COFFEE AND TEA PROCESSING

Level-II

Based on May 2019, Version 2 Occupational standards

Module Title: - Preparing and pre-processing of raw Materials

LG Code: IND CTP2 M04 LO (1-3) LG (9-11)

TTLM Code: IND CTP2 TTLM 1020v1

October, 2020

United Nations Educational, Scientific and Cultural Organization

`

LG#9 LO#1: prepare for pre-processing

Instruction sheet

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

- Confirming materials for pre-processing
- Identifying and confirming cleaning and maintenance requirements
- Fitting and adjusting machine components
- Entering processing parameters to meet safety and production requirement
- 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 materials for pre-processing
- Identify and confirm cleaning and maintenance requirements
- Fitting and adjusting machine components
- Entering processing parameters to meet safety and production requirement
- Checking and adjusting equipment performance
- Carrying 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 materials for pre-processing

1.1. Pre-processing raw materials

raw materials required for pre processing like

- Green coffee beans
- Tea leaves
- Water

1.2. Service/materials availability **for pre- processing include**:-

Power:- The energy sector is driven by the supply and demand for world wide energy government has also a role there.

Steam:-The original procedure consists of a relatively gentle steam-treatment lasting between 30 and 60 minutes during which the beans undergo chemical and physical changes.

Water :-The processing of natural Arabica require little or no water at all, and where water is used in Brazil, for example, for flotation it can be recycled for several days and the degree of contamination is very low, if any. the name indicates, and there was little concern for water consumption and contamination.

Vacuum:- **it i**s the mass transfer operation in which the moisture present in a substance, usually a wet solid, is removed by means of creating a vacuum. In chemical processing industries like food processing, pharmacology, agriculture, and textiles, drying is an essential unit operation to remove moisture.

Compressed and instrumentation air:- **Compressed air** is air kept under a pressure that is greater than atmospheric pressure. Compressed air is an important medium for transfer of energy in industrial processes, and is used for power tools such as air hammers, drills, wrenches and others, as well as to atomize paint, to operate air cylinders for automation, and can also be used to propel vehicles.

Brakes applied by compressed air made large railway trains safer and more efficient to operate

Fig -1.industrial air compressor

1.3. Methods of Pre-processing

Cleaning:- There are many different types of equipment, like pressure cleaners, sweepers and polishers, but also vacuum cleaners Pressure cleaners are machines that use high-powered steam to get rid of stains and dirt.

Sorting:- it is any process of arranging items systematically, and has two common, yet distinct meanings:

- Ordering: arranging items in a sequence ordered by some criterion;
- Categorizing: grouping items with similar properties

Sorting materials

✓ **Inspecting and sorting Material** to check quality requirements are met.

- ✓ **Material inspection and sorting** include: sizing, quality inspection , sorting/grading
- ✓ **Tools and equipment used for pre processing**

✓ Steaming thermometers, Electronic scale, Large knock box, Measuring spoons, sieve, Color meters

Syrup pumps, equipment cleaning powder, cleaning tablets, Steam wand cleaning liquid, Microfiber cleaning cloths

❖ Types of machine used for Coffee

Harvester, Pulpier, Huller, Sorter, Washer, Drier

1.2. Purpose of confirming materials availability

1. To achieve the exact pre-processing goal
2. To ensure the performance of materials
3. To maintain the materials if it is needed

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. Write the Purpose of confirming materials availability (3point)
2. List at least three pre processing methods. (3point)

Test -1. Choose the best answer

1. Which one of the following equipment used for tea leaf processing (2points)

A. Roller B. Pulpier C. A' & B D. all

2. Which one of the following is machine of the coffee processing (2 points)

A. Sorter machine B. Plucker c. withering D. All

Note: Satisfactory rating - 7 points Unsatisfactory - below 5 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. **Cleaning of coffee and tea processing machines**

All tea and coffee equipments/tools/ machines are required to clean from time to time .example harvester, sorter, pulpier, drier and withering must be clean before processing.

2.1.1. Required material for cleaning agent

Disinfectant, Soap, Caustic soda, Municipal water, Pneumatic cleaning agent , sweepers and polishers, but also vacuum, cleaners Pressure cleaners Cleaning operation or collecting equipment/machine includes:- lubrication, oil test, Remove dust by using brush cleaning and sanitized, Municipal Water

3. Safety device use appropriate personal protective device (PPE)

Figure2. Coffee machine cleaner

2.2. Method of cleaning

There are two methods of cleaning in industry level such as Clean in place (CIP) and **Clean-out-place** (**CIP**) .

A. Clean in place:- is a method of cleaning the interior surfaces of pipes, vessels, equipments, filters and associated fittings, without major disassembly.

B. **Cleaning out of Place** is defined as a method of cleaning equipment items by removing them from their operational area and taking them to a designated cleaning station for cleaning.

2.2.1. **Cleaning procedure of coffee harvesting machine**

Preparing to Wash:- The operator places the drum or bucket to be washed into the machine and closes the front door. Push the start button to commence the cycle.

Washing Cycle:- After start has been pushed, the machine checks if all sensors signals are ok then begins to wash. The washing media is sucked from its tank into the washing pump and then to the washing head.

Rinsing Cycle: - Rinsing is performed automatically, after washing, with clean media sucked from a second storage tank or directly from the net (if water is used), injected into the main pump and into the washing head. Rinsing media is filtered and collected into the washing liquid storage tank or into a specific tank.

- **End of cycle**:-At the end of the cycle the machine stops and a visual signal on the control panel informs the operator. Now the drum/bucket is clean and can be removed from the machine**.**

2.3. Purpose of cleaning of equipment/machine

- ✓ To maximize performance and flexibility to suit coffee bean and tea leaf cleaning needs.
- ✓ It reduced product loss
- ✓ Increase the quality of operating equipment
- ✓ To reduce different types food safety hazard (microbial, chemical and physical)
- ✓ Machine durability
- ✓ Equipment and sorting areas should be checked daily and kept thoroughly washed clean any ferment part of cherry from the previous day will contaminated.

2.4. Maintenance requirements status include

machines are easy to run, and to maintain, model of machine, specification , machine accessory, maintenance schedule, take corrective action in response to out-of-specification results, respond to and/or report equipment failure within level of responsibility,locate emergency stop functions on equipment, stop operate equipment during maintenance, any processing machine care full calibrated by using different chemical solution

2.5. purpose of maintenance

- ✓ to increase the speed of machine
- ✓ to increase of efficiency of machine
- ✓ minimize product loss
- ✓ to minimize unwanted faults, voice, signals.

2.6. maintenance required for Coffee harvester Machine

This machine picking coffee bean strip and selective pickling

Automatic machines are typically placed in high-volume areas, because that's what they're suited for.

2.7. maintenance required for Tea leaf sorting machine

Daily :-you should be removing your glass pot at the end of each day, washing it thoroughly in warm water with sufficient dish-washing detergent, and allowing it to dry properly before it is used again. Just make sure to run one or two full tanks worth of water through the machine again before attempting to brew more coffee, otherwise you might be left with a bit of a strange taste in your mouth.

2.8. Three major maintenance rules depend up on types and capacity of factory

- ✓ Hourly cleaning,
- ✓ Daily cleaning
- ✓ Weekly Cleaning

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. List method of coffee cleaning in machine (5 points)
2. Write at least two major maintenance rules (3 point)
3. Mention at least two maintenance rules (2 points)

Test II: choose

1. which one of the following are purpose maintenance ?(1 points)

   A. increase the efficiency of machine B. minimize product loss C. ‘’A’’ and ‘’B’ D. none

   2. Which one of the following is the cleaning procedure for coffee harvesting machine? (1points)

   A. Washing cycle B. Rinsing cycle C. End of cycle D. all

Note: Satisfactory rating - 7 points Unsatisfactory - below 5

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

Information Sheet 3- Fitting and adjusting machine components

3.1. definition: fitting and adjusting machine components

Fitting is-Make correct and proper the machine components for the pre-processing of coffee and tea processing

Adjusting is-Prepare**/** checking the cleanliness and operation of coffee and Tea machines, equipment and containers. optimal adjustment needs a direct expression of functional requirement Usually, assembly and positioning are two functional studied requirements having a geometrical expression One way of improving product quality is in controlling the geometrical tolerance by:- Either adjusting machine tools in order to respect at best a set of standard functional requirements applied to a part, Simulating the geometrical effect of manufacturing fault causes and adjustment Parameters (temperature, time and pressure) in the respect of functional requirements. In coffee and tea leaves process operation any spare part must fit and adjustable like Temperature, time and pressure parameter that fit the machine in order to get the final quality product

3.2. component of coffee harvesting machine

- ✓ **Shaker (**vibratory harvesting)
- ✓ **Catch pan**

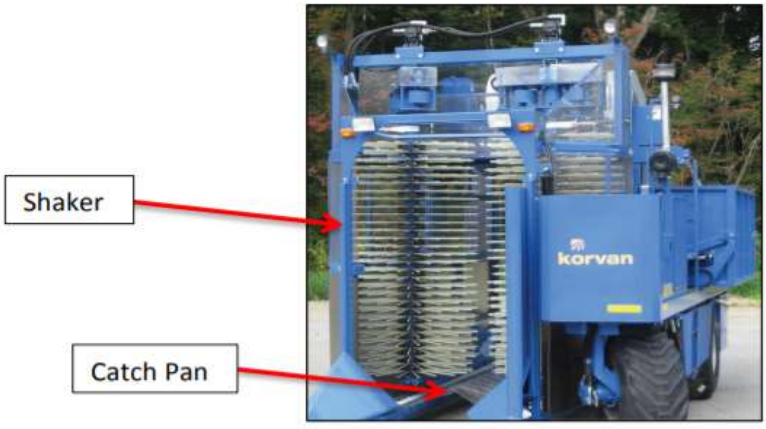


Fig2: Coffee Bean Harvester

1. **Catch** :- The catching units used in shaker harvesting are collection surfaces located below the shaker that extend under the tree, covering the drop area of the fruits (Cargill, 1999). Coffee harvesters, for instance, have complicated plastic panels that individually rotate around a pivot point allowing the trunk of each tree to pass through the machine (Figure 2.1).
2. **Shaker or (vibratory harvesting):-** Mechanical harvesters utilizing shaker or vibratory technology has been used to harvest a variety of other crops besides coffee including; apples, peaches, pears, plums, prunes, apricots, grapes, lemons, grapefruit, olives, and many others. However, due to the indiscriminate nature of vibratory harvesting, all of the available fruit (ripe and unripe) is usually

3.3. Techniques of fitting and adjusting coffee harvesting machine components

In the industrial production the various component parts of machines and plants are produced independently of each other by using different methods and in different production fields. The necessary dimensional accuracy of the component parts is specified by fit directions in the working drawings. The component parts are worked until the dimensions correspond to the fit directions.

3.4. Purpose of fitting and adjusting harvesting machine components

ooptimal adjustment of a machine tool for, status and purpose of guards, equipment operating capacities and, Applications, and the purpose and location of sensors and related feedback instrumentation, to improve the quality of its manufactured products**,** improving the geometrical quality of machined parts,minimize machine error, increase capacity

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 at least two component of coffee color sorter? (5 points)

2. List down the purpose of fitting and adjusting machine components? (5points)

Note*:* Satisfactory rating – 8 points Unsatisfactory - below 5 points

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

Information Sheet 4- Entering processing parameters to meet safety and production requirement

4.1 Entering processing/operating parameters

Operating parameters are the important criteria in the coffee and tea process production or manufacturing. Such as:-

- Environment Relative humidity
- Time and Temperature
- Moisture content content
- Varieties s of coffee
- Size and shape of bean
- Physical attributes(weight, density, brightness of defective coffee beans)
- Altitude
- Appearance of coffee beans

Climate Requirements Arabica coffee is well adapted to cooler temperatures, needs more than seven months of rainy season and high temperatures for an abundant differentiation of flower buds; it tolerates drought when grown in deep soils.

Varieties of coffee:- First of all, there are 3 main types of coffee beans. The names of these coffee beans are Robusta, Liberica and Arabica. There are also sub-types of these beans. But these are the main bean types. These types of beans take on different flavors while they are being processed and harvested.

A. Liberica is a low yield type of coffee compared to Arabica and Robusta.

B. Robusta**:** This type of coffee, which contains 2.5% more caffeine than other types, has a pretty strong taste.

C. Arabica: This coffee bean with low caffeine and a smoother taste is aromatic and delicious. 80% of the coffee in the world is

Temperature - The optimum mean annual temperature ranges from 18 to 22º C.

Temperatures above 23º C accelerate the development and ripening of fruits and can provoke loss of physical and beverage quality.

Effect of increase temperature and time results.

- ✓ Color changes
- ✓ Sweetness decrease as temperature and time increase
- ✓ Appearance observed
- ✓ Increase maturity
- ✓ Ripeness increase

Coffee has different moisture contents at the harvesting stage, varying from 50 to 70% in ripe cherries, from 35 to 50% in coffee raisins (almost dried) on the plant, and from 16 to 30% in cherries that have completely dried on the plant (7). At the end of the drying process, the moisture content must be at or below 12% to prevent fermentation and mold growth (3).

Coffee has different moisture contents at the harvesting stage, varying from 50 to 70% in ripe cherries, from 35 to 50% in coffee raisins (almost dried) on the plant, and from 16 to 30% in cherries that have completely dried on the plant (7

Rainfall - It is generally considered that the best amount of annual rainfall for Arabica coffee is between 1,400 and 2,400 mm, though a range between 800 and 4,200 mm remains acceptable.

4.2. Safety and production requirements for preparing pre processing

Food safety is traceability, hygiene and control

Avoid contamination to ensure food safety

Extraction solvents relevant for decaffeinated

Relative humidity:- the amount of water vapor in the air, expressed as a percentage of the maximum amount that the air could hold at the given temperature; the ratio of the actual water vapor pressure to the saturation vapor pressure. Abbreviations: RH,

It is the ratio of the partial pressure of water vapor to the equilibrium vapor pressure of water at a given temperature. Relative humidity depends on temperature and the pressure of the system of interest. The same amount of water vapor results in higher relative humidity in cool air than warm air.

A hygrometer is a device used for measuring the humidity of air.

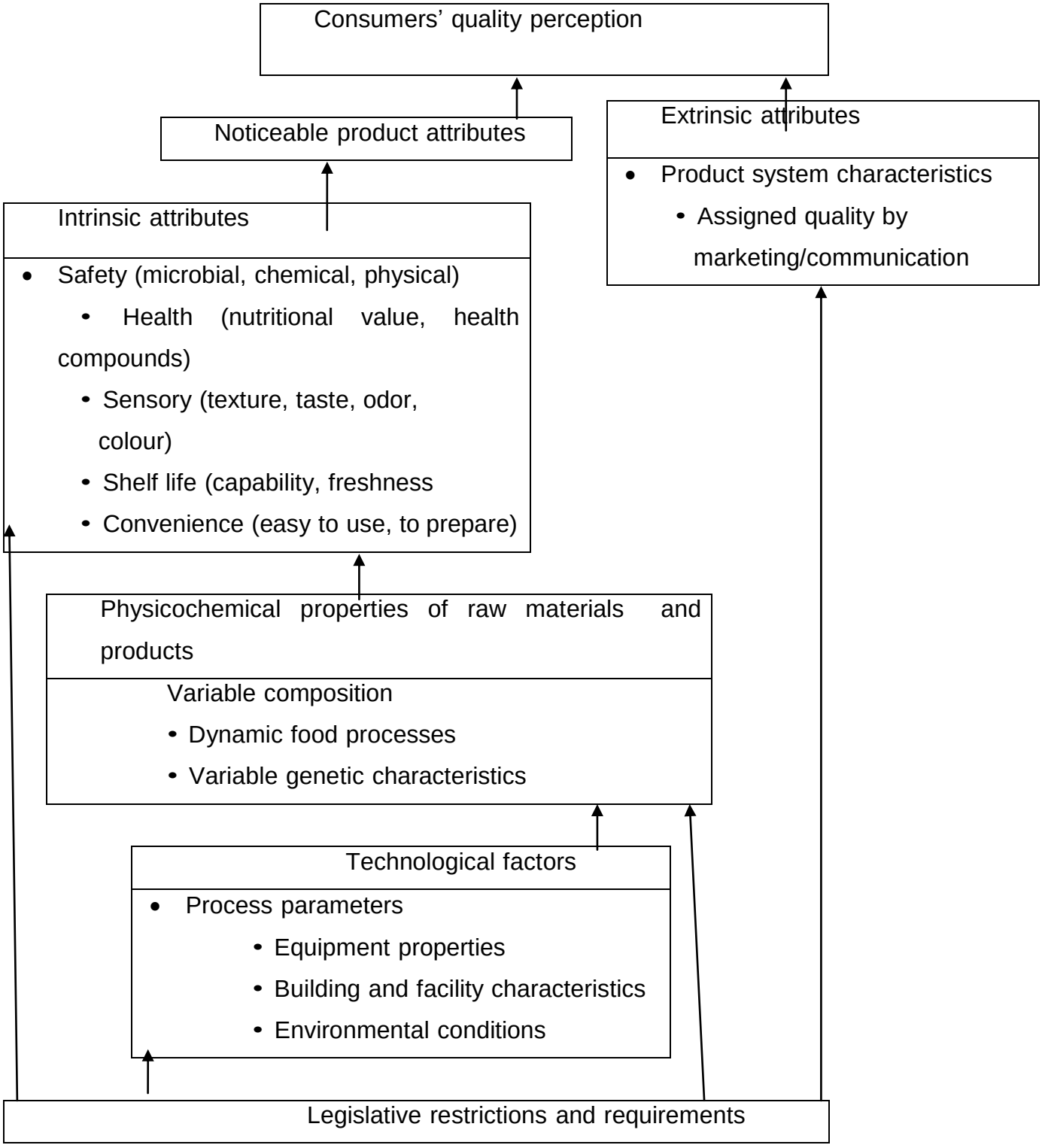
Water content or **moisture content(MC)**is the quantity of water contained in a material, such assoil(called **soil moisture**),rock, ceramics, crops, or wood. Water content is used in a wide range of scientific and technical areas, and is expressed as a ratio, which can range from 0 (completely dry) to the value of the materials' porosity at saturation. It can be given on a volumetric or mass (gravimetric) basis.

Fig 5. Coffee bean moisture testure measurement **fig 6 coffee density measurement**

4.3 .coffee and Tea process parameters mechanisms

- quality characteristics to be achieved at the pre-processing stage
- effect of raw material characteristics on process performance
- inspection or test points in the process and the related procedures and recording requirements
- contamination/food safety risks associated with pre-processing and related control measures
- common causes of variation and corrective action required
- Operational Health and Safety (OHS) hazards and controls, including limitations of protective clothing and equipment relevant to the work process

Table 1 Intrinsic-extrinsic quality attributes model



(Source: Luning and Marcelis, 2009

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. briefly explain moisture content and relative humidity (5 Points)

2. List down the parameter coffee bean? (5 points)

Note: Satisfactory rating - 8 points Unsatisfactory - below 5 points

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

Information Sheet 5:- Checking and adjusting equipment performance

Introduction

5.1 Importance of Checking and adjusting equipment performance

Regular checks & adjusting equipment performance are important for pre-processing of coffee & tea leaf process in order to maintain equipment efficiency and avoid frequent breakdowns.

Preventing problems is way better than having to patch things up when they arise.

Before starting the processing of all coffee and tea harvesting machine should be done the process of checking and adjusting our equipments to be used. Because the quantities of the incoming ingredients and products are based on the performances of equipments to be used. The services available also should match with the performance of equipments

5.2. Equipments to be adjust and check their performance

- ✓ Coffee harvester machine
- ✓ Coffee pulpier
- ✓ Coffee color sorter
- ✓ Coffee cleaning
- ✓ Coffee grading
- ✓ Coffee drier
- ✓ Tea plunked
- ✓ Tea roller
- ✓ Tea sorter
- ✓ Tea fermenter
- ✓ Color meters

Cleaning and maintaining your equipment should be one of your top priorities if . Maintenance schedule should include regular check-ups and the tank of their machine every six months to ensure good performance.

Preventative Maintenance is carried out while the equipment is still working, so that it does not.

Checkout our large selection of cleaning equipment and cleaning Like any piece of equipment that is central business performance, coffee machine Check alignment and adjustment of chains and belts

The results of study indicated that an increase in green leaf height increases the yield amount in a harvest round, in a low height harvest due to the increase of the number of harvest rounds during plucking, harvesting from a lower height shows a better yield. However, it should be mentioned that green leaves harvested from lower heights have better qualities for producing black tea.

tea plucking machine, such as Japan, England, France, India, Australia ... COROLLA has good travel performance, tea plucking surface and less lose tea leaf cool rate of sprout and leaf 75% around, rate of picking up to 85% to 90%. and popularized more easily, can mechanization of tea plucking speedup.

8.1. Purpose of checking and adjusting equipment performance

- ✓ Increase the equipments life
- ✓ Increase the quality of product
- ✓ Increase the efficiency of equipments
- ✓ Save the consumption of power and

Self-Check 5	Written Test

Name…… ID……. Date…….

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

Test I. **Short Answer Questions**

1. Define calibration? (5 points)
2. Describe the uses of checking and adjusting equipment performance? (5 points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 **Points**

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

Information Sheet 6: Carrying out pre start checks

6.1**. Meaning of pre-start checks activity includes**

Monitor and adjust process equipment to achieve required quality outcomes and take corrective action in response to typical faults and inconsistencies Visual inspections of important features prior to starting the machine, Visual & function tests while the machine is turned on but stationary

Testing the machine's functions during a short drive, Positioning sensors and controls correctly,

Ensure any scheduled maintenance has been carried out, Place sand filters/scourers in base of percolators

6.2**. Required equipment for Pre-operational checks includes**

- ✓ Pre-start and safety checks including the service and maintenance system.
- ✓ Checking size of sieve, type machine with respective oil seed type, fuel, and lubricants needed, fan belts, lines, connections and transmission.
- ✓ Inspection of safety guards
- ✓ Checking and confirming equipment calibration settings and operating methods
- ✓ Observing and monitoring noise levels for correct operation.
- ✓ Preparation of independently powered tools may include cleaning, priming, tightening, basic repairs and adjustments.
- ✓ Identify and segregate unsafe or faulty equipment for repair or replacement

6.3. Workplace information requirements include:

Standard Operating Procedures (SOPs), specifications, production schedules and instructions, manufacturers' advice

Standard forms and reports.

6.3.1. standard operating procedures

Standard Operating Procedures (SOP) is a process document that describes in detail the way that an operator should perform a given operation.

SOPs involve the purpose of the operation, the equipment and materials required, how to perform the set-up and operations required for the process, how to perform the maintenance and shutdown operations carried out by the worker, a description of safety issues, trouble-shooting, a list of spare parts and where to find them, illustrations, and checklists.

6.3.2. work place information specification

A specification often refers to a set of material, design, product, or service. A specification is often a type of technical standard

6.4. Purpose of pre-start checks

- ✓ To make the process easy
- ✓ To reduce hazards,
- ✓ To take action

Self-Check 6	Written Test

Name…… ID……. Date…….

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

Test-I. **Short Answer Questions**

1. Meaning of pre-start checks (5 points)
2. Purpose of pre-start checks? (5 points)

Note*:* Satisfactory rating - 8 points Unsatisfactory - below 5 **Points**

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

Operation Sheet 1:- identifying and confirming cleaning and maintenance requirements

The following procedures should be taken into account to identify cleaning and maintenance equipment

Procedure

Step1. Wear the proper clothing(Personal protective equipment)

Step 2. Prepare Checklists for recording

Step3 .Identify parameters required to be check the cleaning and maintenance status

Step4. Take records of the parameters on the proper formats

Step5. See the cleaning and maintenance requirement and status of the parameters

Step6. Check the cleaning and maintenance status with Standards and Specifications

Step7. Put the corrective actions to the identified variations

Step 8.Report to the responsible person based on the reporting procedure

Operation sheet 2:- Fitting and adjusting machine components and related attachment

The following procedures should be taken into account to identify Fitting and adjusting machine components

procedure

Step1. Wear the proper clothing

Step2. Prepare Checklists for recording

Step3. Identify machine components and related attachments

Step4. Take records of them on the proper formats

Step5. See the fitting and adjustment of Machine status

Step6. Check the fitting and adjustment of Machine status with Standards and Specifications

Step7. Identify the variation/fault/gap which find out from the current situation

Step8. Put the corrective actions to be corrected

Step9. Report to the responsible person based on the reporting procedure

Operation sheet-3. Checking and adjusting equipment performance

The following procedures should be taken into account to identify the performance of coffee harvesting machine

Procedure

Step1: Wear the proper clothing

Step2: Prepare Checklists for recording

Step 3: Record the parameters of equipments performance to be check and adjust

Step4: Identify the current status/situation and record

Step5: Identify the variation with the standard

Step6: Put the corrective action to be adjust

Step7: Make adjustments based on their specification and standard

LAP Test	Performance Test

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task -1.perform Clean the material and equipment of coffee harvesting machine

Task -2. perform adjusting machine components

Task-3. Perform adjusting equipment performance

LG#10	LO #2- Operate and monitor the pre-processing 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 operating equipment
- Identifying variation in equipment operation
- Reporting maintenance requirement
- Monitoring the processes to meet specification
- Identifying, rectifying and reporting out-of-specification product/process outcomes
- Maintaining work area
- Conducting work
- Maintaining workplace record

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

- Start and operate the process
- Monitor operating equipment
- Identify variation in equipment operation
- Report maintenance requirement
- Monitor the processes to meet specification
- Identify, rectify and report out-of-specification product/process outcomes
- Maintain work area
- Conduct work
- Maintain workplace record

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 - Starting and operating the process

1.1. Introduction

Starting and operating the pre-processing of the process means checking and making available all necessary equipments and the coming raw-materials. The operation may require making adjustment, maintenance and taking corrective action when and where necessary.

1.1.2.coffee and tea production in ethiopia

Ethiopia is the center of origin for highland coffea (Coffea arabicaL), which is one of the most valuable cash crops in the country. It represents the major agricultural export crop, providing 20–25% of the foreign exchange earnings (ECFF,2015). The coffee sector contributes about 4–5% to the country's Gross Domestic Product (GDP) and creates hundreds of thousands of local job opportunities (EBI,2014).

In Ethiopia, 764863.16ha of land was allocated for coffee production and 494574.36 tones were obtained with average productivity of 0.64tones ha^{-1}in 2018/19 Meher Season from which 30% of the total production belongs to South Nation Nationalities and Peoples Regional State (SNNPR) (Central Statistical Agency [CSA],2019). From top 25 coffee producing districts in Ethiopia, Oromia dominates with 18 coffee producing districts and the remaining top coffee producing districts are located in Sidama region and South Nations, Nationalities and Peoples Regional State.

In Ethiopia, coffee grows at various altitudes, ranging from 550to 2,750 m above sea level. However, Arabica best thrives and produced between altitudes of 1,300 and 1,800 masl, annual rainfall amount ranging from 1,500 to 2,500mm with ideal minimum and maximum air temperature of 15 and 30°C, respectively (MOA,2013.

1.1. Varieties of coffee production

The two most common grown coffee bean types are c.Arabica and c.Robusta. Coffee plants are now cultivated in over 70 countries, primarily in the equatorial regions of the Americas, South east Asia, the India sub continent and African. As of 2018, Brazil was the leading grower of coffee beans, producing 35% of the world total. Coffee is a major export commodity country. It is one of the most valuable commodities export by developing countries. Green, unroasted coffee is one of the most traded agricultural commodities in the world.

1.2. . Coffee harvesting

(a)

Fig 6a. Mechanical coffee harvesting machine

(b)

Fig 6b. Manual coffee harvesting method

1.2.1. Two Types of coffee harvesting methods

A. Strip picking – The cherries are stripped off of the branch, either by hand or by machine

Fig 7. Coffee bean strip picking machine

B. **Selective picking** – The red cherries are picked and the green ones are left to ripen. Picking is carried out at 10 day intervals. Since this method is labor intensive, it is mainly used to harvest the high quality Arabica coffee. In most regions there is one major harvest season in a year.

Fig 8. Selective pickling machine

1.3. Cherry processing

After harvesting, cherries are processed as soon as possible to avoid spoilage. Depending on available resources and location, one of the following two methods is used

1.4. Green coffee bean processing

Wet process:- a coffee processing method which involves "washing" the green coffee beans to remove the coffee's fruity material while the coffee cherry is still moist (e.g., just after picking).

Fig 9. Fully Washed Coffee

The picture above shows a fully washed coffee, after being passed through a pulping machine. This is now ready to go through fermenting, washing, grading and drying before being hand-sorted (graded) for sale

Removing the parchment and mucilage:-More specifically, wet processing is a method of getting the parchment off the coffee cherry (fruit) by first removing the pulp from the green coffee inside. Next the coffee cherry's mucilage is removed through fermentation, and finally the beans are dried, either in the sunlight or using forced-air drying, to achieve a final moisture content of about 10.5%.

Dry process:- Dry processing is the oldest method. It means placing the coffee cherry fruit in the sun to dry. In Ethiopia, India and Kenya it can be as simple as placing the coffees on sheets on the ground to dry. In Colombia, Brazil and Costa Rica it may mean dispersing the coffee fruit in buildings that look like sun houses, either covered by glass or fabric screens to

Fig 10. Coffee drying in the sun

Semi-dry process:- Semi-dry is a hybrid process used in Indonesia and Brazil. The process is also called "wet-hulled", "semi-washed", "pulped natural" or, in Indonesia, "Giling Basah". Literally translated from Indonesian, Giling Basah means "wet grinding". This process is said to reduce acidity and increase body

CLEANING AND SORTING:-The final steps in coffee processing involve removing the last layers of dry skin and remaining fruit residue from the now dry coffee, and cleaning and sorting it. These steps are often called dry milling to distinguish them from the steps that take place before drying, which collectively are called wet milling.

Sorting by Size and Density:- Most fine coffee goes through a battery of machines that sort the coffee by density of bean and by bean size, all the while

removing sticks, rocks, nails, and miscellaneous debris that may have become mixed with the coffee during drying.

Sorting by Color:-The final step in the cleaning and sorting procedure is called color sorting, or separating defective beans from sound beans on the basis of color rather than density or size. Color sorting is the trickiest and perhaps most important of all the steps in sorting and cleaning.

Color Sorting by Eye and Hand:- With most high-quality coffees color sorting is done in the simplest possible way — by hand. Teams of workers, often the wives of the men who work the fields, deftly pick discolored and other defective beans from the sounds beans. The very best coffees may be hand-cleaned twice (double picked) or even three times (triple picked). Coffee that has been cleaned by hand is usually called European preparation. Most specialty coffees, since they are whole bean and consumers see what they get, are European preparation.

Color Sorting by Machine:-Sophisticated machines now can mimic the human eye and hand. Streams of beans fall rapidly, one at a time, past sensors that are set according to parameters that identify defective beans by value (dark to light) or by color..

Fig 11. Color sorter of coffee

These machines are not widely used in the coffee industry for two reasons. values.

1.6. **Coffee Bean Grade**:-Grading is the process of categorizing coffee beans by various criteria such as size of the bean, where and at what altitude it was grown, how it was prepared and picked, and how good it tastes (cup quality). Coffees also may be graded by the number of imperfections (broken, under-ripe, or otherwise defective beans; pebbles; sticks; etc.) .

Fig -12.green coffee grading

Moisture content:-There is no fixed ratio of moisture in all coffee beans; normally 11% is a good percentage. Keep one thing in your mind if your coffee beans exceeded from 12.5% moisture then it never allowed importing at any condition**.**

ure 4.5: Measuring moisture content in the solar coffee dryer (Photo by Karinne

Fig 13. Measuring moisture content

Coffee beans appearance defects

There are many coffee beans defects. These are:- Blackish, blotchy, antestia, crushed, Diseased, elephant beans, faded, foxy, moldy, paled, ragged, shell, stinker and under-dried There are different defects which caused due to carelessness in processing, less maintenance of moisture content, discolor and physical defects. Any type of defect must influence the quality of beans lets read all defects in detail and get how much coffee bean color sorter is important to improve the quality of beans**.**

Blackish:-Black or dark color beans which are damaged due to immature harvesting or natural fall of cherries from the trees. Some time due to exposure to

heat and water. If coffee beans are unroasted, more than 25% black, deep blue and dark brown can be considered black beans.

Blotchy:-If coffee beans have some yellowish and whitish irregular patches it is called Blotchy. This is due to the uneven drying process.

Crushed:- Coffee beans are crushed due to unsmooth pulping process or maybe it occurs during separation of beans from the husk.

Diseased:- There are many diseases which damage plants especially coffee plants like fungus, Coffee Leaf Rust and Coffee Berry Disease.

Elephant beans:- The group of two or more clustered beans which grow together and locked with each other is called “elephant beans” or “ears”.

Faded:-Coffee beans which lost color, size or any other property due to any environmental, processing like bleached and soapy coffee beans.

Foxy:-during the drying process, washing process, fermentation or harvesting it can be brown coffee beans.

Paled:- Due to drought or immature harvesting coffee beans looks pale and dehydrated.

Ragged:- Drought effect beans and immature harvested fruit looks ragged in appearance.

Shell:-This is the defect of coffee beans which occurs commonly, a cavity or a shell is produced around the beans. For example Black beans, stones, and stick which take the quality of beans to the lesser grade.

Stinker:- is the defect but not regarding the shape and color it destroys the taste of coffee beans.

Under-dried:-Coffee Beans less than 12.5% of moisture content lie in under dried condition. The normal ratio of moisture content is 10% to 12%.

Insects’ pest damage: Sometimes pests damage the crops, coffee beans can be affected by the pests**.**

Fig14. Different coffee defects

2. Tea leaves processing

The most important phases of the treatment with respect to orthodox tea production (which can be used for the production of any type of tea desired as opposed to the later explained CTC production) are: withering, rolling, fermenting, drying and sorting into leaf and broken grades, i.e. sizes.

2.1. Tea harvesting

Fig15. Tea leaf processing

A. Withering

Fig 16. Tea leave withering

When the fresh leaves reach the factory, they are weighed and the amount is registered. Next, the withering process is commenced where the humidity content of the leaves is reduced by about 30 % in order to make them soft and flexible for the subsequent rolling. The withering takes place in special withering through of a length of 25 - 30 m, which are stringed with a wire grid and ventilated with large fans. The leaves are spread out on the grid. The air, which moves through the ventilators, can also be heated if required due to higher humidity content of the leaves. The withering process takes 12 - 18 hours.

B.Rolling

Fig 17. Tea leave rolling

Subsequently, the withering green leaves are rolled in large rolling machines. These generally consist of two large, heavy metal plates, which are rotating against each other and are hereby breaking open the cells, bringing the cell fluid into contact with the oxygen in the air.

C.Fermentation

Fig 18. Tea leave fermentation

The fermentation is an oxidation and tanning process of the cell fluids, which have been released during the rolling. For the fermentation, the leaves are spread out on tables in layers of 10 cm.

D.Drying

The fermentation is finished when the desired grade of fermentation is reached, i. e. as soon as the tea has developed its typical smell and the copper-red color is dried. For this, so-called tiered dryers are used which are fuelled with wood or oil..

Fig 19. Tea leaves drying

E.Sorting

Fig 20. Tea leave sorting

The black tea, which is released by the dryer, is the so-called raw tea, which is now sieved via a number of shaking, mechanical sieves with varying sieve sizes with which the common leaf grades are separated from each other.

2.2. Classification of tea

There are four main types of tea:

- ✓ green tea
- ✓ black tea
- ✓ Oolong tea and white tea.

All this varieties comes from the same plant. The way the leaves are processed after harvesting determines the type of tea that is created

Tea Production/processing

- ➢ General tea leaf processing steps includes

Fig 21. Tea prodcing process

2.2.1. Black tea production

Black teas originated in China, where they are known as red tea, but now

come from many growing regions throughout the world. The traditional method of processing black teas comprises four steps: withering, rolling, oxidizing and drying. process step (vedio link) of black tea

2.2.2. Green tea production

The finest green teas are handmade during the spring season in China and Japan. Green teas are often referred to as non-fermented or unfermented teas .The intent is to preserve the healthy and natural elements of the fresh leaves. The traditional method of processing green teas involves withering (though not always), heating, rolling and drying. After picking, the fresh leaves are spread out on bamboo trays and exposed to sunlight or warm air for one to two hours. processing steps (here) of green tea

2.2.3. Oolong tea production

The best oolong tea is picked by hand during the spring and winter months in southeast China and Taiwan. Oolong teas are partially oxidized teas and undergo the most difficult and time consuming processing method. Processed to be full-bodied teas, the leaves for oolong tea must not be picked too early but just when they reach their peak, and they must be processed immediately. First the leaves are withered in direct sunlight and then shaken gently in bamboo baskets to lightly bruise the edges of the leaves. Next the leaves are oolong tea processing **(**refer in vedio) steps

2.2.4. White tea production

White tea is the most delicate of all teas. Produced mainly in China, primarily in Fujian province, white tea is made entirely from leaf buds that are covered with whitish hairs. The new buds are plucked before they open in early spring, then withered and dried slowly at low temperatures. Sweetness, with little of the grassy undertones sometimes associated with green tea refer vedio here.

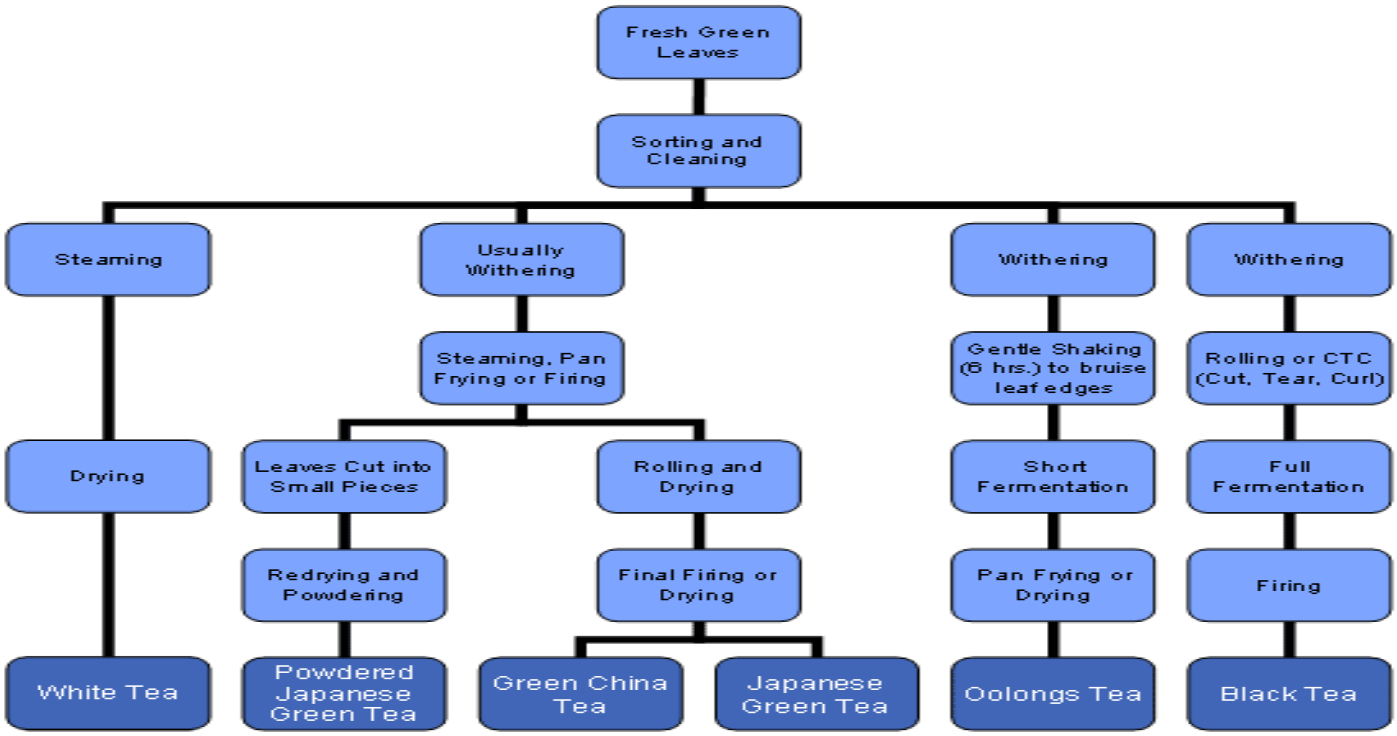


Fig -22. General flow chart of tea leaves processing

Self-Check 1.	Written Test

Name .....ID .....Date.....

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

Test-I, Short answer question

1. Write the type coffee Bean? (2 points)
2. List down types of tea leaf (2 points)
3. Define wet processing of coffee bean (2 points)
4. Write at least four types coffee defects (2 points)
5. Write the two types coffee harvesting (2 points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

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

Information Sheet 2:- monitoring operating equipment

Definition of monitoring

2.1 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 order to measure its effectiveness and adjust inputs where necessary.

In any processing industry there must equipment and process monitoring and controlling system. So in coffee and tea processing industry there is equipment that needs monitoring and control of its processing parameters like temperature, pressure, and flow meters and different sensors. Monitoring equipment and process in an industry helps to obtain expected out puts. Without monitoring and controlling the equipment and process it is impossible to get quality products. Basic equipment which is controlled and monitored in coffee pulp extraction are explained below.

2.2. Monitoring operation of equipment and processes

During extraction of pulp or mucilage from by using mechanical extraction process you can use many types of equipment. In these process we have monitor equipment operation and process weather the equipment or process are going under specified conditions.

So, when you extract seed oils using hydraulic oil press you have to monitor and control the temperature and pressure gauges are working under setting point or not.

- **Hydraulic pulp press of coffee**

Preheat before each pressing, preheat temperature, summer and autumn is 50 degrees 70 degrees, winter Spring is 70 degrees-90 degrees.

Preheat automatic control without turning off the temperature switch.

A. Temperature controller

- ✓ Temperature controller can set the fixed temperature which can heat temperature automatically. Adjustment mode: As shown in the figure, according to the needs of the loop below the upper and lower buttons, you can set the heating temperature.
- ✓ Temperature controller is automatic control, after reaching the set temperature, it will stop working. Temperature drop will automatically start heating, no need to turn off the temperature switch.
- ✓ If the temperature controller appears heating digital abnormalities, it is recommended to check the Temperature controller line connection, check whether there is a loose line.

B. **Moisture content control** of green coffee and tea leaf

Fig 23. Digital moisture meter for green coffee

2.3. Typical operating equipment monitoring in conditions for coffee and tea processing

- ✓ Mechanical Harvesting machine
- ✓ ,pulpier remove coffee leaf bean
- ✓ sorting machine:- sorting and cleaning by different sorting and cleaning materials
- ✓ washing machine for wet processing of coffee bean
- ✓ , grading machine, according to bean size grade coffee bean by using sieve Sieve size

2.4. Importance of monitoring equipment in operation condition

- ✓ Analyzing the situation in the community and its project.
- ✓ Determining whether the inputs in the project are well utilized.
- ✓ Identifying problems facing the community or project and finding solutions.
- ✓ Ensuring all activities are carried out properly by the right people and in time.
- ✓ Using lessons from one project experience on to another; and

- ✓ Determining whether the way the project was planned is the most appropriate way of solving the problem at hand.

✓

Self-Check 2	Written Test

Name .....ID .....Date .....

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

I, Short answer questions

1. Define the monitoring system (4 points)
2. List down the importance of monitoring in operation condition (3 points)
3. What are the processing parameters to be monitoring and controlled in an industries (3 points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

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

Information Sheet-3: Identifying variation in equipment operation

3.1. Identifying variation in equipment operation

Variations in equipment operations can be happen due to many factors. Such as lack of maintenance or poor maintenance, sensor defects, equipment component problem, difference in applied pressure, and power shortages.

These variations may cause different damages to a machine, process, products, and environments.

To minimize these variations we have to conduct pre-start checks on all components of equipment, sensors, and perform maintenance before we are going to operate equipment

3.1.2. Variables to be monitored to minimize variations in equipment operations include:

- ✓ Production capacity
- ✓ Equipment durability
- ✓ Equipment performance (e.g. speed, output, variations)
- ✓ equipment component performance
- ✓ sequences and timing of operation
- ✓ materials changes (desired and not desired)

3.2. Reporting maintenance requirement

3.2.1. Introduction

Maintenance recommendations are based on industry standards and experience in Reclamation facilities. However, equipment and situations vary greatly, and sound engineering and management judgment must be exercised when applying these recommendations. Other sources of information must be consulted (e.g., manufacturer=s recommendations, unusual operating conditions, personal experience with the equipment, etc.) in conjunction with these maintenance recommendations.

3.2.2. Maintenance requirements status include

- ✓ take corrective action in response to out-of-specification results
- ✓ respond to and/or report equipment failure within level of responsibility
- ✓ locate emergency stop functions on equipment
- ✓ stop operate equipment during maintenance

3.2.3. Preventive Maintenance Preventive maintenance (PM) is the practice of maintaining equipment on a regular schedule based on elapsed time or meter readings. The intent of PM is to “prevent” maintenance problems or failures before they take place by following routine and comprehensive maintenance procedures. The goal is to achieve fewer, shorter, and more predictable outages

3.2.4. MAINTENANCE FEATURES

Maintenance requirements Coffee harvesting machines and tea leaf maintenance falls into the following categories. Operational checks to simulate automatic start-up, shut-down and emergency shutdown.

Inspection and maintenance:-Drive train, Rotor, including tip flaps, Hardware control systems, Hydraulics, Electrical control signals and power system, Braking system, Tower.

The operational checks are carried out every seven days or 100 hours of operation; inspection and lubrication every 40 days or 1000 hours of operation. This is supplemented by an annual or 9,000 hours of operation check, when a more detailed examination and overhaul is carried out.

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. **Explain maintenance requirements of machine (2 points)**
1. List the variation of operation equipment for coffee sorting machine (5 point)
2. Write down all the safety requirements for coffee bean sorting machine. (3 point)

Note: Satisfactory rating - 8 points Unsatisfactory - below 5 points

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

Information sheet-4:- Monitoring the processes to meet specification

4.1. Monitoring the processes

Monitoring is the systematic process of collecting, analyzing and using information to track a programmer's progress toward reaching its objectives and to guide management decisions.

Process monitoring:- is Control different operate and process parameters, manually adjustments, Take place due to special causes, Control relative humidity during harvesting and in storage

Automatic feedback control is applied continuously by computer systems and makes short-term, temporary changes to the system to keep it at the desired target (set point).

4.1. Coffee is Ethiopia main source of income, thus improving processing and monitoring has

a large potential economical impact we are introducing low-cost sensor Technology by utilizing embedded system

To monitor coffee washing station processing method and store centers, the system will be reporting the status of PH, moisture content, carbon dioxide (CO_2) and luminosity and temperature, time and other monitoring parameters

gure 4.5: Measuring moisture content in the solar coffee dryer (Photo by Karinne

Fig25. Control and measuring moisture content

Table 1. Optimum values for coffee cultivation

Coffee cultivation values range

Altitude (masl)	^{O}C	Humidity	Sunshine hours per year	CO^2	pH
600–1800	18–24	70%–85%	1600–1800	700–900	5–5.5

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 next page.

Test-I. Short answer questions

1. Write the importance of control charts (5 points)
2. What are the coffee variable monitors? (5 points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

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

Information Sheet -5:- Identifying, rectifying and reporting out-of-specification process outcomes

5.1. Identifying out-of-specification of product

Out-of specification of a product means a condition in which the product did not fall in a specified condition, like chemical composition, physical appearance, recommended quality and so on.

There are many factors that lead a product in to out-of specification such as;

- quality of raw material,
- production/processing temperature and Pressure
- Harvesting or post harvesting conditions.
- Washing materials used
- Efficiency of a machine
- Varieties of production
- Product handling system or mechanisms

In any food processing industry, out-of specification can be happen due to many factors. Several general factors affect the stability of green bean as well as most harvesting coffee during storage.

One of these factors is the degree of grading of coffee bean and tea. Product shelf-life is affected by manufacturing conditions such as the type of extraction process.

Other major factors influencing the oxidative stability are the particular storage conditions: moisture content, humidity, time, temperature, and light, among others.

5.2. Problem Identification

- Think back about what you, the process, the team, the organization or whatever were doing just prior to the problem.
- Look at the symptoms of the problem without disturbing the condition of the system, process or whatever is giving off problem signals.
- Consider the possibility of specification error, that is, you're misinterpreting what you're seeing.
- Ask yourself if there are alternative explanations for what's occurring (or did occur in the past).

- State your description of the problem.

Investigation

- Think about how the problem can be reproduced – this is useful to test your understanding of it check effectiveness of any proposed solutions.
- Identify the symptoms of the problem – symptoms are signs of how things appear and are not necessarily causes.
- Try to understand how severe could the problem be – you may not see the full, worst case manifestation of it so you need to avoid coming up with a over-simplified or weak solution.
- Now drill down into what might be causing the problem – look for the cause and
- Consider alternative solutions, for example, what might be a workaround? No need to create complicated solutions if you can run around the obstacle in some other easier and more efficient way.
- State your recommended solution and why you think it will work.
- Talk to somebody else to get a second opinion, make sure you didn't miss anything important.

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 -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 billow.

Test-I. Short Answer questions

1. Write types of 2 step rapid out-of-specification process outcomes identification method? (3 points)
2. What are factors that lead a product in to out-of specification (3 points)
3. Describe Steps of rectifying out-of-specification process outcomes? (4 points)

Note*:* Satisfactory rating - 8 points Unsatisfactory - below 5

You can ask your teacher for the copy of the correct answer

Information Sheet -6. Maintaining the work area

6.1 Maintaining the work area

Maintaining the work area cleanness is playing the vital role of the organizational success. It includes keeping work areas neat and orderly; maintaining halls and floors free of slip and trip hazards; and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas.

It also requires paying attention to important details such as the layout of the whole workplace, aisle marking, the adequacy of storage facilities, and maintenance. Good housekeeping is also a basic part of accident and fire prevention.

A safe work environment Including facilities, Amenities and accommodation.

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

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

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

- ➢ **Housekeeping standards**

Untidy workplaces may lead to injuries e.g. slips and trips, therefore good housekeeping practices are essential for all workplaces.

For example:

- ✓ Spills on floors should be cleaned up immediately
- ✓ Walkways should be kept clear of obstructions
- ✓ Work materials should be neatly stored
- ✓ Any waste should be regularly removed

- ✓ Suitable containers for waste should be conveniently located and regularly emptied.

- **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.

- **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.

- **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

- **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 odors.
- ✓ 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 re circulate some of the indoor air.

- **Drinking Water**

Free potable drinking water which is cool, clean and palatable is required at each place of work.

The supply of drinking water should be:

- ✓ Positioned where it can be easily accessed by workers
- ✓ Close to where hot or strenuous work is being undertaken to reduce the likelihood of dehydration or heat stress
- ✓ Separate from toilet or washing facilities to avoid contamination of the drinking water
- ✓ Below 24 degrees Celsius
- ✓ Supplied in a hygienic manner e.g. upward jet fountain, via disposable or washable drinking containers.
- ✓ Non-drinking water should be marked accordingly.

Self check-6	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 billow.

Test-I. **Short Answer Questions**

1. Write a good housekeeping practices which are essential for all workplaces (5 points)
2. Write at list five items that a work environment, facilities and amenities are provided for basic health and welfare of employees, contractors and visitors (5 points)

Note: Satisfactory rating - 8 points Unsatisfactory - below 5 points

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

Information -7:- Conducting work

7.1. introduction

Conducting work is procedure sets out the steps to be followed for work activities.

You must consult with affected workers when developing procedures for resolving work health and safety issues, consulting with workers on work health and safety, monitoring worker health and work place conditions, and providing information and training

Work is carried out: loading vehicles is transport material, equipment and machine for heavy machine or carry heavy machine equipment product in the coffee industry.

Loading the raw material and equipment: the small laboratory equipment like moisture control instrument, thermometer.

7.1. 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

7.2. Benefits of Waste Minimization

While it is obvious that 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.

7.3. 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.

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. 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)

Test –II. Choose

1. which one the following are Workplace environmental guidelines

   A. reducing emissions B. seeking alternative sources of energy C. Efficient and effective use of energy and other resources D. all
2. Which one of the following are Benefits of Waste Minimization?

❖ A. Economic benefits B. reducing emissions C. seeking alternative sources of energy D. none

Note: Satisfactory rating – 8 points Unsatisfactory - below 10 points

You can ask your teacher for the copy of the correct answer

Information -8:- Maintaining workplace record

8.1. **Importance of workplace record**

- Gives you the information you need to run your business and help it grow
- Helps identify the strengths and weaknesses in your coffee packaging process
- helps manage changes and improvements in your packaging process

8.2. 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 log books:-are used for a variety of reasons throughout the production area to aid with the recording of information relevant to machine operation or other information records.

Routine maintenance schedules

Manufacturers' advice and condition monitoring information

Table 3 maintenance schedule

Maintenance schedule

Date ----------

Prepared by:----------

Submitted to: ----------

Approved by: ----------

No.	Task description	Task duration	Due date	Target date	Resource names	Person responsible	predecessor
1							
2							
3							
4							

Self-Check -8	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 question?

1. Explain the Importance of workplace record? (5 points)
1. What is SOPs? (5 points)
2. Write types of workplace maintenance records? (5 points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answer

Operation sheet 1:- Monitoring operating equipment

The following procedures should be taken into account to monitor operating equipment.

Procedure of operating equipment

Step1: check the efficiency and reliability of machine

Step2: identify the operation part of machine/equipment

Step3: use monitoring testing device for operation

Step4: control the temperature, pressure gauge and time of equipment

Step5 calibrate equipment properly

Step6: report and verify

Step7: ready for next process

Operation sheet 2: Identifying Variation in equipment operation and report maintenance requirements

The following procedures should be taken into account to identify variation in equipment operation

Procedure of variation and report maintenance

Step 1: use appropriate personal protective equipment

Step2: list the name of variation equipment.

Step 3: identify the name of harvesting machine component

Step 4: record equipment Information.

Step 5: cost analysis of component of machine

Step 6. Adjust for maintenance

Step7: report and verify

Step 8: Suggestions and Signature

Operation sheet 3: Monitoring the process to meet specifications

The following procedures should be taken into account to monitor the process

Procedure

Step: 1 use appropriate clothing

Step: 2 Complete Background Tasks.

Step: 3 Designs and Implement Management.

Step: 4. Design the Monitoring Methodology.

Step: 5. Implement Monitoring as a Pilot Study

Step 6. Monitor the process to meet specification

Step: 7.ImplementMonitoring.

Step8. Ready for the next process

LAP Test	Performance Test

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task -1. Monitor operating equipment

Task -2. Monitor Variation in equipment operation

Task-3. Perform monitoring process

LG#17	LO3. Shut down the pre-processing process

Instruction sheet

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

- Identifying appropriate shut down procedure and process
- Identifying and reporting maintenance requirement

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

- Identify appropriate shut down procedure and 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 your performance is satisfactory proceed to the next learning guide,

Information-1. Identifying appropriate shut down procedure and process

1.1.Introduction

Definition of shut down procedures

Normal shutdown includes steps to render the systems safe, such as removal of hazardous process materials and inert (asphyxiating) gases.

The systems might be cleaned as part of the shutdown; cleaning is often a machine shutdown is a temporary closure of a building to perform maintenance.

The main activities should be preventative in nature with the focus on equipment inspections. This is the best time to replace worn-out or broken process materials and equipment at their useful end-of-life process unto itself requiring its own set of startup, operation, and shutdown procedures.

1.2. The following procedures should be taken into account to identify shutdown procedures.

Shut down must be conducted using the standard procedures established for the Machine or equipment (not emergency procedures or other shortened/simplified method).

Pull plug or throw switch to off position before cleaning or adjusting any machine and away from moving parts. Wait until machine stops before moving coffee and tea.

1.2.1. shut down procedure

Step1: A comprehensive list:

Step 2: Have it in inventory

Step 3: Safety first

Step 4: Within current specifications

Step 5: Inspect before installation

Step 6: Precise installation

Step 7: Inspection before restart:-

1.3. Advantage of appropriate shut down procedure

- ✓ reduced unplanned downtime
- ✓ reduced overtime

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. Write at least two Advantage of appropriate shut down procedure (3 points)
2. Define shut down procedures? (2 points)
3. Describe requirements of different shutdowns procedures appropriate to the processes? (2 points)
4. Mention the following procedures should take in to account to identify shutdown procedures? (3 points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct answer

Information-2. Shutting down the process

2.1 Definition of shut down processes

Shut down is a term used to describe the process of closing all systems of process control systems.

2.2 Uses of Shutdown Processes

- Safely shut down of the equipment.
- To locate emergency stop functions on the equipment.

2.3. Shut down the process includes.

- Clean and sanitize equipment
- Take samples and conduct test
- Carry out routine maintenance

2.4 Environmental Issues related to Shutting down process

Controls Relevant to the Process Including.

- inclement weather during operations
- machinery breakdowns
- power outages
- storm damage to equipment and site

.

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. Define shut down processes (3 points)
2. Uses of shutdown processes (3pointts)
3. mention environmental issue relevant to the processes (4points)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct

Information-3. Identifying and reporting maintenance requirement

3.1. Definition of maintenance requirement

Maintenance requirements are the processes of maintaining work area to meet housekeeping standards and Respond to and/or report equipment failure within level of responsibility

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

Food premises and equipment that are not kept in good repair and condition are a potential source of microbiological and physical contamination of food. Poorly maintained premises and equipment cannot be cleaned effectively. Poor maintenance may allow the entry of other sources of physical, microbiological and chemical contaminants such as water, pests and dust. Poor maintenance can have health and safety implications for workers.

3.2. Identifying and reporting maintenance requirements

To minimize the hazards that might be happen during equipment operation, you have to check that the equipment was in a god operating condition or not. If there is a defects on it, report and undertake maintenance before starting operate equipment.

The maintenance that needed may be adjusting thermocouple, pressure sensors, some components of a machine or equipment and etc

3.3. Maintenance activities

Maintenance of equipment was the basic and mandatory activities in an industry. Many hazards that might be happen was due to lack of maintenance activities before, during and after operating a machine or an equipment. The following are the maintenance activities that will be done in a food processing industries. Such as: Operational maintenance (e.g. connection-disconnection of hoses, greasing lubrication and lubricant systems, adjusting sealing glands, cleaning and changing filters, 'nipping up' flanges) General cleaning Removal and replacement (e.g. gland

packing, changing blades or cutters, replacing gaskets, replacing /maintaining seals, changing filter elements, servicing strainers).

3.4. Purposes of Maintenance Requirement

Maintenance requirement requires that: all sorting and grinding equipment be maintained in an efficient state, in efficient order and in good repair. Where any machinery has a maintenance log, the log is kept up to date; and that maintenance operations on work equipment can be carried out safely.

3.5. Uses of Maintenance Requirement

Are used to maintain typical equipment faults and related causes, including signs and symptoms of faulty equipment and early warning signs of potential problems

Table4. Example of simple "Repair Report"

GEAR DRIVE REPAIR REPORT	
Location: Building 511, 1st floor	**Machine separator 1**
Gear drive type: Reducer 1:20	**Serial no.: 10245156**
Date of putting in operation: 5/20/1997	**Manufacturer: Flender Germany**
Date of Repair: 5/26/2000 **Special maintenance requirements:** **Oil Grade 05**	**Auxiliary drives:** □ Belts _____ □ Chain _____ □ Coupling **Flexible Coupling** □ Others _____

Part	Failure	Mark	Part	Failure	Mark
Auxiliary Drive	Chain or belt broken		**Gears**	Seat worn out	
	Sprocket/Pulley worn out			Broken teeth	
	Keyway problem			Worn out teeth	**X**
	Drive shaft bent			Others	
	Coupling damaged		**Lubrication**	No oil	
	Coupling rubber broken	**X**		Little oil	**X**
	Others			Dirty oil	

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 - Short Answer Questions

1. Define maintenance requirement? (3points)
2. Describe uses of maintenance requirement? (3pts)
3. Describe purposes of maintenance requirement? (4pts)

Note: Satisfactory rating – 8 points Unsatisfactory - below 5 points

You can ask your teacher for the copy of the correct

List of Reference Materials

- Comprehensive coffee development and marketing plan. Addis Ababa: Federal Democratic Republic of Ethiopia (FDRE), Ministry of Agriculture and Rural Development IMF. 2006
- Alpizar E, Bertrand B (2004). Incidence of elevation on chemical composition and beverage quality of coffee in Central America. In: 20th International Conference on Coffee Science (ASIC), 11-15 october, 2004, bangalore, india, pp. 322-327
- coffee quality and safety manual
- Edible, Medicinal and Useful Plants for a Healthier World. http://www.pfaf.org/ accessed on 3 February, 2009. 2. Wikipedia, the free encyclopedia. http://en.wikipedia.org/wiki/Camellia_sinensis accessed on 2 February, 2009. 3. Tea and oral health fact sheet
- www, coffee pulpier processing refer video of oolong tea processing
- www.black tea processing green tea processing video of coffee washing machine here
- This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do
- Framework for the Food and Beverage Processing Industry NFITC June 1995.
- http://osha.europa.eu
- https://www.usda.gov/sites/default/files/.../USDA-aphis-shutdown-plan.
- http://www.springleaf.com.au/images/Tea_and_oral_health.pdf 4. Asian News, Feb 6-12, 2009, Volume 4 No 4, a magazine found online at www.asiannews.net accessed on February 8, 2009.