commodity in the world. With increasing tendency, coffee beans are stored in silos instead of bags or big-bags. Several factors justify that tendency: cheaper and safer transport by container trucks, lower cost of containers for export shipment, less labor in handling, greater safety against fire, faster filling and discharge, and elimination of extra expenses due to values not aggregated to the product.

5.2 **packaging material and Product positioning**

Product positioning: is a marketing technique intended to present products in the best possible light to different target audiences. The method is related to "market segmentation" in that an early step in major marketing campaigns is to discover the core market most likely to buy a product or the bulk of the product. Positioning products including

- ground coffee
- roasted coffee and tea products

Positioning of packaging material: The purpose of this positioning is to determine the best material for coffee packaging to optimize the freshness of its contents and its ability to hold ink abrasion resistance and graphics to attract the consumer. Typical film materials that are position in to coffee packaging. Such as:

- Polyethylene terephthalate (PET),
- Polyvinyl Chloride (PVC,)
- Aluminium foil(Al),
- Polystyrene (PS,)
- Low density polyethylene (LDPE) and nylon

Self-Check – 5	Written test

Name…… ID…… Date…….

Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the below

Part I: write Short Answer for the Questions

1. Define product positioning? (5 points)

2. Mention the purposes of positioning of packaging material? (5 points)

3. Describe the types of materials used packaging coffee? (5 points)

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

Information sheet 6	Checking and adjusting equipment performance

6.1 Definition

Adjusting means to change something slightly to make it fit, work better, or be more suitable.

Checking means examining machine in order to determine its accuracy, quality and condition to detect the presence of machine.

Performance: Making the right thing

6.2 Checking equipment performance

Evaluation of performance of packaging machinery: Measure the packaging 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 and checking the equipment fault is occurred or not. In the packaging operation, a changeover is adjusting a machine to accommodate different products like roasted coffee, ground coffee and tea product.

6.3 Measurements of equipment performance

The performance of equipment are measured through their

- Capacity to pack the products
- Accuracy of packaging tools top pack
- Type of packaging materials and their respective cost
- Requirement of floor space
- Affordable and reliable solution
- High weight accuracy due to the use of the advanced weighing controller
- Quick external adjustments for different bag widths and lengths
- Cost saving due to low operation and maintenance costs

6.4 Typical Equipments performance checked

- **Conveyor system**

  A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in

applications involving the transport of heavy or bulky materials. Operational efficiency of systems is generally measured by key performance indicators (KPIs)

- **filling/dosing**

Filling machines or dosing machines are essential pieces of equipment used in food processing and packaging

Figure 10 : coffee bag filling machine dry powder coffee dosing

- Sealing: **s**ealing food in plastic bags with a vacuum sealer keeps **food** fresh for a much longer time and it also preserves the flavour of /coffee **food**.

Figure 11: sealing machine

- shrink wrappers : shrink wrap machine is referring to a machine used in heat shrink packaging that includes a sealer and heat source to apply heat to the shrink wrap.

Figure 12: auto shrink wrappers

- Thermo-Form Equipment

  Thermoforming is a general term that refers to the process of transforming a plastic sheet into a 3-dimensional shape by using heat, vacuum, and pressure

Figure 13 : Thermoforming

Other equipment performance check

- case packers
- ink jet coders
- labellers
- palletizes

6.5 Equipment performance consider the following points

- Availability
- Maintainability
- Reliability
- Level of the system
- Sub-system
- Components of the equipment and machinery

Self-Check 6	Written Test

Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the below

1 define adjusting and checking (5 points)

2. Describe equipment performance (5 points)

3. Mention the points that equipment performance consider? (5 points)

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15**

Points

Information sheet 7	Carrying out pre-start checks

7.1 Introduction

In a food industry, equipment pre-start checks important to safe the working environment. For example: machine and laboratory operation. So before we are going to operate machine/lab equipment we have to inspect /check whether it was in a good operating condition or not. Checking conditions of operating equipment has a vital role for the operator's safety, quality of a product and also for equipment safety.

7.2 Pre-operational safety checks

- Check workspaces and walkways to ensure no slip/trip hazards are present.
- Ensure all guards and safety shields are in position before starting the packer.
- Parameter setting (pressure, temperature, flow...)
- Analyze maintenance requirements
- Check those packers are running true and are not glazed or loaded.
- Locate and ensure you are familiar with the operation of the ON/OFF starter.
- Faulty equipment must not be used. Immediately report any suspect machine.

7.3 Benefits of Pre-Start Checklists

Pre-Start Checklist: equipment pre-start inspection, the operator uses a checklist to perform a standardized routine inspection prior to using the equipment. A pre-start checklist normally covers the exterior and interior condition of the equipment as well as operational aspects including mechanical and electrical systems, fluid levels and safety devices such as alarms, fire extinguishers and first-aid kits. The intent of a pre-start checklist inspection is to identify defects and safety hazards prior to operation.

Safety Benefits of Pre-Start Checklists

Pre-start checklist inspections help ensure equipment are safe to use. Safety benefits of equipment pre-start checklist inspections include:

- ✓ identification of faults and defects before equipment use
- ✓ decreased likelihood or severity of injury from catastrophic equipment failures
- ✓ well-maintained equipment in safe-operating condition
- ✓ a workplace culture of safety.

- Financial benefits of equipment pre-start checklist inspections include:

  - ✓ Reduced operating costs—minimizing risks and hazards decreases workplace injury associated costs
  - ✓ decreased repair costs—minor repairs are made so major repairs are avoided
  - ✓ reduced unplanned downtimes -equipment keep working
  - ✓ fewer costly on-road and off-site repairs for equipment that break down during operation
  - ✓ more on time deliveries for the logistics sector.

- The benefits of digital pre-start checklists include:

  - ✓ automated reporting and electronic tracking of maintenance and repair jobs
  - ✓ reduced paper and printing costs
  - ✓ increased validity with geo- and time-stamping
  - ✓ faster completion of pre-start checklist inspections and enhanced reporting capabilities through the addition of photos
  - ✓ no late, lost or illegible pre-start checklists
  - ✓ streamlined administrative processes to increase efficiency (compared to paper pre-start checklists).

✓

Table 1: pre-start checks report format

S.No.	Pre-start Check Point	Frequency of check					Signature	Remarks
		Daily	Weekly	Monthl	Half	Yearly		

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. What are the things in which the machine operators will be always have to check just before going to manipulate operations**? (5pts)**
2. What are the Causes of accidents while working with machinery?**(5pts)**
3. What are the dangerous parts of machinery? (5pts)

Operation sheet 1	Fitting and adjusting machine components

Operation tittle: Fitting and adjusting packaging components

Objective: To adjust packaging component

Procedure of Fitting and adjusting machine components

Step 1. Ensure cleanliness of machine and machine components by making use of hose, air guns, solvents, cloths, vacuum or other appliances

Step 2. Disassemble machines and take off parts for replacement or repair by using cranes, hoists, chain falls, hand tools and jacks

Step 3: Examine or carry out tasks on broken machine parts and identify defective parts for repair requirements.

Step 4: Replace, fix or realign machine parts and accessories in line with production specifications

Step 5: Application of adhesives, lubricants or other materials to machines or their parts as well as other Equipment in accordance with stated procedures

Step 6: Put machine parts together after accomplishing maintenance and repair work

Step 7: Take off hardened material from machines or machine parts by utilizing power and hand tools jack and sledge hammer, abrasive and other appliances.

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **2**hour. The project is expected from each student to do it.

Task-1: **Fit and adjust packaging machine components**

LG #32	LO 2- Operate and monitor the process

Instruction sheet

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

- Starting and operating the process
- Monitoring equipment
- Identifying variation in equipment operation
- Reporting maintenance requirements
- Monitoring the process
- Identifying, rectifying and reporting out-of-specification process outcomes
- Maintaining work area
- Conducting work
- Maintaining workplace records

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

- Starting and operating the process
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- Identifying variation in equipment operation
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- Monitoring the process
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6. If your performance is satisfactory proceed to the next learning guide,

Information Sheet 1	Starting and operating packaging process

1.1 Definition

The **Packaging** refers to all those activities related to designing, evaluating and producing the container for a product. Simply, the box-like container, wherein the product is stored to protect it from any physical damage and at the same time attracting the customer through its appeal is called as **packaging**

1.2 Functions of Food Packaging

The primary purpose of food packaging must continue to be maintaining the safety, wholesomeness, and quality of food. Historically, package design was a task centered on specifying, an often pre-conceived package, with the primary goal of achieving compatibility with the filling and sealing operations.

The four basic functions of a food package are:

- Containment (holding the product),
- Protection (quality, safety, freshness)
- Communication (graphics, labels)
- Convenience or utility of use

1.3 Food packaging techniques

A. **Primary package:** is the one which is in direct contact with the contained product. It provides the initial, and usually the major protective barrier.

Example: Metal cans, paper board cartons, glass bottles and plastic pouches, aerosol spray can, Beverage can, cushioning envelopes, plastic bottles, skin pack

Figure 14: primary packaging materials of coffee and tea

B. secondary package

Contains a number of primary packages. It is outside the primary packaging perhaps used to group primary packages together.

Examples: Corrugated case, Boxes

Figure 15: secondary packaging materials

C. **A tertiary package** is made up of a number of secondary packages. It is used for bulk handling.

Example being a stretch-wrapped pallet of corrugated cases.

Figure 16: tertiary packaging

D. A quaternary package is frequently used to facilitate the handling of tertiary packages.

This is generally a metal container up to 40 m in length which can be transferred to or from ships, trains, and flatbed trucks by giant cranes. Certain containers are also able to have their temperature, humidity and gas atmosphere controlled. This is necessary in particular situations such as the transportation of frozen foods, chilled meats and fresh fruits and vegetables

Figure 17: quaternary package

1.4. Types of packaging methods

1 vacuum packing

Vacuum packaging is removing air from the product pouch and hermetically sealing it. This increases storage or shelf life by inhibiting the growth of microorganisms and improves hygiene by reducing the danger of cross contamination. Common packaging solution for ground coffee is to pack it under vacuum and protects against dehydration and weight loss . The absence of any air helps delay most reactions and it keeps all the flavours within.

Advantages of vacuum packaging

- ✓ A simple solution to packaging goods requiring protection from oxygen
- ✓ Positive control of the moisture content of the produce
- ✓ Inhibits the growth of aerobic spoilage bacteria
- ✓ Lower costs than those of rigid containers
- ✓ Longer shelf life for goods

Figure 18 : vacuum packaging

2 Modified atmosphere packaging (MAP)

A MAP pack is a Modified Atmosphere Pack, in which the air is first pulled out of the pack. After this vacuuming process a pre-defined gas mix is added and the pack is sealed.

MAP is defined as 'the packaging of a perishable product in an atmosphere which has been modified so that its composition is other than that of air.' Storage of foods in a modified gaseous atmosphere can maintain quality and extend product shelf life, by slowing chemical and biochemical deteriorative reactions and by slowing (or in some instances preventing) the growth of spoilage organisms.

many specialty coffee roasters utilize MAP packaging in the form of ONE-WAY VALVES (pictured at left) that allow for the release of carbon dioxide from the coffee bag without letting any ambient environmental gases or contaminants in. This allows for packaging coffee beans at the height of their freshness, preserving the flavors and quality that consumer's desire.

Figure 19 : Modify atmospheric packaging

3 Blister Packaging Or Over Wrapping

Blister packaging is a form of plastic packaging that is used for small consumer goods and pharmaceuticals. It is mostly made from thermoformed plastics. Blister packs have a backing of paperboard, aluminum foil, or even other plastic sheets

Blister packaging used: In blister packaging, a plastic sheet is thermoformed to form multiple cups or blisters that hold the product. Blister packaging is used in multiple areas

Figure 20 : blister machine

4 Aseptic Package Materials

The term **aseptic** implies the absence or exclusion of any unwanted organisms from the product, package or other specific areas, while the term hermetic (strictly airtight) is used to indicate suitable mechanical properties to exclude the entrance of micro-organisms into a package and gas or water vapor into (or from) the package. Plastics are the most common material used for aseptic packaging Glass, metal, etc.

1.5 **LABELS**: Coffee Labels. Make an impact with high-quality labels for your handmade coffee products. No Minimum Orders. No matter the quantity, we can meet your needs. We carry thousands of our standard label configurations in stock,

offering the internet's largest selection of ready-to-ship blank labels on sheets and rolls

- **Labeling Requirements**

The requirements that a food label must meet in international trade are defined in a series of codex standards on food labeling. This is of particular importance for those companies intending for those intending to export their products. For local markets the labels must conform to the food legislation. In summary the general labeling requirements are:

- The name of the food
- List of ingredients
- Quantitative ingredients declaration (where indicated)
- Net contents and drained weights
- Name and address
- The country of origin
- Lot identification
- Date marking and storage instructions
- Instructions for use and special storage requirement
- General script
- Nutrition labeling

1.6 Storage

The made black tea (MBT) **must** be stored in protective containers to ensure no additional moisture pick up before bulking and/or packing. Storage containers when used should be constructed of materials which are of approved food grade (not wood) and **must** have protective covers. The clean ability of the containers **must** be ensured. All the storage containers **must** be labeled and identified.

1.7 Workplace safety procedures and instructions

Safe work practices are generally written methods that define how tasks are performed while minimizing risks to people, packaging equipment, packaging materials, environment, and packaging processes. Safe Work Procedures are documented procedures for performing tasks.

1.8 Workplace safety procedures and instructions

Handling chemicals – these involves procedures on how to handle chemicals in workplace where these are used.

Lifting and moving objects – are procedures that pertain to how objects are to be lifted and moved safely and without strain to the person or worker.

Working at heights – these are procedures that underscore what a worker must observe to keep himself safe while working in an elevated structure or environment.

Slips, trips and falls – are procedures that pertain to safety procedures that should be in place to prevent slips, trips and fall accidents in the workplace.

Housekeeping – are procedures that pertain to how housekeeping activities should be done while keeping in mind safety, health and well-being of workers in a facility or workplace.

Electrical equipment – these are safety procedures that pertain to the installation, repair and maintenance of electrical equipment.

Self-Check – 1	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions

1. Define packaging? (5 points)
2. Explain functions of packaging? (4 points)
3. Write general labeling requirements? (5 points)
4. Explain types of packaging methods?(8 pt.)
5. Mention some printed information on the labeler?

Note: **Satisfactory rating – >20 points** **Unsatisfactory - below 15 points**

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

Information Sheet 2	Monitoring equipment

2.1 Definition

Monitoring - is a systematic process of observing, tracking, and recording activities or data for the purpose of measuring program or project implementation and its progress towards achieving objectives. Information gathered through monitoring is used to analyze, evaluate the all of the components of a project or a department in

2.2 Packaging Machineries and Automation Systems

Food processors use a variety of machines for different production lines and for various food types. Several machine types are integrated into a single packaging line. Some of the machine types are wrapping, labeling, shrinking, sealing, case and tray forming, capping, and drying, feeding, palletizing, picking and placing (robotic systems), cleaning and sterilizing, in addition to inspection and detecting machines. According to the Organization for Machine Automation and Control (OMAC), the number of packaging machine types employed in a packaging line ranges from two to ten. Order to measure its effectiveness and adjust inputs where necessary

Types of Variation

Common cause variation happens in standard operating conditions. Think about the factory we mentioned before. Fluctuations might occur due to:

- temperature
- humidity
- metal quality
- machine wear and tea
- one of the machines broke down.
- a worker forgot the process and made a lot of unusual mistakes.

Benefits of a Condition Based Maintenance strategy

Condition monitoring is a central part of a condition based maintenance strategy. A well-orchestrated condition monitoring system is an opportunity for continuous improvement, and the impacts can be dramatic. A condition monitoring system enhances safe

operation, preserves assets and minimizes environmental impact. Integrated operations enable global collaboration between offshore and onshore activities. Extending time between equipment surveys and overhauls, and reducing unplanned downtime cuts maintenance and operating costs.

Basing maintenance activities on actual condition rather than on a predetermined time schedule can progress maintenance work to a new level of efficiency. Fewer maintenance induced damages and failures results in improved equipment availability and more efficient operation for longer periods of time. Faster and more confident maintenance decisions and a significant reduction in work orders is a motivating factor for the maintenance crew. With advance warning of machine failures, unexpected breakdowns can be substituted with planned repairs, allowing more time to be spent identifying areas for further improvement in terms of machine performance, energy efficiency or output.

Benefits include:

- Increased uptime/reduced downtime
- Reduction/elimination of unplanned failures
- Reduced overall maintenance costs. Equipment condition monitoring of increasing importance .Equipment condition monitoring is proving to be of incredible use in maintaining operations and eliminating accidental incidents. Equipment condition monitoring is proving to be of incredible use in maintaining operations and eliminating accidental incidents. Those companies that are heavily invested in energy-providing fuels need to make absolutely certain that nothing has a chance to go wrong.

Self-Check –2	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 the typical equipment for coffee packaging? (4 points)
2. List down the importance of monitoring in operation condition (4 points)
3. Define monitoring?(2 pt.)
4. Write Common cause variation during packaging operating condition?(5 pt.)

Note: **Satisfactory rating – 13 points** **Unsatisfactory - below 10**

Information sheet 3	Identifying variation in equipment operation

3.1 Techniques of identifying equipment variations

- 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

3.2 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 seven 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.

2.3 Factors to Consider materials variation in Coffee Packaging operation

Bag style

Flat Bottom Bag: The **flat bottom coffee bag** is one of the most popular in the industry. Often the top of the bag is folded over or completely down into a brick shape and sealed.

Quad Seal Bag: A **quad seal bag** is also very popular in the coffee industry. This bag type holds its shape very well and can support heavier fills of coffee. The quad seal bag usually is more costly than other bag styles

Pillow Bag: The most economical and simplistic bag type, the **pillow bag** is often used for fractional, single-serve coffee packaging formats. This bag style lays flat for display purposes. The pillow bag is by far the least costly to produce.

Bag-in-Bag (BIB): Fractional packs of coffee can be packaged **bag-in-bag** into a larger package for foodservice or bulk sale purposes. Modern equipment can form, fill, and seal the smaller franc packs and subsequently package those into a larger outer wrap on one machine.

Doypack: With a flat top and a rounded, oval-shaped bottom, the **Doypack** differentiates itself from more typical coffee package types. It gives the consumer an impression of quality. This bag style usually costs more than other more simple bag types and often requires premade pouch filling equipment.

Self-Check –3	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 Factors to Consider materials variation in Coffee Packaging operation(5*points)*
2. What are the techniques used in identifying equipment variations? (5 pts)
3. Mention some techniques of identifying equipment variations? (5 points)

Note: **Satisfactory rating – 13 points** **Unsatisfactory - below 10**

Information sheet 4	Reporting maintenance requirements

5.1 Equipment maintenance requirements

- **Fans & Motors**
  - ✓ Belts should be check for tightness and wear every three months and replace as necessary.
  - ✓ Exhaust fan(s) should be cleaned annually
  - ✓ Fan bearings should be lubricated every six months with Lithium-base grease.

Note: do not over grease as damage to bearings will result

- **Exhaust System**

The exhaust ducts, exhaust fan blades, and exhaust discharge point(s) should be inspect annually for residue build-up and clean as necessary.

- **Fire suppression system**

All fire sprinkler heads should be inspect and clean on a regular basis to prevent residue build-up, thus ensuring proper performance.

- **Controls & Heat Systems**

Electrical connections and motor load currents should be checked annually. If your booth has heated air make-up, you need to have the furnace serviced, cleaned, and re-tuned annually.

5.2 Types of maintenance

- Basically there are 5 types of maintenance have been distinguished, which are differentiated by the nature of the tasks that they include:
- Corrective maintenance: The set of tasks is destined to correct the defects to be found in the different equipment and that are communicated to the maintenance department by users of the same equipment.
- Preventive Maintenance: Its mission is to maintain a level of certain service on equipment, programming the interventions of their vulnerabilities in the most opportune time. It is used to be a systematic character, that is, the equipment is inspected even if it has not given any symptoms of having a problem.

- Predictive Maintenance: It pursues constantly know and report the status and operational capacity of the installations by knowing the values of certain variables, which represent such state and operational ability. To apply this maintenance, it is necessary to identify physical variables (temperature, vibration, power consumption, etc.)..
- Zero Hours Maintenance (Overhaul): The set of tasks whose goal is to review the equipment at scheduled intervals before appearing any failure, either when the reliability of the equipment has decreased considerably so it is risky to make forecasts of production capacity .
- Periodic maintenance (Time Based Maintenance TBM): the basic maintenance of equipment made by the users of it. It consists of a series of elementary tasks (data collections, visual inspections, cleaning, lubrication, retightening screws…) for which no extensive training is necessary, but perhaps only a brief training. This type of maintenance is the based on TPM (Total Productive Maintenance).

5.3 Maintenance reporting requirements

Table 2: Equipment Breakdown Maintenance report format

S.No.	Name / Code No. of the Machine / Equipment	Location	Nature of Breakdown	Details of repairs carried out	Breakdown Period	Work Done by	Remarks

Table 3: preventive maintenance requirement report format

S.No.	Maintenance Check Point	Frequency of check					Signature	Remarks
		Daily	Weekly	Monthl	Half	Yearly		

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. Explain types of maintenance ? (5 points)
2. Which parts of equipment is required maintenance?(5pt.)

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

Information sheet 5	Monitoring the process

5.1 Introduction

Many packaging machines - from overflow fillers, nitrogen purge machines and container cleaning equipment - will use a touch-screen operator interface to allow the users of the equipment to quickly and easily prepare a certain bottle or container for production. Other packaging machines, such as spindle cappers and even power conveyors, require simple adjustments to fingertip knobs or simple handles to make quick adjustments. However, on the panels for almost every packaging machine some common non-touch screen controls exist for safety and ease of operation.

5.2 Operation of equipment and processes control panels

Component controls: Packaging machines will often include component controls on the control panel that are include

- to a given machine or type of machine
- Rinsing machines
- filling equipment and capping equipment
- a power height control on the control panel. This simply control allows rinse heads
- fill heads or capping heads to be raised or lowered by the simple turn of a switch.
- a component control is the pump speed on certain filling machines. A simple dial will allow an operator to increase or decrease pump speed on a number of different fillers, allowing a quick and easy adjustment to different fills. The component controls found on any packaging machine control box will depend on the specific application being run.
- control box is simply to centralize control of the packaging line. Allowing controls for multiple machines and components to exist on one control panel adds efficiency to the line and the operator performance. also include specific controls to optimize the performance of the equipment.

5.3 Performance control chart

A control chart is one of many process improvement techniques. It is not the answer to all your problems. Nor should a control chart be used alone. There are always other process improvement tools that should be used along with control charts.

A control chart is used to monitor a process variable over time. That variable can be in any type of company or organization - service, manufacturing, non-profit and, yes, healthcare. It provides a picture of the process variable over time and tells you the type of variation you are dealing with as you move forward with continuous improvement. This understanding of variation is the key to using control charts effectively.

What Does a Control Chart Look Like?

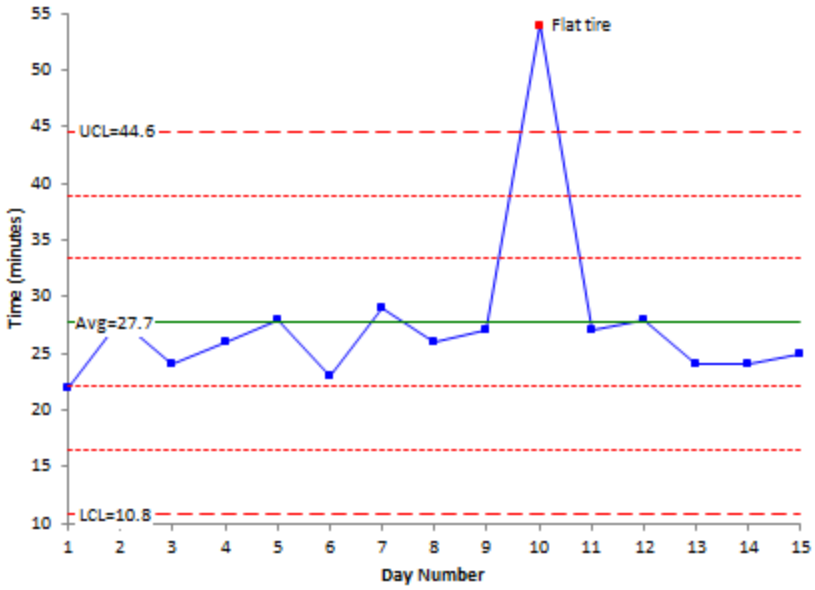

Fig 5. performance Control chart

This process is essentially in statistical control. You found the reason for the out of control point and recalculated the control limits. The control chart now tells you the average of the process and the spread in the data. The average time it takes to get to work is 27.7 minutes. And as long as the process stays in control, that time will vary from about 10 minutes to 44.6 minutes - and it is all due to the normal variation in the process.

5.4 Importance of control charts

- The control chart identifies the special cause's
- The control chart tells you when you should not take corrective action
- The control chart shows how much the defects are costing
- The control chart shows who is responsible for the defects

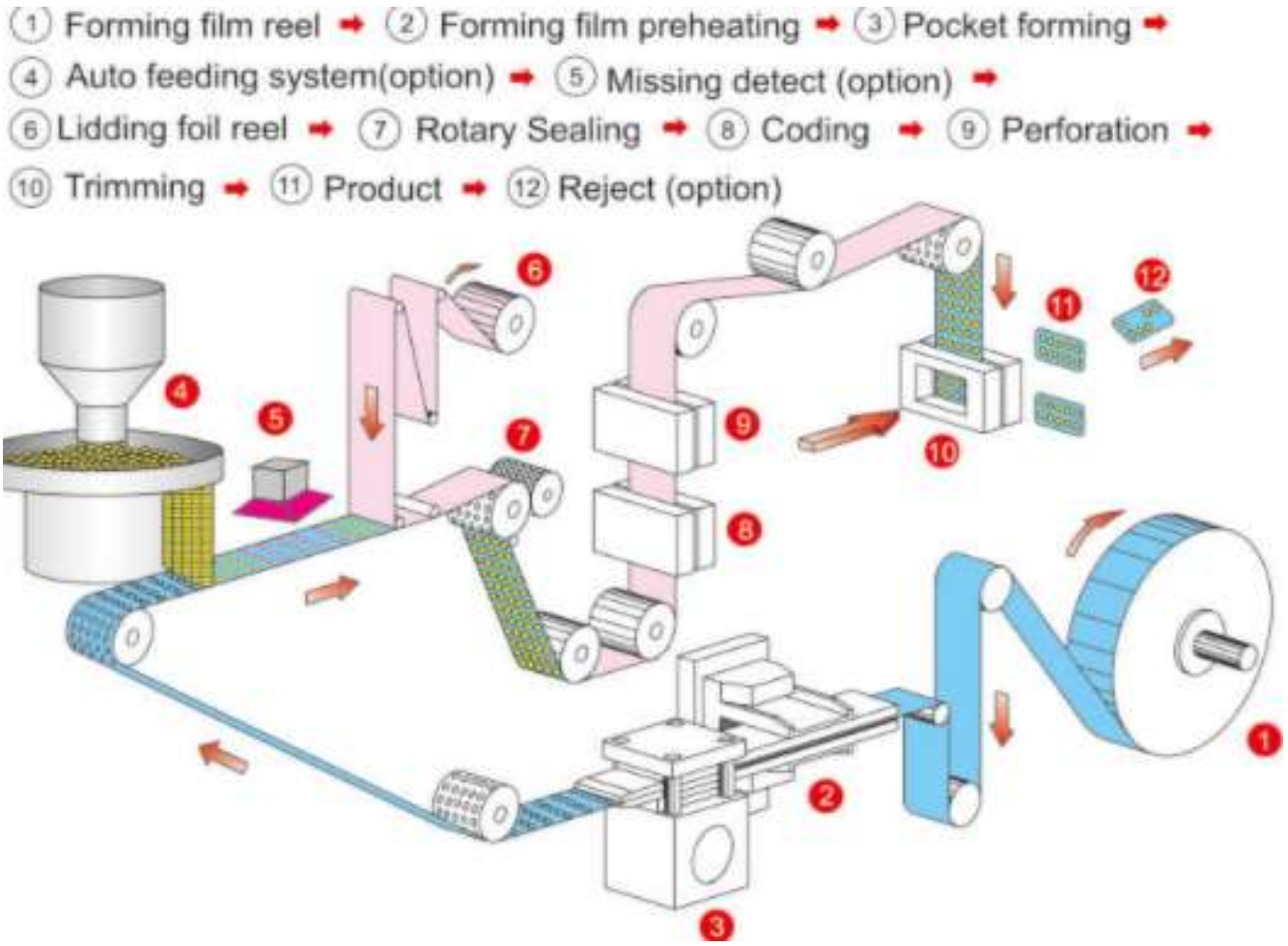

Figure 5: Blister Packaging Process conterol

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. which Component controls and monitoring during packaging process ?(5pt.)
2. write purpose of monitoring the packaging process(5pt.)
3. Write the importance of control charts?(5pt)

Note: **Satisfactory rating - 13 points** **Unsatisfactory - below 10 points**
You can ask you teacher for the copy of the correct answers.

Information sheet 6	Identifying, rectifying and reporting out-of-specification process outcomes

6.1 Introduction

Out of specification out comes

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.

6.2 Factors affecting coffee packaging

❖ Packaging materials

Packing is best for freshly roasted coffee: used plastic re-usable bags and lined paper bags, both of which better preserve the freshness of the coffee but which are not so good for the environment. but

- Unlined paper on opening the bag, the aroma is not strong. On tasting, these beans gave the smoothest taste and still tasted rich and fresh, however they lacked some of the brightness and fruitier notes compared to the valve bag and rest period bag.
- Lined paper bag with a one-way valve: retaining the fruity notes of the bean. It also had a buttery flavour to the finish. This could be an anomaly or a result of being in the valve bag.

- Lined paper bag without a valve: keeping the beans in a bag with no outlet for the natural gases to escape would preserve the flavour of the beans best, and indeed they did have the richest aroma on opening, however these beans were noticeably stale and flat in taste and had a much flatter crema than the other beans. The coffee had none of the richness or fruity. It basically tasted like brown water.
- Whole bean coffee or freshly-ground coffee is typically packaged in valve-sealed bags or vacuum-sealed bags, instant coffee is often packaged in vacuum zed sealed jars, cans, or other airtight packaging. but the packaging materials out of air tight affect the coffee product.

- **Types of raw materials**

Green coffee beans are graded according to certain criteria, such as shape, size, uniformity of the beans, color, horniness, husk, cut, gloss, smoothness of the beans, proportion of defective beans, foreign matter and odor

The color of the beans must exhibit a greenish to deep green and fresh background hue and varies depending on variety and origin (top varieties from Central America: strong green to gray-blue, other varieties: light yellow to light green).

In addition, the proportion of defective beans and foreign matter constitutes an important criterion in the quality grading of coffee. Thus, the highest quality green coffee is sorted (previously hand-sorted, now sorted by machine) and contains only a few defective beans. Foreign matter, such as sticks, stones and leaf residues, has been almost completely removed, while medium quality green coffee still contains a considerable proportion of defective beans and foreign matter.

- **Methods of coffee packaging**

Whole bean coffee or freshly-ground coffee is typically packaged in valve-sealed bags or vacuum-sealed bags more preferred method.

6.3 Rectifying out-of-specification process outcomes

At its core, problem solving is a methodical four-step process. You may even recall these steps from when you were first introduced to the Scientific Method.

- First, you must **define** out-of-specification process outcomes. What is its cause? What are the signs there's a problem at all?
- Next, you **identify various options** for solutions. What are some good ideas to solve this?
- Then, **evaluate your options** and choose from among them. What is the best option to solve the problem? What's the easiest option? How should you prioritize?
- Finally, **implement the chosen solution**. Does it solve out-of-specification process outcomes? Is there another option you need to try?

Self-Check 6	Written test

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

Part 1: write short answer

1. Which packaging materials preferable for the quality of coffee during packaging?(5)
2. which packaging methods baste for coffee and tea packaging?(5)
3. Describe Steps of rectifying out-of-specification process outcomes? (5 points)

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15**

Information sheet 7	Maintaining work area

7.1 Introduction

Housekeeping is crucial to safe workplaces. It can help prevent injuries and improve productivity and morale, as well as make a good first impression on visitors

7.2 Access

Consideration should be given to the ability of a person to access the amenities and facilities. The means of access to the facility or amenities should be safe and accessible for all persons who require access.

7.3 Maintenance

The work environment, facilities and amenities are required to be maintained in a safe and healthy condition, and need to be hygienic, secure and in a serviceable condition. This includes replenishment of consumables, repair of broken or damaged furnishings and equipment and ensuing cleanliness of these areas.

7.4 Work Layout

The layout of the workplace is required to allow persons to enter and exit the workplace and move within safely, both under normal work conditions and in an emergence

7.4.1 Entry and Exit

Entries and exits are required to be safe to allow impeded access and egress for all workers, students and visitors including those with special needs.

In particular:

- Entries and exits should be slip resistant under wet and dry conditions
- Any walkways, boundaries or pathways shall be marked with 50mm wide with a contrasting color e.g. white or yellow
- Open sides of staircases should be guarded with an upper rail at 900mm or higher and a lower rail
- Handrail should be provided on or at least one side of every staircase
- Separate entry and exits for mobile equipment e.g. forklifts or trucks, and pedestrians are to be provided

- Power operated doors and gates should have safety features to prevent people from being stuck or trapped.
- Location of exits should be clearly marked and signs posted to show direction of exit doors to aid emergency evacuation.

7.5 Work Areas

The layout of the work area should be designed to provide sufficient clear space between machines, fixtures and fittings so workers can move freely without strain or injury also evacuate quickly in case of an emergency.

In determining how much space is required, the following should be considered:

- The physical actions needed to perform the task
- The need to move around while working
- Whether the task is to be performed from a sitting or standing position
- Access to workstations
- The equipment to be handled and the personal protective equipment that may be worn to perform the work.
- Environmental factors including heat or noise may require an increase to the space, as will work activities that involve manual tasks or the use of equipment.

7.6 Floors and Other Surfaces

Floor surfaces shall be suitable for the work area and be chosen based on the type of work being carried out at the workplace, as well as the materials used during the work process, the likelihood of spills and other contaminants, including dust, chemicals, and the need for cleaning.

In general:

- Floors shall be free from slip or trip hazards e.g. cables, uneven edges, broken surfaces
- Floor surfaces shall have sufficient grip to prevent slipping, especially in areas that may become wet or contaminated
- Anti-fatigue matting, carpet, shock absorbent underlay, cushion backed vinyl shall be provided for workers where static standing occurs
- Carpet shall be properly laid without loose edges or ripples and should be well maintained
- Floors should be strong enough to support loads placed on them.

7.7 Workstations

Workstations should be designed so workers are comfortable undertaking their task and allow for a combination of sit and standing tasks.

For tasks undertaken in a seated position, workers should be provided with seating that:

- Provides good body support, especially for the lower back
- Provides foot support, preferable with both feet flat on the floor, otherwise a footrest shall be provided
- Allows adequate space for leg clearance and freedom of movement
- Is fully adjustable to accommodate different size workers (e.g. seat height, back rest height and back rest tilt adjustments) and should not tip or slip utilizing a five-point-base
- Chairs shall be fitted with castors for carpeted surfaces and glides or braked castors on hard surfaces.

7.8 Lighting

Sufficient lighting is required to allow safe movement around the workplace and to allow workers to perform their job without having to adopt awkward postures or strain their eyes to see.

Emergency lighting is to be provided for the safe evacuation of people in the event of an emergency.

The following factors are to be taken into account:

- The nature of the work activity
- The nature of hazards and risks in the workplace
- The work environment
- Illumination levels, including both natural and artificial light
- The transition of natural light over the day
- Glare Workplace Environment Guidelines
- Contrast
- Reflections.

7.9 Air Quality

Workplace are to be adequately ventilated which includes provision of fresh, clean air drawn from outside the workplace, uncontaminated from flues or other outlets and be circulated through the workplace.

Workplace inside buildings may have natural ventilation, mechanical ventilation or air conditioning.

An air-conditioning system should:

- Provide a comfortable environment in relation to air temperature, humidity and air movement
- Prevent the excessive accumulation of odours.
- Reduce the levels of respiratory by-products, especially carbon dioxide, and other indoor contaminants that may arise from work activities
- Supply an amount of fresh air to the workplace, exhaust some of the stale air as well as filter and recirculate some of the indoor air.

7.10 Heat and Cold

Refer to the Thermal Comfort Guidelines for further information on managing health and safety risks associated to hot and cold environments

7.11 Welfare Facilities

Workers, including those who have particular needs or disabilities, must have access to the facilities provided.

Workers are to be provided with:

- Adequate breaks to use the facilities
- Facilities which are within a reasonable distance from the work area
- Shift workers have similar access to those who work during the day
- A means of access which is safe.

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. Mention welfare facilities should be fulfilled in the work area? (5 points)
2. What are the requirements a person should ensure during conducting work in accordance with workplace guideline? (6pts)
3. Write at list five items that a work environment, facilities and amenities are provided for basic health and welfare of employees, contractors and visitors? (5pts)

Note: **Satisfactory rating - 16 points** **Unsatisfactory - below 16 points**

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

Information sheet 8	Conducting work

8.1. Workplace environmental guidelines include:

- Minimization of waste, through implementation of the waste management hierarchy
- Efficient and effective use of energy and other resources
- seeking alternative sources of energy
- efficient use of materials and appropriate disposal of waste
- use of controls to minimize the risk of environmental damage from hazardous substances
- reducing emissions

8.2. Benefits of Waste Minimization

waste minimization supports sound business and economic practices in addition to protecting the environment, other benefits include the following:

- Improved product quality – New technological practices and innovation will not only reduce generation of waste but also contribute to improved input quality that translates to improved products.
- Economic benefits – Efficiency in product use translates to reduced costs when purchasing materials thus significantly affecting financial performance.
- Efficiency of production practices – Waste minimization will attain more output of the product for every part of raw material.
- Environmental responsibility – eliminating or minimizing generation of waste will make it easy for you to achieve environmental policies, standards and regulations.
- Public image – Embracing waste minimization will boost the reputation of your company, as it is a reflection of proactive movement in the quest to protect the environment.

8.3. Waste Minimization Techniques

- Optimization of resources

  In order to reduce the quantity of waste that is produced by individuals or organizations calls for the optimization of raw materials used in production. For instance, a dressmaker will do well to arrange the pieces of pattern in a certain way along the length of the fabric to use a small portion of the fabric.

- Scrap metal reuse

  Incorporating scraps into the initial stages of manufacturing is a surefire way of ensuring that they do not end up in landfills as waste products. A majority of industries embrace this process effectively returning rolls that are damaged to the initial production line and in the manufacturing of off cuts, plastic items so that scrap is re-incorporated in the new commodities.

- Quality control improvement and process monitoring

  Measures can be put in place to control the number of rejects and ensure it is at a minimum. This may be achieved through increased frequency of inspection as well as increasing the number of inspection points. For instance, installation of continuous monitoring device that is automated will help in identifying production problems before they get to an advanced stage.

- Exchange of Waste

  Here, the waste products from one process are used as raw materials for other processes. Exchange of waste is another means of minimizing waste disposal volumes especially for waste that may not be eliminated.

- Shipping to the point of use

  Here, raw materials as well as other components are directly delivered at the point of assembly or manufacturing plant ostensibly to minimize handling and use of enclosures and protective wrappings.

- Zero waste

  This systems approach is designed to eliminate waste from the source as well as at every point the supply chain to ensure that no waste is produced

Self-Check – 8	Written test

Name…… ID…… Date…….

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

Part 1: write short answer

1. Explain Benefits of Waste Minimization? (5 points)

2. Mention Waste Minimization Techniques? (5 points)

3. Write at least 3 points of workplace environmental guidelines? (5point)

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

Information sheet 9	Maintaining workplace records

9.1 Record Keeping Systems

There are certain written records or kinds of documentation that are needed in order to verify that the system is working. These records will normally involve the Implementing Hazard Analysis and Critical Control Point (HACCP) plan itself and any monitoring, corrective action, or calibration records produced in the operation of the Hazard Analysis and Critical Control Point (HACCP) system. Verification records may also be included. Records maintained in a HACCP system serve to document that an ongoing, effective system is in place. Record keeping should be as simple as possible in order to make it more likely that employees will have the time to keep the records.

9.2 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
- Procedures for verification of the HACCP plan
- Production process
- Variation of results
- Helps identify the strengths and weaknesses in your coffee packaging process
- helps manage changes and improvements in your packaging process

9.3 Types of workplace maintenance records include:

- Standard Operating Procedures (SOPs) - are a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations.
- A specification- is exact statement of the particular need to be satisfied, or essential characteristics that customer requires(in a good, material, methods, process, service ,or work)
- production schedules and instructions -Production Scheduling is the allocation of raw materials, resources, and processes to produce products for customers.
- The purpose of production scheduling is to make manufacturing process flow with maximum efficiency, by balancing the production needs with your available resources in the most cost-effective manner.
- manufacturers' advice
- standard forms and reports

Self-Check – 9	Written test

Name…… ID……. Date…….

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

Part I: Short Answer Questions

1 Makeup hazard analysis and critical control point plan includes? (5 points)

2 Write the importance of recording? (5 points)

3 What is SOPs? (5 points)

4 Write types of workplace maintenance records? (5 points)

Note: **Satisfactory rating – 20 points** **Unsatisfactory - below 18 points**

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

LG #33	LO 3- Shut down the process

Instruction sheet

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

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

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

- Identify shutdown procedures
- Shutdown the process
- Identify and report maintenance requirement

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).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go

back to “Operation sheets”.

Information sheet 1	Identifying shutdown procedure

1.1 Introduction

Lock-out procedures work safe regulations require that all powered machinery or equipment shut down for maintenance or repair must be secured against the possibility of the equipment being accidentally turned on while being worked on. To safeguard the person working on such equipment, lock-out procedures must be posted near the equipment, and the procedures listed must be followed before repairs or maintenance can start. Locking out a machine usually means the power feeding the machine is disconnected either by pulling a plug, placing a switch in the off position, or turning a circuit breaker to the off position. The disconnected circuit is then secured in the inoperative position by the use of a padlock. The person doing the maintenance or repair keeps the key to this lock until the work on the machine has been completed. The worker then removes the lock and the machine is again operable.

1.2 The types of shutdowns

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

1.2.1 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.

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

1.2.2 Maintenance shutdown

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

- Isolated (process, mechanical and electrical)
- Cooled and depressurized
- Purged and gas freed
- Cleaned
- Gas tested on a continuous basis prior to and during entry.

A planned unit shutdown will prevent:

- Plugging of lines or equipment
- Possible damage to equipment
- Possible injury.

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

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

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.

1.2.3 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.

1.2.4 Trips

Shutdown of a unit can be initiated by the automatic shutdown system. The systems may be shut down automatically because of temperatures, fluid levels, pressures or flows that are above or below trip points. Typical shutdowns initiated by trips may include:

- Low liquid level in a vessel
- High liquid level in a storage tank
- High viscosity causing increased load on pumping or mixing equipment
- Mixer failure
- Pressure to high
- Temperature to high
- Low feed flows

1.2.5 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 spec 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. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is shut down process? (5 points)
2. Write down steps of shutdown? (5 points)
3. Explain emergency shut down?(5pt.)
4. Write steps taken in unit shut down of schedule shut down? (5 points)

Note: **Satisfactory rating - 20 points** **Unsatisfactory - below 15 points**

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

Information sheet 2	shut down process

2.1 Shutting down the process

To safeguard the person working on such equipment, lock-out procedures must be posted near the equipment, and the procedures listed must be followed before repairs or maintenance can start. Locking out a machine usually means the power feeding the machine is disconnected either by pulling a plug, placing a switch in the off position, or turning a circuit breaker to the off position. The disconnected circuit is then secured in the inoperative position by the use of a padlock.

2.2 workplace procedures

In the work place to control hazardous energy, you must prevent it from being transmitted from its source to the equipment that it powers. You can accomplish that by doing the following.

- **Identifying energy sources and energy**

isolating devices Identify equipment in your workplace that needs service or maintenance. Determine the types of energy (there may be more than one) that powers the equipment, including potential energy that may remain when the energy sources are disconnected.

- **De-energizing equipment**

Turn off or shut down equipment following established procedures. Stop buttons and on/off switches are used to shut down equipment, not to separate the equipment from its energy sources. The method you use to de-energize equipment depends on the types of energy and the means to control it. After the equipment has been shut down, engage the equipment's energy-isolating devices, physically separating the equipment from the energy. For compressed air, this could mean closing a specific manually operated valve. For an electric motor, this could mean opening a manually operated circuit breaker.

Energy-isolating devices can be:

- Disconnect switches (main)
- Line valves

- Manually operated
- electrical circuit breakers
- Bolted blank flanges
- Bolted slip blinds
- Safety blocks
- Any similar device used to block or isolate energy

Figure 32: energy isolating device

- **Secure energy-isolating devices in a safe position**

When equipment has been shut down, then de-energized using an energy isolating device, nothing will prevent the energy-isolating device from accidently (or intentionally) being turned on, reopened, or reactivated until it is secured.

Locking out, also known as lockout (LO), is a procedure for physically securing energy-isolating devices in an off, closed, or neutral position. A lockout device typically a lock with a unique key secures the energy-isolating device in a safe position. When an energy-isolating device is secured by a lockout device, it physically prevents the energy-isolating device from being manipulated.

Tagging out, also known as tagout (TO), when performed correctly, is a procedure for securing a warning sign to an energy-isolating device when a lockout device cannot be used.

Disconnect switch Line valve Circuit breaker

Figure 33: locked out and tagged out energy-isolating devices

- **Dissipate or restrain potential energy that can't be isolated**

Stored energy must be released or restrained after equipment has been de-energized. Capacitors; coiled springs; elevated machine parts; rotating flywheels; and air, gas, steam, chemical, and hydraulic systems are sources of stored energy. If the energy could return to a hazardous level, make sure that it remains isolated from the equipment until all service work is finished.

- **Verify equipment isolation**

It's your last chance! Verification means purposely confirming that

Equipment is separated from its energy source; therefore it is "isolated."

The authorized employee must verify that:

- Equipment has been properly turned off/shut down.
- Energy-isolating devices were identified and used to effectively isolate energy.
- Lockout or tags out devices have been attached to the energy-isolating devices.
- Stored energy has been removed or controlled.
- Attempting to restart the equipment is one way to confirm isolation;
- however, testing equipment ensures that capacitors have been properly

discharged, hazardous heat has dissipated, and excessive pressures have been relieved.

Self-check 2	Written test

Name…… ID…… Date…….

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

part I: Short Answer Questions (3 points each)

1. Write some of good housekeeping indicators?
2. Describe house keeping records and importance?
3. describe the characteristics of poor house keeping records?
4. Define shut down processes ?
5. Uses of shutdown processes?

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.

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

3.2 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. 1 maintenance check list for coffee packaging machine

	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 available?			

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.

3.3 Scheduling routine maintenance

Reporting faults and problems: very work shop has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the a 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.

3.4 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

Table. 2 maintenance schedule

ACTIVITIES	SCHEDULE										
	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3

PREPARED BY: _____ DATE:_____

CHECKED BY: _____ DATE: _____

Self-Check – 3	Written test

Name…… ID…… Date…….

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

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. How do we/you perform maintenance safely?(10pts)
4. Define maintenance and write what maintenance may include. (5pts)

Note: **Satisfactory rating – 20 points Unsatisfactory - below 20 points**
You can ask you teacher for the copy of the correct answers.

Operation sheet 1	Shut down Equipment

in Equipment Shut down through Operating procedures should be controlled documents, generally covered under the company's quality system and thus kept fully up to date. Any changes should be fully controlled and documented and should be subject to company change.

1. Identify the shutting down procedures
2. Start shutting down the process by following the appropriate shutting down procedures for electric oven, refrigerator.
3. Clean Equipments and workplace based on the procedure during coffee sensory analysis
4. Prepare the waste collecting Equipments and give a tag for each
5. Separate different types of waste to be recycle or dispose such as disposable water cup, aluminum foil.
6. Record the identified requirements as a recommendation
7. Report the required maintenance to the appropriate person

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **2**hour. The project is expected from each student to do it.

Task-1: operate equipment shut down