የሥራና ክህሎት ሚኒስቴር
Ministry of Labor and Skills

Dairy product processing

Level-II

Based on October, 2019 Version 2 Occupational Standards

Module Title: Operating a Bulk Liquid /Milk /Transfer Process

LG Code: IND DPP2 M08 LO (1-5) LG (31-35)

TTLM Code: IND DPP2 TTLM1222v1

December, 2022

Addis Ababa, Ethiopia

Table of Contents

Introduction to Modules

This unit covers the knowledge, skills and attitude required to prepare bulk liquid transfer and sampling equipment for process operation, Collect samples, transfer bulk raw milk and complete transfer operations and practice in obtain and provide information in bulk raw milk transfer.

LG #31	LO #1- Prepare bulk liquid transfer equipment and process for operation

Instruction sheet 1

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

- Identifying tank locations, product/materials holdings and capacities.
- Confirming actual and recorded holding levels.
- Inspecting, identifying and reporting maintenance condition of farm tank equipment.
- Selecting transfer equipment settings and operating parameters.
- Establishing priorities for materials transfer

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 tank locations, product/materials holdings and capacities
- Confirm actual and recorded holding levels
- Inspect, Identify and Report maintenance condition of farm tank equipment
- Select transfer equipment settings and operating parameters
- Establish priorities for materials transfer

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet 1

1.1 Identifying tank locations, product/materials holdings and capacities.

1.1.1 Introduction

Farm milk transport operator" shall mean one who grades, samples and gauges milk in farm milk tanks and transports milk from farms to milk plants. Formerly, when dairies were small, collection confined to nearby farms.

Stainless steel milking pails are an improvement on the utensils commonly used. The producer should use small aluminium milk Cans of 5-10 litter capacity for transporting milk, while the collector should use 30-50 litters' cans

The milk collector must have the following equipment during milk collection:

- The use of Motor bicycle and bicycle
- Graduated cylinder lacto-densitometer / lacto sane
- Measuring pail

Figure 1.1: **Milk collection by motor bicycle, bicycle and cylinder lacto-densitometer**

The following equipment needed for the reception of milk brought in by producers themselves and by the collectors:

- Milk scale
- Milk Pail
- Milk funnel and 50-liter milk can
- Milk tank
- Milk can
- Milk bucket

Figure1.2: Milk bucket

Figure1.3: milk tank

Figure-1.4 Milk can

Figure 1.2 Milk measuring pail.

Figure 1.6: Tanker on a weighbridge

The microorganisms in the milk could keep under control with a minimum of chilling, as the distances were short and the milk collected daily. Today the trend is towards progressively larger dairy units. There is a demand for a higher production and increased quality of the finished product. Nowadays milk collection usually takes place every other day, but the interval can sometimes be three days and even four Farm milk tank" shall mean a unit for measuring milk or other fluid dairy product, comprising a combination by:

- A stationary tank, whether or not equipped for cooling its contents.
- Means for reading the level of liquid on the tank, such as a removable gauge rod or surface gauge.
- A chart for converting level-of-liquid readings to gallons and pounds.
- Chart readings shall also be shown in avoirdupois weight in conjunction with gallon readings based on eight and six-tenths (8.6) pounds milk per gallon.
- Each compartment of a subdivided tank have purposes of this article construed to be a farm milk tank

- They are variously known commercially bulk farm tanks
  - ✓ Farm cooling tanks
  - ✓ Farm holding tanks
  - ✓ Producers' tanks.)

1.1.2 Size/Scale of Milk Processing Equipment

a. Small Scale Milk Processing Equipment/Materials

The Small Scale Milk Processing Materials and equipment are those used in small dairies, mini dairy plants, small milk collection centers and small milk chilling stations. The milk handling is normally small in the range of 1000 Litre to 5000 Litre. Only few essential materials and equipment are used in such small dairies/centres.

Figure 1.7: Small Scale Milk Processing

b. Medium Scale Milk Processing Equipment

The Medium Scale Milk Processing Materials and equipment are those used in medium size dairies and their attached canters. The milk handling is normally medium in the range of >5,000 Litre to 10,000 Litre.

Figure 1.8: Stainless Steel Milk Cans

c. **Large Scale Milk Processing Equipment**

The Large Scale Milk Processing Materials and equipment are those used in Large size dairies and their attached centres The milk handling is normally high in the range of >10,000 Litre.

- ✓ Milk handling capacity more than 10000 Litre per day -Almost all Process Equipment available -Bigger in size, heavy weight, maintenance is moderately easy to complex, good expertise required.
- ✓ Semiautomatic/automatic operated.
- ✓ Medium to high level of automation can be observed in this equipment.
- ✓ High investment required.

Figure 1.9 Milk collection can

Figure 1.10 Milk funnel

1.2. **Confirming Actual and Recorded Holding Levels.**

The milk is brought from the farm (or collecting Centre) to the dairy product processing center for processing.by different holding capacity receptacles milk tanks have used and still in use throughout the world from 2-3 liters calabashes and pottery to modern bulk cooling farm tanks for thousands of liters milk tanks. Today the trend is towards progressively larger dairy units. Then high milk holding tanks required for:

- There is a demand for a higher production and increased quality of finished product.
- Milk must brought from farther away and this means that daily collection is generally out of the question.
- Nowadays, collection usually takes place every other day, but the interval can sometimes be three days and even four.
- Milk tanks in a dairy factory used for a number of purposes.

- The sizes range from 150 000 litters for the silo tanks in the reception department down to approximately 100 litters for the smallest tanks.
- Milk tanks generally divided into two main categories according to function:
  - ✓ Storage tank
  - ✓ Process tank

1.2.1 Storage tank

A. Silo tank

Silo tanks for milk reception belong to the storage category.

- They vary in size from 25 000 to about 150 000 litres
- The wetted surfaces are made of stainless steel.
- They often placed outdoors to save on building costs.
- In these cases, the tanks insulated.
- They have a double shell with a minimum of 70 mm mineral wool insulation in between.
- The outer shell can be of stainless steel, but for economic reasons, it is usually made of mild steel and coated with anti-corrosion paint.
- To make complete drainage easy, the bottom of the tank slopes downwards with an inclination of about 6 % towards the outlet.
- This is a statutory requirement in some countries.
- Silo tanks are fitted with various types of agitators and monitoring and control equipment.
- The number and size of the silo tanks are determined by factors such as
  - ✓ The milk intake per day
  - ✓ The number of days per working week

- ✓ The number of hours per working day (one, two or three shifts)
- ✓ The number of different products to be manufactured
- ✓ The quantities involved.

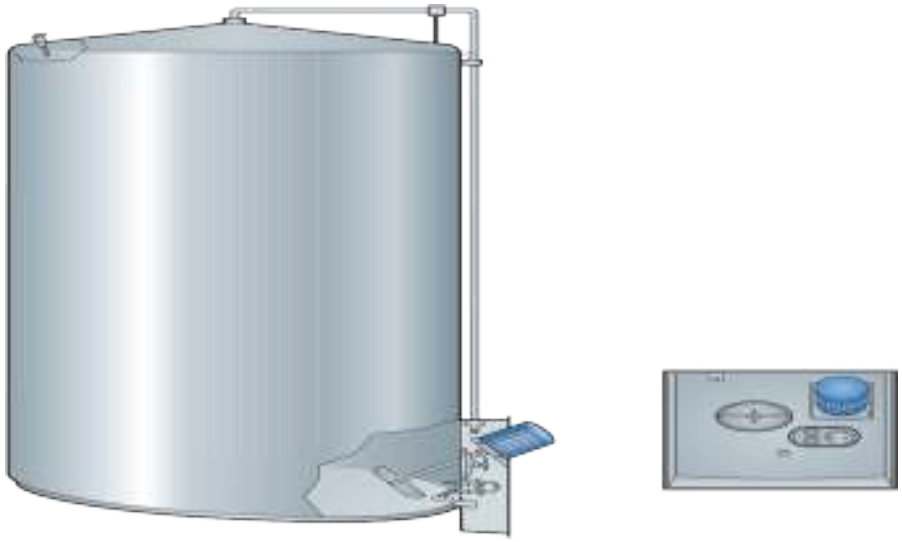

Figure 1.11: Silo tank alcove with manhole and motor for propeller agitator.

B. Intermediate storage tank

These tanks used to store a product for a short time before it continues along the line. They used for

- Buffer storage to level out variations in flow.
- After heat treatment and cooling, the milk pumped to a buffer tank and from there to filling.
- If filling interrupted, the processed milk buffered in the tank until operation can be resumed.
- Similarly, milk from this tank used during a temporary processing stoppage.

- In storage tanks with a capacity of 1 000 to 50 000 litters the inner shell is made of stainless steel.
- The tank insulated to maintain a constant product temperature. In this case, the outer shell is also of stainless steel, and there is a layer of mineral wool between the shells.
- The storage tank has an agitator and can be fitted with various components and systems for cleaning and for control of level and temperature.
- This equipment basically, the same as previously described for silo tanks.
- A good general assumption is that the process requires a buffer capacity corresponding to a maximum of 3 hours normal operation i.e. 3 x 20 000 = 60000 litters.

Figure 1.12.Intermidate storage tank has a capacity of 1,000 litters to 50,000 litters.

C. Mixing tanks

As the name implies, these tanks used for mixing different products and for the admixture of ingredients to the product:

- The tanks may be of the insulated type or have a single stainless steel shell.
- Equipment for temperature control may fitted.
- Insulated tanks, with mineral wool between the inner and outer shells, have a jacket outside the inner shell through which a heating/cooling medium pumped.
- The jacket consists of welded on channels.
- Agitators for mixing tanks designed to suit the specific application.

Bulk milk mixing tank

https://www.youtube.com/watch?v=JnmvPi6CZ0M (access date 24/11/22)

Figure 1.13: bulk milk mixing tank

1.2 Inspecting, identifying and reporting farm tank condition and equipment operation

1.3.1. Introduction

Inspecting and Checking fist the Condition of farm tank and equipment before any operation to make sure that the farm tank/ equipment or machine functional and in good condition.

A. Materials tools and equipment's.

- Lacto scan
- Lacto meter
- Milk cans
- Storage thank
- Reception thank
- PH meters
- Supply can

1.3.2. Checking and inspecting farm tank and equipment

Consistently checking and inspecting equipment/ farm tank and machines will facilitate preventive maintenance, which include

- Machine temperature
- Wear and surface condition
- Corrosion
- Electric insulation

Performing consistently checking and inspecting` farm tank/ equipment or machine pre and after operation activities to ensures that all the tools, equipment and utensils are

- Properly assembled and checked
- Inspected and sanitized

General if any problem/ defect occurred on farm tank/ equipment or machine reporting on time to the supervisor or concerning body decrease the cost of maintenance, increase the service life of farm tank/equipment and improve the product quality and quantity of dairy product. Appropriate dairy product processing producer include:

- Milk collecting
- testing quality
- Cooling
- Transporting
- Homogenising
- Pasteurizing

1.3.3. Working condition of equipment

In daily operation, the working condition of dairy product processing machinery should paid close attention. Each machine has its own feature, if overlooking the actual detailed functioning problems; the potential risk will affect the quality of dairy product and dairy product processing. Correcting operation and maintenance will guarantee a long lasting and better working performance of farm tank or machine.

Therefore,

- Read the instructions of the machine carefully
- Aware of the operation methods.
- Use the dairy product-processing machine strictly according to the instructions of the farm thank or machine

When the machine just bought or installed all staff, operator should

- Check the complete machinery, from the whole frame to the spare part.

- The connecting part should lubricate regularly.
- Furthermore, test the machine to see if it stands stable on the ground, to ensure a stable dairy product processing performance.
- If there is anything wrong with the machine, turn off the power as soon as possible.
- Examine the problem and restart the wok again when all the problems are settled.
- Complete washing is a dispensable part during season change maintenance.
- The whole set of machine should be kept in a cool and dry condition, protecting the dairy product processing machine from rusted
- Maintain the machine according to the instructions.

1.4. Selecting transfer equipment settings and operating parameters

There are many milk transferring equipment setting and operating parameter system in modern dairy production and product processing.

1.4.1. Milk Testing Unit (Milk Analyser Instruments):

The incoming milk is tested for different tests like specific gravity, acidity, Fat content, SNF, Protein content, Microbial load etc. to check the quality parameters of milk and to enable the acceptance/ rejection and grading of milk.

Figure 1.14 Milk Test a. Lactometer b. **Digital lactometer**

1.4.2. Milk Collection & Measurement:

a. Weigh tank/pan & weighing scale

Milk brought by farmers/dairy farms in milk cans/small utensils, is collected in weigh tank and weighed by weighing scale and recorded.

b. Volumetric Basis Measurement Devices:

Sometimes, milk quantity is measured using volumetric devices on volume basis.

Figure 1.15: Milk Weigh Tank with Weighing Scale

1.4.3. Milk Drop (Dump) Tank:

Receiving Milk is dumped in Dump tank. Dump Tank is provided with a muslin cloth filter for filtering the milk and also has a cover for protection. The tank is made out of stainless steel.

Figure 1 16: Milk Dump (Drop) Tank

1.4.4. Milk Storage Tanks

For storage of Milk, the Storage tank (500L to 5000 L or higher as per requirements) are used. The storage tanks are insulated with polyurethane foam (PUF) so that they maintain the temperature during storage. The tanks are provided with agitators with motors. The tanks are normally manufactured in stainless steel.

Figure 1.17: Milk Storage Tanks

1.4.5. Cooling Equipment

In order to preserve milk for better quality, milk is cooled down to 4 deg C by using different types of cooling equipment as follows:

https://www.youtube.com/watch?v=fMzKqXEmaHQ (access date 24/11/22)

a. Immersion type can cooler

Milk cans are immersed in cold water/ice water/cold chamber in a tank for cooling of milk

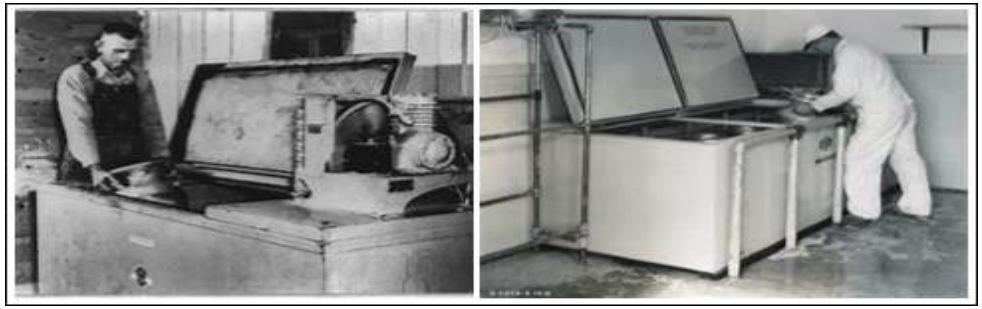

Figure 1.18: a, Immersion Type Can Cooler b, Surface cooler

b. Surface cooler/Plate Cooler

It can be of simple surface type (used in older times) or plate type in which a plate heat exchanger is used.

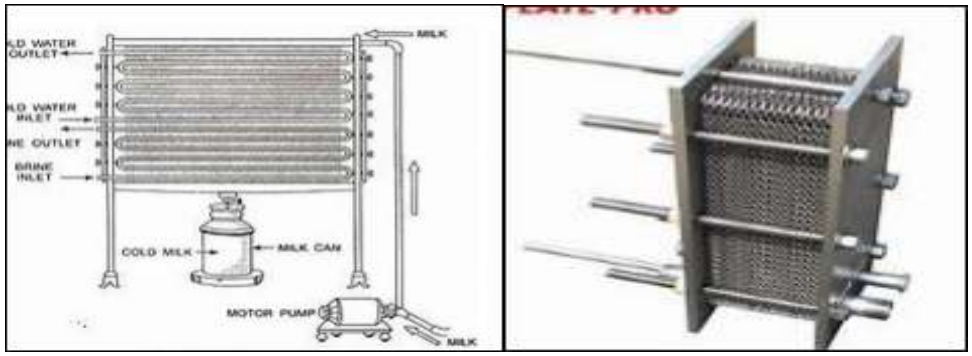

Figure 1.19: a. Surface Type Milk Cooler b. Plate Type Milk Cooler

c. Bulk Milk Coolers (BMC)

Bulk Milk Coolers are installed for cooling of milk to 4 degree C in Collection centres. Capacity varies (500 Lit to 3000 Lit or higher). These are sometimes installed at Dairy Farms also.

Figure 1.20: Bulk Milk Cooler (BMC)

1.4.6. Cleaning Equipment:

As hygiene is most important, milk collection centre has to be equipped with suitable cleaning and sanitizing facilities.

a. Can Scrubber:

It is used for scrubbing the milk cans from inside and outside. It consists of water through with a central motorized shaft mounted with a brush which provides scrubbing action on inner side of cans. The two side brushes provided on the inner side of trough facilitate scrubbing of outer can surface. The scrubbing action enables to remove dirt and deposits on the can surfaces from inside and outside and accordingly help to clean the cans.

Figure 1.21: Milk Can Scrubber

b. Can Washer:

Can washer is used for washing/cleaning and sanitizing of Collection cans. It can be rotary type wherein can path is in a circular style or straight through type wherein cans path is in a straight line entering, from one end to exit at the other.

Figure 1.22: Milk Can Washer

1.5. Establishing priorities for materials transfer

In the dairy production, raw milk passes through several stages starting from farm up to processing centers for treatment in various types of processing equipment before reaching the consumer in the form of a finished. The processing usually takes place continuously in a closed process, where the main components connected by a system of pipes. Quality of milk product affected by many factors like

- The raw milk production and handling at farm level
- Raw milk transportation from farm to dairy product processing center.
  - ✓ payment parameters
  - ✓ quality control of the raw milk

A. Temporary storage by Refrigerator

The milk may arrive at a chilling center or dairy plant in cans. After unloading the cans, milk chilled and stored in storage tanks. Storage tanks used to store raw or even pasteurized milk.

Milk storage vats or silos are refrigerated and come in various shapes and sizes. Milk stored at the farm level around 5 degrees Celsius 5°C or colder, for no more than 48 hours. All fresh fluid milks should be stored at temperatures below 40 °F and not stacked high in the display cases. If stored above 40 °F milk develop signs of spoilage including

- Sour odor
- Off-flavor

The Temperature Danger Zone is between 41° and 140°F.Maintaining the Safety of Milk: Refrigeration is the single most important factor in maintaining the safety of milk.

- Milk and must be maintained at a temperature of 5 ºC or below.
- Dairy products must be stored in the refrigerator at temperatures of 4°C or below.

B. Milk Recording book or Computer

Milk arrives at the milk dairy processing plant over the weighbridge and the weight of milk automatically recorded. At the same time, data from Record book/ on-board computer/ downloaded wirelessly to a data capture system, which holds the

- Records of the temperature volumes of milk collected from each farm
- The temperature should be at 4–6°C. Milk samples
- Using sterile containers collected automatically from each supplier at source
- Delivered to a laboratory technician for detailed analysis.
- Milk that deviates in composition, taste, and smell from normal milk receives a lower quality rating
- The samples from each compartment tested for acidity, antibiotics, added water, fat, and protein content.

Self-check 1	Written test

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

I. Choose the best answer (each 2 point)

1. What is the immediately cooling temperature of milk after milking?

A. 4 °C. C. 65°C for 30 minutes

B. 37 °C. D. 72°C for 15sec

2. Which one of the following bacterial fermented milk product affected Milk from sick animals treated by antibiotic?

A. Yoghurt C. A and B

B. Cheese D. None

3. _____ one who grades, samples and gauges milk in farm milk tanks and transports milk from farms to milk plants

A. Farm milk transport operator C. Separator

B. Pasteurizer D) Churner

4 What are the capacity of milk can, for milk producer and milk collector have during milk collection for transportation?

A. 5-10 litter capacity for milk producer C. 100_150,000 litters

B. 30-50 litters' for milk collector D. A and B

5. Which one of the following material is/are pipe components milk and milk product?

A. Stainless steel C. Copper and Aluminums

B. cast iron D. Plastic

II. Write short Answer Questions

1. Write the two main categories of milk tanks based on its function! (2%

2. List down the type's milk storage tank! (4%)

3. List down why high milk holding milk tank required! (4%)

Note: **Satisfactory rating above 50 %** **Unsatisfactory below 50 %**

LG #32	LO #2- Prepare for Sampling

Instruction sheet 2

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

- Identifying sampling requirements
- Preparing Sampling equipment, containers and labels
- Following and checking materials/product clearance procedures

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 sample requirements
- Prepare sample equipment, containers and labels
- Follow and checks materials/product clearance procedures

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test

Information Sheet 2

2.1. Identifying sampling requirements

2.1.1. Introduction

The farm bulk milk sampler plays a very unique and important role in the dairy industry as a representative of both the buyer and the seller of raw milk. The sampler's judgment and decisions with regards to quantity, sampling, and quality of the milk at the farm has a direct effect on the final milk price paid to the producer andalso the quality of the milk products being offered for sale.

The sampler must possess many skills in addition to being able to negotiate a large truck over a variety of terrains under all types of

weather conditions. The driver is first a food handler. All steps taken by the sampler must protect the milk from contamination. Personal appearance, milk sampling and pickup practices and the appearance of the truck reflects upon this role. The sampler is responsible for hisor her vehicle and all of its equipment regardless of who cleans and sanitizes that equipment including the tanker, the hoses, valve lid, gasket, vent, and sample dipper andsample dipper container.

The sampler must be able to determine and record milk weights accurately and collect and handle milk samples properly. It is important for the sampler to appreciate the need and take responsibility for cleanliness and sanitation in the handlingand protection of samples entrusted to his or her care. Sufficient time must be taken to perform all duties in the proper manner.

The sampler is a most important link in the chain of events that moves milk from the farm to the processing plant. A chain is only as strong as its weakest link. By being the middle link, the sampler is in a position to ensure that the good quality milk collected from dairy farms is handled properly so that the quality is maintained between the farm and the milk processing plant.

2.1.2. Licensing

Each hauler/sampler, whether full-time, part-time, a relief driver, or an emergency driver,must be licensed by each state in which they pick up milk even if they only pick up milk infrequently in that state. Applicants for a hauler/sampler license must be qualified, trained and evaluated. For all new applicants, this includes both a written exam and a field evaluation administered by the state regulatory agency. A state regulatory agency may accept the examination results and field evaluation conducted by another state if the hauler/sampler is applying to be licensed in more than one state. It is mandatory for everyone who holds a Certificate of Competence to weigh and Sample Milk (CCWM) to have attended at least one training seminar during the three year period their license was in effect to have their license renewed.

If someone fails to attend at least one training seminar during the three year period their license was in effect they will have to retakeand pass the examination to renew their license Field evaluations of licensed hauler/samplers are conducted at least once every 24 months (two years) by the state regulatory agency.

2.1.3. General Information of Milk Sample

Hauler/samplers shall practice good hygiene, shall maintain a neat and clean appearance and shall not use tobacco in the milk house. Outer clothing must be freeof any loose particles which may come off into the milk supply or the sample being taken. Always pick up all of the milk in the producer's bulk tank.

Generally the driver is not required to physically clean the inside of the tanker but it is the responsibility of the driver to determine that the tank is clean and sanitized prior to picking up milk. The milk pump, hose, valve and pump compartment must be cleaned and sanitized after each delivery, or once each day if the truck is immediately going out on another route.

2.2. Preparing Sampling equipment, containers and labels

2.2.1. Milk sampling techniques

There is no need to test the whole quantity of milk – we can test only a small sample, to check the quality. Accurate sampling, however, is essential for a proper quality control system. Liquid milk in cans and bulk tanks should be thoroughly mixed to disperse the milk fat. Then, a sample for testing is taken from the can, using a plunger or a dipper. In the case of packed products, representative samples must be taken to make sure that the samples actually reflect the whole batch.

A. Preparation of samples

Make the sample homogenous most of samples are heterogeneous due to inter-unit variation or intra-unit variation.

Inter-unit variation – variation of properties in different units e.g. milk fat content variations that occur in different milk cans

Intra-unit variation – variation within individual units, e.g. fat content variation in one milk can.

B. Reduce the sample size

Smaller sample sizes are easier to manage during analysis, which reduces the chances of sample contamination and cross-contamination.

2.2.2. **Tools and Equipment for sampling raw** milk

a. Stirrer/Planter

This equipment is useful for attaining consistency in the milk/cream for a representative sampling of these dairy products. It is made of stainless steel, aluminum or any other metal that does not adversely affect the milk. It is effective mixing the sample milk.

b. Dipper/Scoop

It is mainly used to collect sample from the container. They vary in capacity. You do not need costly equipment for sampling. Just a few simple materials used in our day-to-day activities are enough.

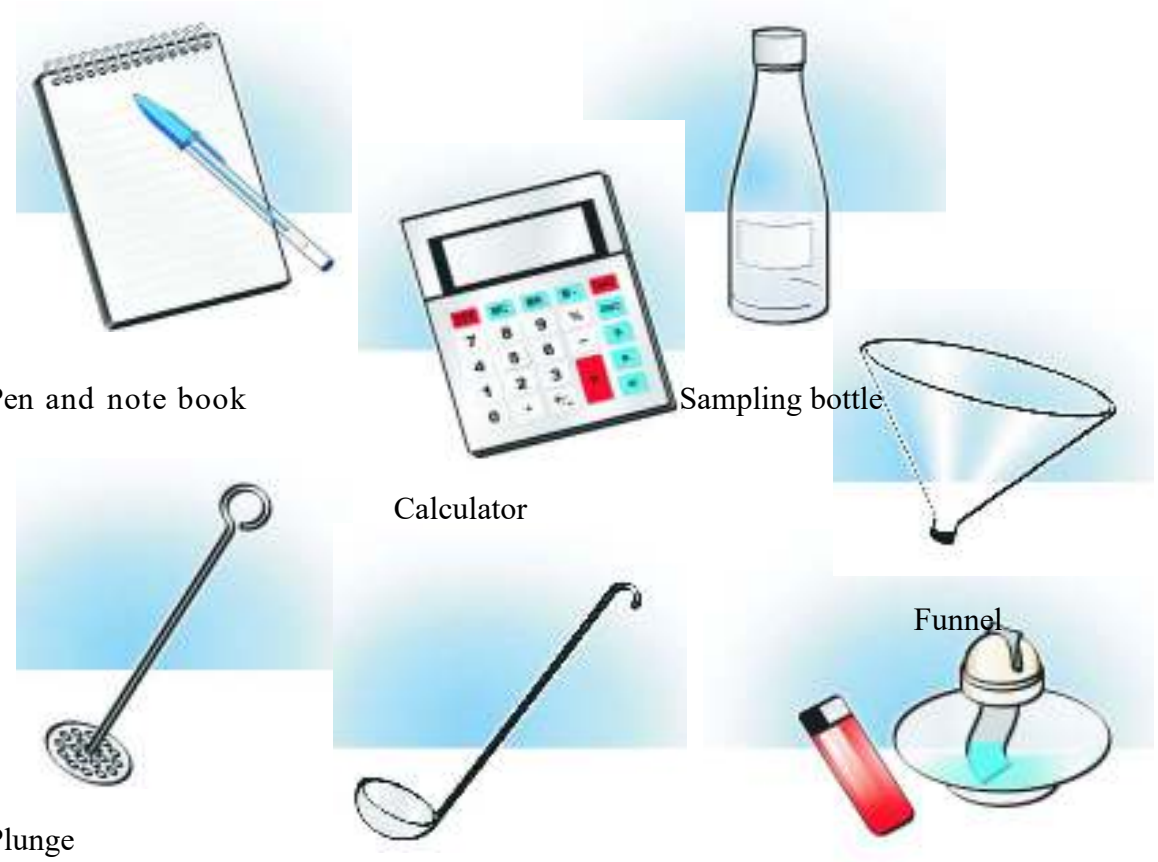

Figure 2.1 milk sampling tools

2.2.2. Essential Equipment's

It is essential that the hauler/sampler have on hand the necessary equipment to pick upmilk. All equipment and utensils used must be made of a safe, material andmust be in good condition free of dents, cracks or checks. This equipment includes:

a. Sample case and rack

The sample case should be constructed of rigid metal, plastic or other approved material for safe transportation of samples to the laboratory.

b. Refrigerant

A refrigerant is required to maintain samples at 5° C. The level of refrigerant should be kept at the level of the milk in the sample containers.The preferred refrigerant is ice and water.

c. Sampling instrument

This can be a seamless stainless steel dipper, sterile and straw other sampling device of sanitary design approved by the regulatory agency. The sampling device must be kept clean and in good repair.

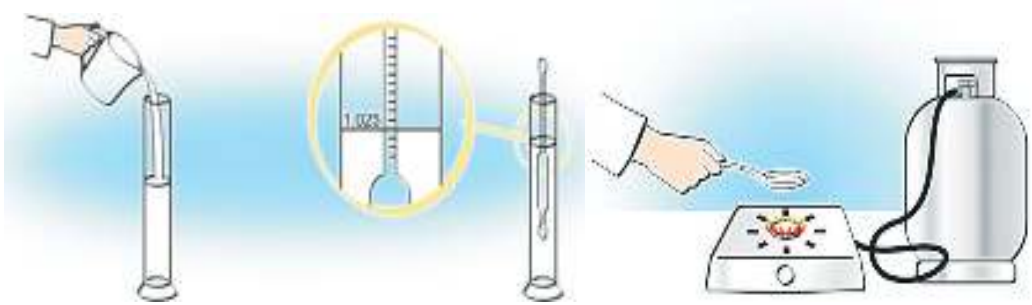

Figure 2.2 Lactometer

d. Sanitizer and sampling instrument container

Most sampling instruments must be stored and carried into the milk house in a tightly closed sanitizing solution container. The sanitizing solution must be of proper strength and must be discarded and replacedwith fresh solution after each tanker load of milk is picked up or sooner if it appears to be diluted in strength due to added solids such as milk or dirt, or due to added water.

Figure 2.3 milk container

Figure 2.4 a) Butyrometer **Figure b) PH-meter**

e. Sanitizer test kit

It used to check strength of sanitizer. The strength of the sanitizermust be tested every time the sampling instrument container is filled. You need to have a test kit for the sanitizer you are using.

f. Thermometer

A calibrated pocket thermometer must be used. This thermo meter can be metal type or digital. Thermometers must have gradations and be accurate to 2°1° C. Thermometers must be checked against a standard thermometer at least once every 6 months. A field check of the thermometer should be conducted periodically. This is done by placing the thermometer in a mixture of three parts to one part water. When the thermometer comes to rest it should read 32° F. If necessary, the pointer on a dial thermometer should be adjusted by turning the external adjustment.

Figure 2.5 a. milk thermometer **b. Digital milk thermometer**

2.3. Following, testing and checking materials/product clearance procedures

Some tests (e.g. color, smelling, testing, clots on boiling and alcohol test) can be done on the farm as well as at the milk collection center. Other tests such as lactometer test to detect adulteration or density (specific gravity) of milk, butter fat content, chemical and bacteriological tests may only be possible at the milk collection center or at a dairy laboratory. Hence, milk samples should be preserved in good condition until the test can be done. .

A. Organoleptic test

This is the simplest test just looking (eyesight) and smelling. If the milk has a bad smell, or abnormal colour, or contains particles, it should be rejected.

Figure 2.6 Organoleptic test

B. Clot on boiling (COB)

The COB test is an old, but very easy test. The test is designed to determine the overall quality of the milk. If used, it should be considered a preliminary test, but it can also be easily done in the field or on the farm. The COB test simply boils milk and looks at physical characteristics once the milk cools. If there is clotting, coagulation or precipitation, the milk has failed the test and should be rejected.

C. Ethanol/Alcohol Test

The ethanol/alcohol test is a very rapid test to determine overall quality of milk. It relies on how milk reacts with ethanol. High quality or otherwise normal milk will not react with ethanol.

Alcohol test

https://www.youtube.com/watch?v=jHUa3znff6E (access date 24/11/22)

D. Lactometer

A lactometer can be used for several purposes. It is basically a tool to measure the specific gravity or mass of milk. The normal density of cow milk is 1.026 to 1.032 and the density of fat milk is about 0.93. For example, milk has a higher specific gravity than water, so a lactometer can be used to test for added water. It can also be used to estimate total solids of milk. The total solids are basically the non-water portions of milk and make up about 13% of all milk (4% fat and 9% protein, lactate and other non-fat solids.

Determine milk density by lactometer

m.mp4

https://www.youtube.com/watch?v=agdFb9qPYQs (access date 23/11/22)

E. Lacto scan

Lacto scan is portable ultrasonic milk analyzer for quick analyses of fat, solids-non-fat (SNF), proteins, lactose, added water, temperature, freezing point, pH, solids, conductivity as well as density of one and the same milk sample directly after milking, at collection and during processing

Reading Results: The normal pH of fresh milk is around 6.6 – 6.7. High levels of microbial growth will produce acid, which lowers the pH of the milk. An estimation of the acidity of the milk samples can be made using the table below:

Table-2.1 Normality of milk

Measurement	Normal	Slightly Acidic	Acidic	Alkaline

pH	6.6 – 6.7	6.4 – 6.6	6.3 or lower	6.8 or higher
Color	Red/Brown	Yellow/Brown	Yellow	Pink/Purple
Physical Characteristics	No coagulation	No coagulation	Coagulation	No coagulation *

Milk analyzer by Lacto scan

m2.mp4

https://www.youtube.com/watch?v=lO2oJ7rN2l0 (access date 24/11/22)

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: Filling the blank space (15%) point)

1. _____is an old, but very easy test. (4point)
2. _____ is basically a tool to measure the specific gravity or mass of milk. (4point)
3. _____is the simplest test just looking (eyesight) and smelling. (3point)
4. _____is required to maintain samples at 5° C. (4point)

Test II: Short Answer Questions (25%)

1. Write the classification of milk tests? (5 point)
2. Write down reasons to examine the quality of milk? (5 point)
3. Write down at least three things to consider when sampling of dairy product? (5 points)
4. Write down Equipments used for sampling of dairy products: (5 point)
5. What are materials and tools used for taking sample of milk? (5point)

Note: Satisfactory rating - ≥ 20 points Unsatisfactory - below 20 points

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

Operation Sheet -2

2.1. Operate milk quality tests

a. Procedure of Clot on Boiling Test (COB)

1. Wearing appropriate Personal Protective Equipments(PPE) such as overall, glove, face mask, helmets and boats
2. Start flam away from all flammable objects.
3. Place milk in spoon using a pipette or similar device.
4. Hold milk/spoon over flame until milk boils
5. Allow milk to cool
6. Check for coagulation
7. If there is clotting or coagulation the test and should be rejected.

b. **Procedure of Ethanol/Alcohol testing**

1. Wearing appropriate Personal Protective Equipments(PPE) such as overall, hand glove, face mask, helmets and boats
2. Prepared necessary materials.

3. Add 20ml of milk and 70% of ethanol alcohol.
4. Mixing with sample milk and ethanol alcohol.
5. Identify milk is coagulate or not.
6. If the milk is does not react with alcohol the quality of milk is rejected.

c. Procedures of Lactometer testing

1. Wearing appropriate Personal Protective Equipments (PPE) such as boats, face mask, hand glove, gown, overall and helmet etc.
2. Prepared necessary materials.
3. Calibrate lactometer at standard temperature /20^{o}c/.
4. Drop or place milk into 200-250ml cylinder.
5. Then let lactometer sink slowly into the milk.
6. Take the lactometer reading just.
7. Finally identify milk is adulterated or not.

d. Procedures of Lacto scan testing

1. Wearing appropriate Personal Protective Equipments(PPE) such as boats, face mask, hand glove, gown, overall and helmet etc.
2. Calibrate lacto scan at standard temperature /20oc/.
3. Drop or place milk into 10 ml pipette
4. Then put the milk sample on lacto scan reading.
5. Then the lacto scan is reading all the composition of milk.

6. Compare the lacto scan reading and standard
7. Finally identify milk is adulterated or not.
8. If the milk is below standard or adulterated we can reject.

e. Procedure of Alcohol/Alizarin (AA)

1. Wearing appropriate Personal Protective Equipments (PPE) such as boats, face mask, hand glove, gown, overall and helmet etc.
2. Alizarin Solution (4.0g Alizarin dissolved in 1L 61% ethanol)
3. Combine equal parts alizarin solution and milk sample (example: 10 mL of milk sample
4. + 10 mL of alizarin solution).
5. Mix thoroughly.
6. Incubate at room temperature for 10 minutes.
7. Check samples for coagulation and record color.

Lap Test-2	Performance Test

Name _____

_____ IDNO. _____ Date _____

Time allocated: 2 hrs. Starting time _____Ending time _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **3** hour. The project is expected from each student to do it.

Task-1 Perform clot on boiling testing

Task-2 performs Ethanol/Alcohol testing:

Task-3 perform Lactometer testing

Task-4 perform Lacto scan testing

Task-5 perform Alcohol/Alizarin (AA) testing

LG #33	LO #3- Collect samples
Instruction sheet 3	

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

- collecting Samples
- handling and preparing Samples
- identifying and reporting Defects or abnormalities
- recording Sample information
- maintaining the work area
- conducting Work
- Specifying and fulfilling communication skills/language

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:

- Samples are collected according to sampling procedures and the requirements
- Samples are handled and prepared to preserve sample and source integrity
- Identify material and/or sample
- Sample information is recorded according to workplace sample recording requirements
- Maintain according to housekeeping standards
- Work is conducted in accordance with workplace environmental guidelines
- Specify communication skills/language competence used to fulfill the job

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.

Information Sheet -3

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

3.1. Collecting Samples

3.1.1. Introduction

The Purpose of sampling may be required for different purposes, such as pre-qualification; acceptance of consignments; batch release testing; in-process control; special controls; inspection for customs clearance, deterioration or adulteration; or for obtaining a retention sample.

How to collect bulk milk sample

https://www.youtube.com/watch?v=A1yyf4oedWo (access date 24/11/22)

3.1.2. Sampling method:

The part of sampling procedure dealing with the method prescribed for withdrawing samples.

The tests to be applied to the sample include:

- verifying the identity;
- performing complete pharmacopoeia or analogous testing; and
- performing special or specific tests

3.1.3. Sampling plan

Description of the location, number of units and/or quantity of material that should be collected and associated acceptance criteria.The sampling plan has a specific objective of ensuring that the obtained sample will be reflective of the qualities that one is seeking to establish about the group.

- **Common Parameter of a Sampling plan:**

✓ Sample size determined by:

- ➢ The variations in the populations
- ➢ Seriousness of the outcome if a bad sample is not detected
- ➢ Cost of analysis
- ➢ Variations of the populations

✓ Sample location no problem when dealing with homogenous population; however, heterogeneous population require consideration of the sampling plans e.g.

- ➢ Random sampling – random picking of the samples from the population
- ➢ Systematic sampling – you pick the samples following a given order.
- ➢ Judgment sampling – you pick samples following past experience.

3.3.4. Sample collection

State clearly whether the sampling will be manual or by specialized mechanical devices. After looking at the factors to be considered when sampling milk, it is now possible to draft a sampling plan. The plan will clearly indicate the size of the sample and all the important features for examination under every group.

3.1.5. Milk sampling

Accurate sampling is the first pre-requisite for a fair and just quality control system. Liquid milk in cans and bulk tanks should be thoroughly mixed to disperse the Milk fat before sampling. Plungers and dippers are used in sampling milk from milk cans

Figure 3.1 sampling milk for quality check up

3.1.6. Sampling for bacteriological testing

Sampling milk for bacteriological tests requires a lot of care. Dippers should be sterilized in an autoclave or pressure cooker for 15 minutes at 120°C before use in Order not to contaminate the sample. On-the-spot sterilization with 70% alcohol Saw and flaming, or scalding in hot steam may also be used.

3.2. **Handling and preparing Samples**

Appropriate sampling is the primary and basic requirement for monitoring its normal components. The milk in the containers must e thoroughly mixed to have uniform distribution of its milk before a septic collection of the milk sample. There should e Random sampling of the packed milk from shops monitoring its components. Hygienic cleaning and sanitation procedure

A very important item of the milk transport business is the vessel in which the milk is carried. Such vessels should satisfy the requirements. In addition, all milk handling vessels should be washed and disinfected immediately after use as follows:

- Pre-rinse with clean potable water
- Thoroughly scrub the container with warm water and detergent/soap using a
- Suitable rush or scouring pad (do not use steel wool or sand!)
- Rinse the container with clean running water
- Immerse the container in boiling water for at least one minute
- Sundry the container upside down on a drying rack

Figure 3.2 sample Preparation

How to collect aseptic milk sample
https://www.youtube.com/watch?v=Zt6APgWWQGo (access date 24/11/22)

a. Personal hygiene

All persons handling milk should maintain high levels of personal hygiene. Milk

Transporter or handler should:

- ✓ Wash hands and nails with clean water and soap before handling milk
- ✓ Wear clean overalls/dust coat and gum boots while handling milk

- ✓ Not suffering from a communicable disease or have open sores or abscess on the arms, hands, head or neck
- ✓ Hot cough or sneeze over milk or milk containers
- ✓ Bath or shower regularly

b. Prevent changes in the milk sample

Ensure the sample does not undergo physical, chemical, or enzymatic changes. Enzymatic changes should be countered elimination or inactivation of the enzyme, which can be achieved through:

- ✓ Adding chemical preservatives
- ✓ Freezing the sample
- ✓ Heat treating the sample

c. Sample identification

Carefully label all the laboratory samples so that in case of any problem, it is easy to trace the origin. The information that is usually used for the identification of laboratory samples includes:

- ✓ Sample description, i.e. what is it? (Raw milk)
- ✓ Note the time of sampling
- ✓ The location of sampling
- ✓ Identity of the person who took the sample
- ✓ Method used to select the sample
- ✓ Record of the procedure used for each sample

d. Reduce the sample size

Smaller sample sizes are easier to manage during analysis, which reduces the chances of sample contamination and cross-contamination

3.3. Identifying and reporting defects or abnormalities

3.3.1. Introduction

These are colostrum milks or pathological milks which normally should not be collected or marketed. These milks have an abnormal mineral and protein composition (high chloride content low casein content) which gives them a characteristic salty taste. Their presence in low concentrations in the collected milk does not change the organoleptic characteristics of the mixture and therefore cannot be detected y sensory analysis.

The adulteration cans only be detected by specific instrument methods which are chemically or physically assed.

3.3.2. Defects due to change in milk consistency

The main alterations in milk taste are due to bacteriological, chemical and physical changes in the milk constituents. These three aspects are.

- Defects of microbial origin
- Defects due to fat oxidation
- Defects due to heat treatment

3.3.3. Defects due to Transmitted flavors

The following abnormal colour, appearances, smells and flavour can be, detected

A. Abnormal color/consistency

- Pink color: Polluted with blood;
- Yellowish creamy color: Colostrum or late milk;
- blue thin colour: Adulterated y adding water;
- Large clots or flakes: Sour milk or mastitis milk;

- Small white clots or grains: Mastitis milk or adulterated with flour and skim milk powder;
- Visible dirt and impurities: Produced under unhygienic conditions.

B. Abnormal smell and/or taste

✓ **Souring:** Lactose fermenting, acid producing bacteria

✓ **Blue souring**: Unpleasant sweet and sour smell, thin and waterish appearance caused by bacterial activity and storage in a closed container without ventilation

3.3.4. Common Adultrants in Milk and their Detection

Adultration of milk may be defined as addition of any material to the milk, or removal of any constituent of milk. The common adultration of milk is addition of water. By water adultration of milk constituents are diluted (Fat and SNF).The water adultrated milk tests less lactometer reading and less SNF content. The common adultrants in milk are:

a) Addition of water
b) Removal of fat
c) Addition of cane sugar
d) Addition of starch / cereal flour
e) Addition of skim milk powder
f) Addition of urea

https://www.youtube.com/watch?v=xQ4FVBn63FA (access date 24 11/22)

- **Added Water:** Many methods are used for detection of milk adultration with water.

Estimate the solid not fat content of the sample of milk and calculate the percent of added water using the following formulae

$$\% \text{ added water} = \frac{S - s}{S} \times 100$$

Where S = Standard SNF (9.0 for buffalo milk, 8.5 for cow milk)

s = SNF of sample milk.

Table 3.1 milk adultration

- **Removal of Fat:** Fat being the costly ingredient of milk, some portion of fat is removed. Removal of fat also comes under adultration of milk. Detect the fat percentage of the sample of milk and calculate the percent of fat removed using the following formulate.

$$\% \text{ of fat removed} = \frac{F - f}{F} \times 100$$

Where F = Standard fat or fat in pure milk.

f = Fat percent in the sample of milk.

Figure 3.3 butyrometer

3.4. **Recording sample information**

A. Sampling record

Written record of the sampling operations carried out on a particular material for a defined purpose. The sampling record should contain the batch number, date and place of sampling, reference to the sampling protocol used, and a description of the containers and of the materials sampled, notes on possible abnormalities, together with any other relevant observations, and the name and signature of the inspector.

Dairy farmers' records help them keep track of the costs of inputs used in milk production (animal feeds, drugs, veterinary services, labor, milk cans, etc.) and how much income they are getting from the sales of milk, heifers, cull cows, nulls, etc. Milk producer groups need to keep records of their members, how much milk is supplied by individual members, raw milk quality, quantities of milk sold and how much is wasted, and payments received for milk sold to processors, transporters or traders.

Similarly, milk traders or transporters who up milk from individual farmers for sale to processors or consumers need accurate records of the quantities of milk traded and associated costs. Milk processing plants need to keep accurate records of the quantity and quality of each consignment of milk received from suppliers.

Additionally, specific records have to be kept for each product and process. Such records are required not only for business transactions but also for quality assurance, food safety and traceability. Indeed, modern quality assurance

B. Sample supply records

Daily milk supply records should indicate the name of supplier, volume of milk supplied, date and time the milk was supplied and the price paid for the milk. Apart from these basic records, it is in the interest of the transporters and suppliers to assess and record the

quality of the raw milk transported. Records of these quality tests are useful in deciding who ears the cost of milk spoilage in cases where milk is found to be spoilt at the time of delivery to the point of sale or processing factory.

The following measurements and basic quality tests may be carried out and the results recorded by the transporter:

- Temperature of milk
- Density of the milk
- Organoleptic test
- Alcohol test

C. **Product sales/delivery record**

Upon delivery of milk to the point of sale or processing factory the following should be recorded:

- Name of customer
- Date and time of delivery
- Price of milk delivered
- Temperature of milk
- Density of milk
- Organoleptic quality
- Results of alcohol test

D. **Labeling and record keeping**

Samples must be clearly labeled with the name or code number of farmer, date of Sampling and the place where the sample was collected.

This information should also be included in standard data sheets. Records must be kept neat and stored in a dry place. Milk producers should be present at the time of sampling and the records should be availed to them if they so require.

The general sample labeling requirements are:

- The name of the product
- 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.

3.5 Maintaining the work area

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

The layout of the work area should be designed to provide sufficient clear space between machines, equipment 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.

3.5.1 Work area entry and exit

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

Generally the work place entry and exit should have:

- ✓ 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
- ✓ Handrail should be provided on or at least one side of every staircase
- ✓ Separate entry and exits for mobile equipment.
- ✓ Location of exits should be clearly marked and signs posted to show direction.

3.5.2 Floors and Other Surfaces

Floor surfaces shall be suitable for the work area and e 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, work area floor should be;

- Floors shall be free from slip 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.
- Floors should be strong enough to support loads placed on them.

3.5.3 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 ack.
- 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.

a. An air-conditioning system should:

Workplaces are to be adequately ventilated which includes provision of fresh, clean air drawn from outside the workplace, uncontaminated from flues or other outlets and e circulated through the workplace. Workplace inside buildings may have natural ventilation, mechanical ventilation or air conditioning.

- Provide a comfortable environment in relation to air temperature & air movement.
- Prevent the excessive accumulation of odours.
- Reduce the levels of respiratory y-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.

Natural ventilation should consist of permanent openings, including windows and doors. Natural ventilation may be assisted by mechanical ventilation. Air-conditioning and other ventilation systems should be regularly serviced and maintained in accordance with manufacturer's instructions.

3.5.4 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.

Figure 3.4 cleaning house

3.6 Conducting workplace environment

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

- Facilities,
- Amenities or services and,
- Accommodations.

Facilities refer to toilets, washrooms, showers, lockers, dining areas, drinking water, etc. These facilities must be in good working order, clean, safe and accessible.

During conducting work, a person should ensure the following requirements;

- Legislative Requirements,
- Responsibilities,
- Need assessment,
- work environment,
- Welfare Facilities
- Inspect and Monitoring.

3.6.1. Legislative Requirements

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

- The layout of the workplace allows, and the workplace is maintained, ,
- Work areas have space for work to be carried out without risk to health & safety,

- Floors and other surfaces are designed, installed and maintained to allow work to be carried out without risk to health and safety,
- Work in relation to or near essential services does not give rise to a risk.

3.6.2. Responsibilities

The facilities management division is responsible for ensuring that workplace facilities:

Are designed and installed according to company legislative and requirements. Are inspected and maintained to ensure a safe level of hygiene. Company Management and Supervisors: Management and supervisors of faculties, divisions and units are to ensure that amenities and facilities in the workplace do not expose workers, or visitors to health and safety risks.

a. Employees

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

b. Nature of Work Performed

The requirements of amenities and facilities will depend on the type of work eing performed and the equipment being used. For example, persons handling chemicals or conducting hot and arduous activities may need to access shower and change room facilities.

c. Size and Location of the Work Area

Consideration should be given to the location such as the work area being in a building, remote area or outdoors. The work area may e multiple locations/sites over an extensive area.

d. The Composition of the Workforce

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

3.7. Specifying communicating skill /language competency

3.7.1. Introduction

Communication skills are those skills which are needed to speak and write properly. A person who is able to speak appropriately whilst maintaining eye contact with the audience, uses varied vocabulary and articulate speech to suit the need of the audience is generally said to be an effective speaker. Similarly, an effective writer should be able to use written words in various styles and techniques to communicate his/her message and ideas to the readers. One should have the ability to listen carefully and write and speak clearly in any situation. Therefore good reading, writing, speaking and listening skills are essential for effective communication.

3.7.2. Benefits of Strong Communication Skills

The benefits of improving your communication skills are seemingly endless. Plus, your team will spend less time fixing misunderstandings that happened because one person wasn't actively listening or someone else was interrupting a meeting. That means boosted productivity and more time spent on meaningful tasks.

When your team communicates effectively across the board, you're likely to improve the customer experience, too. Employees can meet client needs more efficiently when they can work through challenges together, and they can make sure there are minimal miscommunications that leave tasks falling through the cracks. Better communication skills mean that every employee feels heard and more comfortable sharing their ideas. That means your team can bring more ideas to the table, which will help your company set and achieve new goals.

Self-check 3	Written test

Name…… ID…… Date…….

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

Test I: Short Answer Questions (25%)

1) Write down the Purpose of sampling (5 point)
2) What is the sampling method? (5 point)
3) What is sampling plan? (5 points)
4) Write down Common features of a sampling plan:(5point)
5) Write down defects due to transmitted flavour (5 point)
6) Write down defects due to change in milk consistency (5 point)
7) Write down defects due to Abnormal smell and/or taste (5point)
8) Differentiate inter-unit variation and intra-unit variation. (5 point)

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

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

Operation Sheet -3	collecting Samples

Collecting Samples for bulk raw milk

a. Sampling procedures: - are complete sampling operations to be performed on a defined material for a specific purpose. A detailed written description of the sampling procedure is provided in the sampling protocol.

Step 1:- Apply safety first

Step 2:- Wear personal protective equipment's 1. such as boats, face mask, hand glove, gown, overall and helmet etc.

Step 3:- prepare appropriate tools $ equipment for sample collection

Step 4; - Identify samples using appropriate sampling techniques(methods).

Step 5:- Record the procedure used for each sample

Step 6:- Identify product variation using various sampling techniques.

Step 7:- Record variation results.

b. Check milk adultration with water.

Steps 1 Determine SNF of the sample milk

Steps 3 calculate the percent of added water using the following formula

Steps 3 Determine milk adultration with water

$$\% \text{ added water} = \frac{S - s}{S} \times 100$$

Where S = Standard SNF (9.0 for buffalo milk, 8.5 for cow milk)

s = SNF of sample milk.

Where S = Standard SNF (9.0 for buffalo milk, 8.5 for cow milk)s s= SNF of sample milk.

Name……

. ID……

Date

Lap Test 3	Demonstration

Time started: _____ Time finished: _____

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

During your work: You can ask all the necessary tools and equipment

Task Objectives a. / Demands: in accomplishing activities required for this project the student will be able to: (**During your work follow these steps :**)

Task 1:- Apply safety first

Task 2:- Wear personal protective equipment's

Task 3: - prepare appropriate tools $ equipment for sample collection

Task 4; - Identify samples using appropriate sampling techniques (method).

Task 5:- Record of the procedure used for each sample

Task 6:- Identify product variation using various sampling techniques.

Task 7:- Record variation results.

Task Objectives b in accomplishing activities required for this project the student will be able to

Task 1 Determine the solid not fat content of the sample

Task 2 calculate the percent of added water into the milk

Task 3 Determine milk adultration with water

LG #34	LO #4- Transfer bulk raw milk

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

- Starting and operating transfer process
- Monitoring transfer process
- Transferring bulk liquid materials/product
- Maintaining workplace standards
- Conducting bulk liquid (milk) materials transfer
- Monitoring raw milk transfer equipment
- 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:

- Start and operate transfer process
- Monitor transfer process
- Transfer bulk liquid materials/product
- Maintain workplace standards
- Conduct bulk liquid (milk) materials transfer
- Monitor raw milk transfer equipment
- Maintain workplace records

Instruction sheet 4

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet 4

4.1 Starting and operating transfer process to work place information

- The first steps in preserving the quality of milk must take at the farm.
- Milking conditions must be as hygienic as possible; the milking system designed to avoid aeration, the cooling equipment correctly dimensioned.
- To meet the hygienic requirements, dairy farms have special rooms for refrigerated storage.
- Bulk cooling tanks are also becoming more common.
- These tanks with a capacity of 300 to 30 000 litters, are fitted with an agitator and cooling equipment to meet certain stipulations
- All the milk in the tank should chilled to 4 °C within two hours after milking.
- Larger farms, producing large quantities of milk, often install separate plate coolers for chilling the milk before it enters the tank
- This saves mixing warm milk from the cow with the already chilled contents of the tank.
- The milk room should also contain equipment for cleaning and disinfecting the utensils, pipe system and bulk-cooling tank.

Flow chart 4.1 Milk collection chain

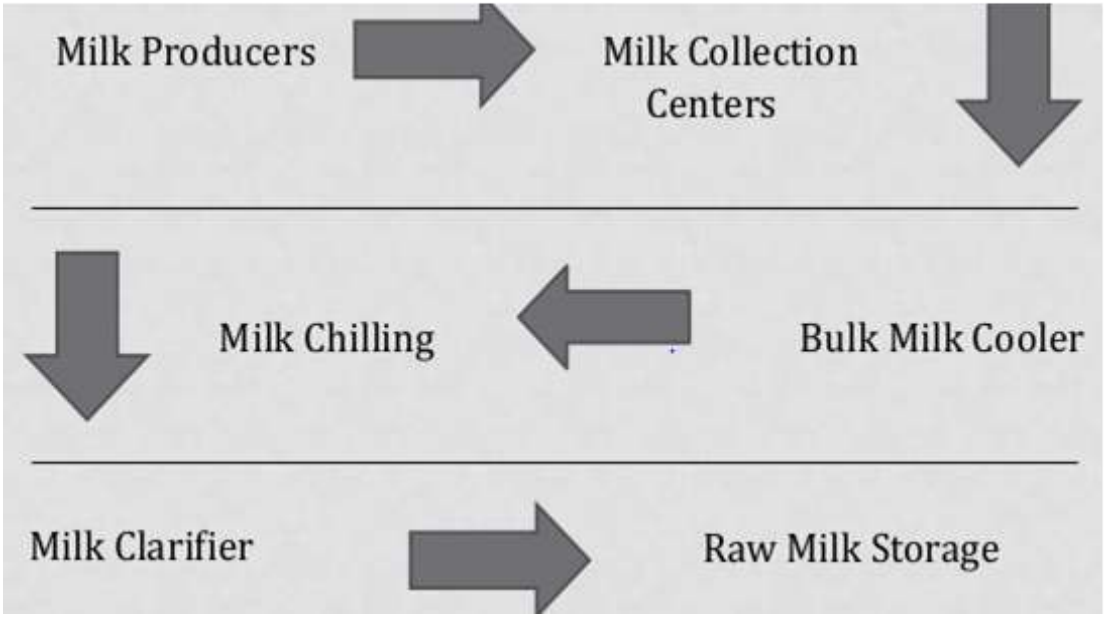

Figure 4.1: milk collection at the farm.

4.1.1 Milk transportation to the dairy product-processing center

The raw milk arrives at the dairy product-processing center in insulated road tankers

- The milk must be kept well chilled, free from air and treated as gently as possible
- Tanks should well filled to prevent the milk from sloshing around in the container.

When milk collected by the milk tanker, it must be:

- Drive all the way to the farm milk room
- The loading hose from the tanker connected to the outlet valve on the farm cooling tank
- The tanker usually fitted with a flow meter and pump so that the volume automatically recorded
- Volume is measured by recording the level difference, which, for the size of the tank in question, represents a certain volume
- The tanker equipped with an air-eliminator
- Pumping stopped as soon as the cooling tank has emptied.
- This prevents air from mixed into the milk
- The tank of the bulk collection vehicle divided into a number of compartments to prevent the milk from sloshing around during transportation.
- Each compartment filled in turn, and when the tanker has completed its scheduled round, it delivers the milk to the dairy product-processing center.

Figure 4.2 Milk collecting and transporting

Figure 4.3: Milk transporting from farm to processor in special stainless steel tankers

4.2 Monitoring transfer process of correct location selection

A. Chilling the incoming milk

Normally, a temperature increase to slightly above 4°C is unavoidable during transportation. The milk usually cooled to below 4°C in a plate heat exchanger, before being stored in a silo tank to a wait processing.

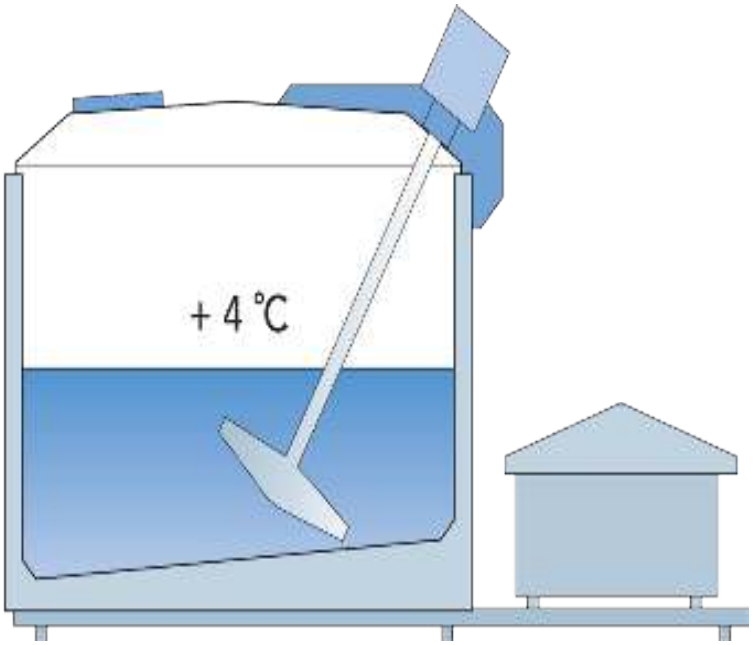

Figure 4.4 Bulk-cooling tanks with agitator and chilling unit.

B. **Raw milk storage**

The untreated raw milk whole milk stored in large vertical tanks silo tanks, which have capacities from about 100,000 litters up to 500,000 litters.

- Smaller silo tanks are often located indoors while
- The larger tanks placed outdoors to reduce building costs.
  - ✓ Outdoor silo tanks of double-wall construction, with insulation between the walls.
  - ✓ The inner tank stainless steel, polished on the inside and the outer wall is usually of welded sheet metal.

4.3 Transferring raw milk product to storage facility

A. Milk reception

Dairies have special reception departments to handle the milk brought in from the farms within the following purpose:

- First, determine the quantity of the milk at reception.
- The quantity recorded and entered into the weighing system that the dairy uses to weigh the intake and compare with the output.
- The quantity of the intake measured by volume or by weight.

B. Tanker reception

Tankers arriving at the dairy drive straight into a reception hall, often large enough to accommodate several vehicles. The milk measured either by

- Volume
- By weight.

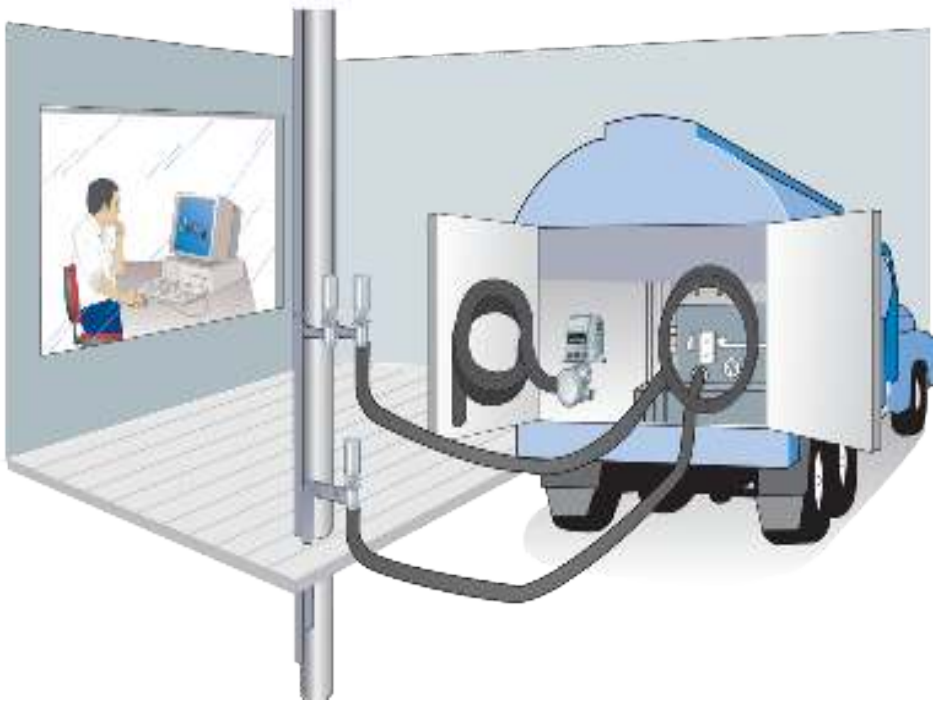

Figure 4.5 Measuring milk intake in a tanker reception hall by Volume

C. Measuring by volume

This method uses a flow meter. It registers the air in the milk as well as the milk, so the results are not always reliable. It is important to prevent air from entering with the milk. Measuring can improved by fitting an air-eliminator before the flow meter

The tanker outlet valve connected to an air-eliminator and from this the milk free from air pumped through the flow meter, which continuously indicates the total flow. When all the milk has delivered, a card placed in the meter for recording the total volume.

The pump started by the control equipment, which senses when the milk in the air-eliminator has reached the preset level for preventing air from sucked into the line.

The pump stopped as soon as the milk level drops below a certain level. After measuring, the milk pumped to a storage (silo) tank.

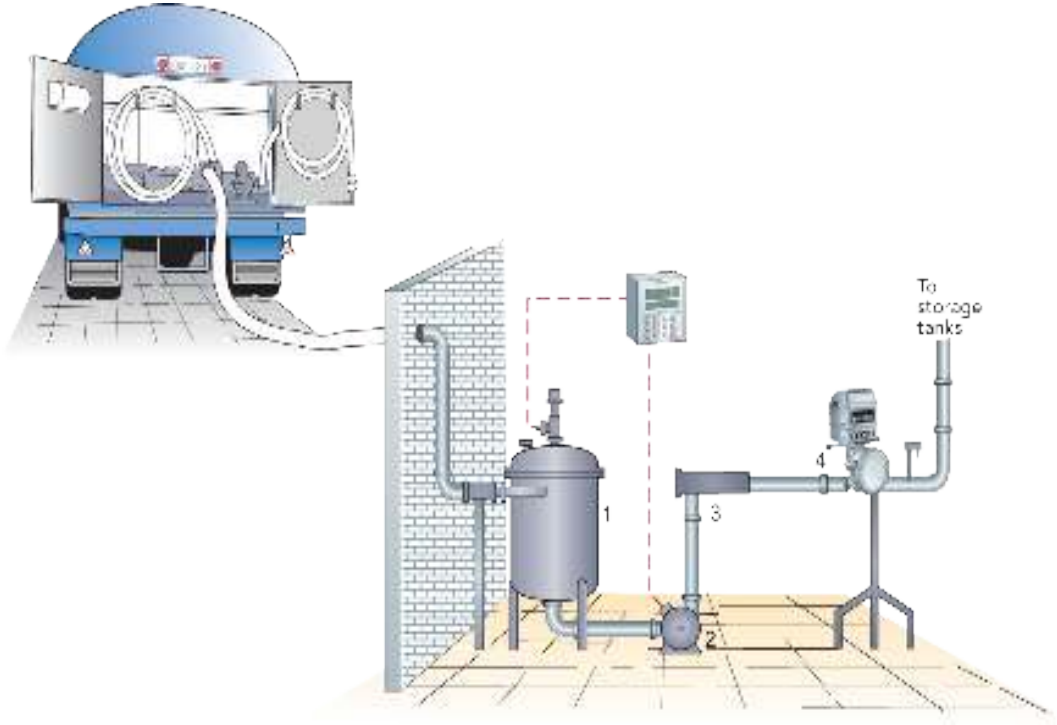

Figure 4.6: Measuring by volume during Collection and reception of dairy milk.

4.4 Maintaining workplace housekeeping standard

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

- Safety

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

4.5 Conducting bulk liquid raw milk materials transfer

A. Maintain workplace environmental procedures

Every business or organization has work practices that will have an impact on the environment. Some businesses will have a larger impact on the environment than others but all businesses consume energy, raw materials, and produce waste but we all have a role to play in ensuring our business operations are of an environmentally sustainable nature.

Environmentally sustainable is “conserving natural resources by

- Replacing and managing environmental impacts to minimize their adverse effects
- Whether you are volunteering or working in an office
- Environment, in a mobile situation, as a career or working outside, your work practices will have an impact on the environment.
- Responsibility of everyone in the work place to contribute to the protection of our environment.

B. Work place procedure and instruction

In working environment, the employees should understand by:

- Set of work place procedures
- Policies and instructions to address the designed goal in the organization.
- Set of policies and procedures in working environment.

C. **Policies and procedures are**

- Set of rules and guidelines that followed to achieve goals.
- The policy sets out the overall course of action and what it aims to achieve
- The procedures are the guidelines followed to achieve the aims of the policy.

D. **Workplace environmental procedures**

- written procedures or work instructions for
- Environmental hazard
- Risk identification
- Avoiding or minimizing environmental risks
- Improving environmental performance

- Waste minimization and segregation
- Environmental monitoring,
- Hazard and incident recording and reporting procedures

E. **Relevant legislation codes and national standards**

That a person will acknowledge that environmental impacts, hazards and risks exist, and that they have a responsibility to work in a manner, which will minimize the impact on the environment within the guidelines established by the workplace. All dairy production facilities must comply with applicable planning and environmental protection legislation for their state.

It is important to identify the legal requirements for the processing and to confirm compliance with these obligations.

F. I**mpact of workplace practices on environment**

There are seven recognized environmental hazards in the workplace. These hazards do have their own impacts on the environment.

- Waste and water
- Erosion and sediment
- Air and atmospheric contaminates
- Hazardous substances and Contaminated land

4.6 Monitoring raw milk transfer equipment

A. Balancing Tank

Milk tank Bulk liquid/milk collected handled free from air or other gases by operating Centrifugal pump properly to avoid cavitation, the pressure at all points in the pump inlet must be higher than the vapor pressure of the liquid..

The balance tank keeps the product at a constant level above the pump inlet. In other words, the head on the suction side kept constant. The tank contains a float connected by a lever to an eccentrically pivoted roller that operates the inlet valve on the tank. As the float

moves downwards or upwards with the liquid level, the valve opened and closed respectively. The valve opens and lets in more liquid. In this way, the liquid in the tank kept at a constant level.

Today the same functionality usually achieved with level sensors that control a regulating valve. The inlet is located at the bottom of the tank so that the liquid enters below the surface consequently; there is no splashing and above all no aeration. Any air already present in the product on entry will rise in the tank.

The balance tank often included in a recirculating system where liquid is returned for recycling, e.g. because of insufficient heat treatment.

- Temperature indicator actuates a flow diversion valve, which directs the product back to the balance tank.
- This causes a quick increase in the liquid level and an equally quick movement of the float mechanism to close the inlet valve.
- The product then circulates until the fault repaired or the plant shut down for adjustment.
- A similar procedure employed for circulating cleaning solution when the line cleaned.

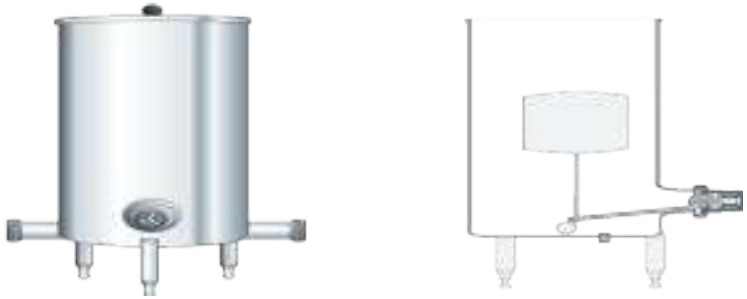

Figure 4.7 Balance tank for constant inlet pressure to the pump.

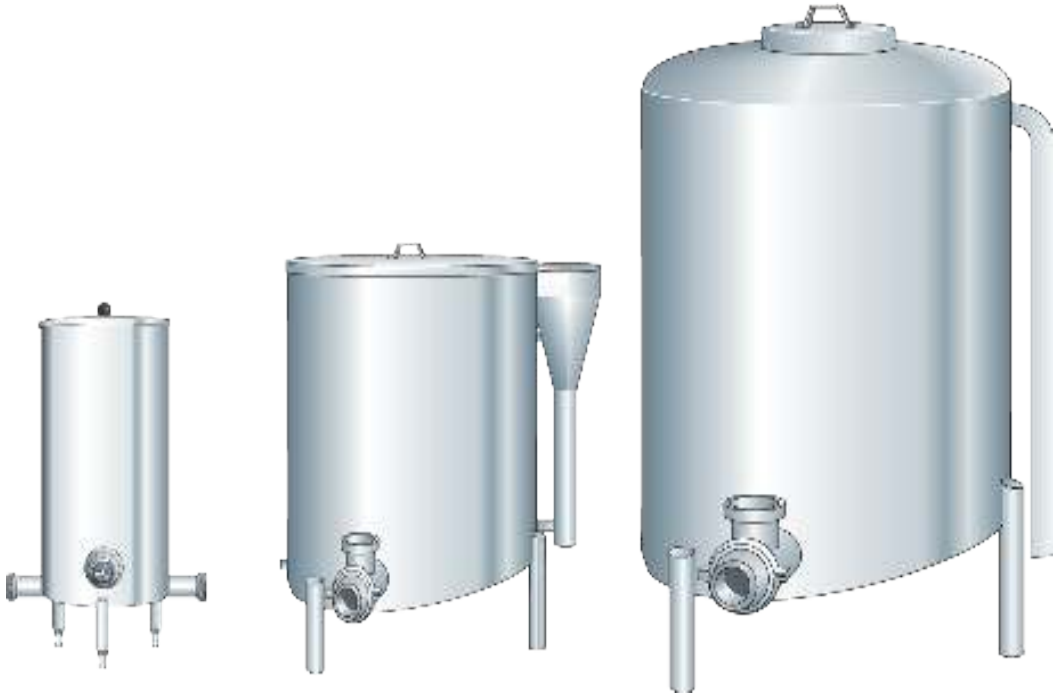

Figure 4.8 Balance tanks are available in different sizes.

B. Agitation in silo tanks

These large tanks must have some form of agitation arrangement to prevent cream separation by gravity.

- The agitation must be very smooth. Extreme agitation causes aeration (ventilation) of the milk and fat globule disintegration.
- This exposes the fat to attack from the lipase enzymes in the milk.
- Gentle agitation is a basic rule in the treatment of milk.
- Propeller agitator, often used with good results in silo tanks.
- In very high tanks, it may be necessary to fit two agitators at different levels to obtain the required effect.

- Outdoor silo tanks have a panel for ancillary equipment. The panels on the tanks all face inwards towards a covered central control station.

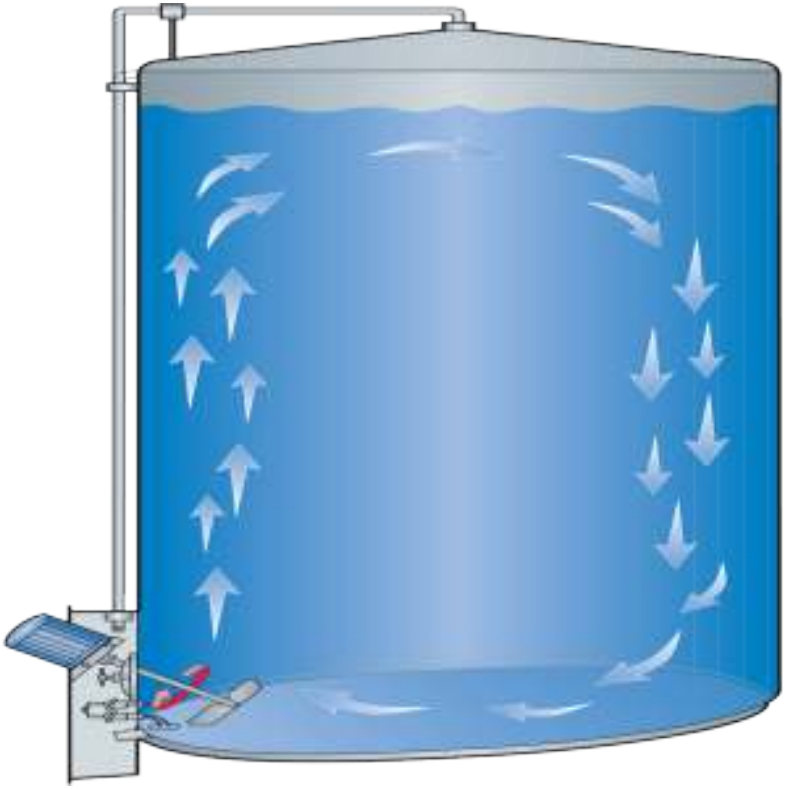

Figure 4.9 Silo tank with propeller agitator.

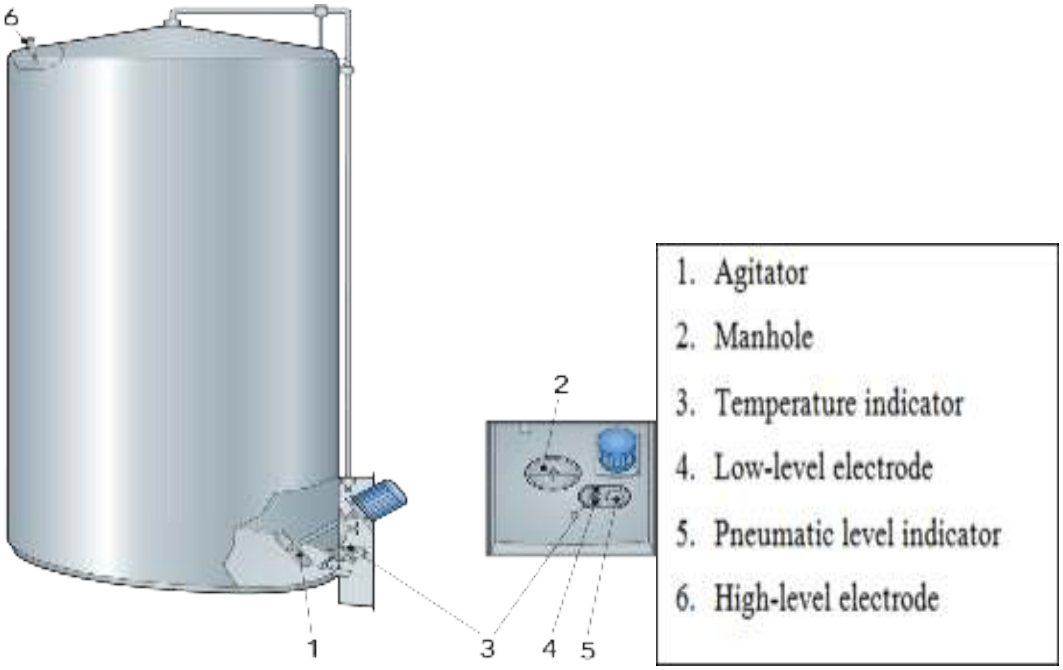

Figure 4.10 Silo tank with alcove for manhole, indicators, etc.

C. Milk tank temperature indication

The temperature in the tank indicated on the tank control panel. Usually, an ordinary thermometer used, but it is becoming more common to use an electric transmitter, which transmits signals to a central monitoring station.

D. Level indication

There are various methods available for measuring the milk level in a tank.

- The pneumatic level indicator measures the static pressure represented by the head of liquid in the tank
- The higher pressure, the higher the level in the tank. The indicator transmits readings to an instrument.

E. Low-level protection

All agitation of milk must be gentle.

- The agitator must not started before it covered with milk
- An electrode often fitted in the tank wall at the level required for starting the agitator
- The agitator stops if the level in the tank drops below the electrode.
- This electrode known as the low-level indicator (LL).

F. **Empty tank indication**

During an emptying operation, it is important to know when the tank is completely empty. Otherwise

- Any milk remaining when the outlet valve has closed will rinsed out and lost during the subsequent cleaning procedure.
- The other risk is that air will sucked into the line if emptying continues after the tank is dry. This will interfere with later treatment.

4.7 Maintaining and recording workplace information

A. Standard Operating Procedure (SOP)

A Standard Operating Procedure (SOP) is a set of written instructions that document a routine or repetitive activity followed by an organization. The development and use of SOPs are an integral part of a successful quality system as it provides individuals with the information to perform a job properly, and facilitates consistency in the quality and integrity of a product or end-result.

SOPs are components of good processing/manufacturing practice that emphasize sanitation procedure. This include

- Safety of water that gets in contact with food and food surfaces;
- Condition and cleanliness of food contact surfaces;
- Measures to prevent contamination;

- Employee hygiene practices;
- Control of employee health conditions that could result in contamination of food and food surfaces;
- Protection of contact surfaces from adulteration with toxic and other harmful components;
- Proper labelling and storage and use of toxic; and
- Control of pests.

B. **Workplace information of milk transportation:**

- Standard Operating Procedures (SOPs),
- Specifications for raw milk reception and processing
- production schedules
- sampling and tests requirements
- Reporting arrangements
- Certificate of analysis
- Recording collected milk from farm and stored milk in milk silo

C. **Record keeping and reporting**

Records must kept allow proper plant management and control. Performance records are required for trouble shooting, to identify changes in operating conditions, to identify reasons for process failure or water quality reduction, for process optimisation, to record changes in influent quality and process conditions, etc. A further important aspect of recordkeeping is the availability of data and information for research and design of future expansion to the facility or erection of new facilities using the same raw water resource.

Operating personnel should routinely record only that information that is useful in plant operation and troubleshooting.

The following data should record as a minimum by the shift personnel:

- Flow-rate: influent, sludge scouring, filter backwash, chemicals dosage, water production
- Pressure: pump inlet and outlet
- Number of filters in operation, filtration rate, number of filters washed
- Chemical parameters: record all on-line and in-line monitor results. Important aspects in this regard are pH, conductivity, disinfectant concentration etc.
- Physical parameters: record all on-line and in-line monitor results, here turbidity (both inlet and outlet) and temperature are to be recorded

Self-check 4	Written test

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

I. Choose the best answer (each 2 point)

1. What is the /are end producer during milk collection and transportation before milk processing?

   A. Milk collection C. Milk clarifier

   B. Bilk chilling D. Raw milk storage

2. What is/ are the first step to preserve quality milk?

   A. Start cooling at farm level C. Storing raw milk

   B. Transporting milk to processing centre D. Milk clarifier

Test II: Short Answer Questions

1. What is the good housekeeping? (5 point)

_____,_____

.

2. Write the purpose of data records? (5)

_____,_____

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

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

LG #5	LO #5- Complete transfer operations

Instruction sheet 5

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

- Positioning valves and related equipment settings correctly
- Purging product/materials from lines
- Cleaning and preparing equipment for further transfer
- Recording information on the transfer operation
- 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:

- Position valves and related equipment settings correctly
- Purge product/materials from lines
- Clean and prepare equipment for further transfer
- Record information on the transfer operation
- Identify and report maintenance requirements

Learning Instructions:

5. Read the specific objectives of this Learning Guide.
6. Follow the instructions described below.
7. Read the information written in the information Sheets
8. Accomplish the Self-checks
9. Perform Operation Sheets
10. Do the “LAP test”

Information Sheet -5

5.1 Positioning valves and related equipment settings correctly

A. Mix proof valve systems

There are many junctions in a piping system where product normally flows from one line to the other, but which must sometimes be closed off so that two different media can flow through the two lines without being mixed. When the lines are isolated from each other, any leakage must go to drain without any possibility of one medium mixed with the other

This is a common problem faced when engineering dairy plants. Dairy products and cleaning solutions flow in separate lines, and have to keep separate. Figure 6.8.6 shows four different solutions to the same task.

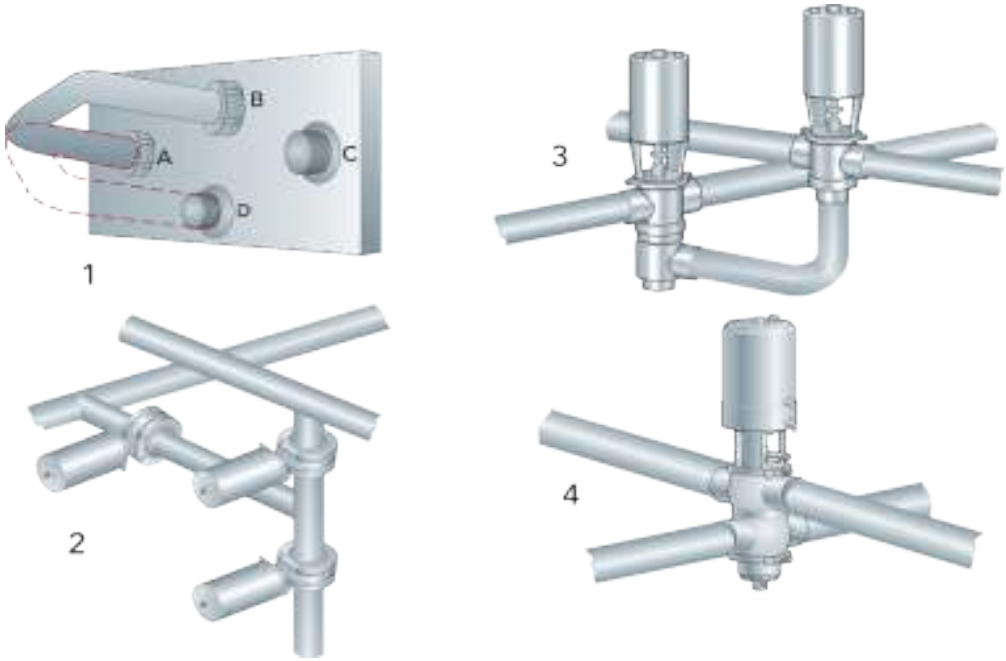

Figure 5.1 Sanitary mix-proof valve systems.

1. Swing bend for manual change between different lines.
2. Three shut-off valves can perform the same function.
3. One shut-off valve and one changeover valve can do the same job.
4. One mix proof valve is enough for securing and switching the flow.

E. Manual control

The butterfly valve is fitted with a handle, usually for two positions open and closed. This type of valve not suitable as a control valve, but can be used for coarse control with a special handle for infinite positions.

F. Automatic control

An air actuator used for automatic control of the butterfly valve.

The function can be:

- Spring closing/air opening (Normally closed, NC)
- Air closing/spring opening (Normally open, NO)
- Air opening and closing (A/A)

The disc easy to turn until it touches the seal ring. Then it needs more power to compress the rubber.

- A normal, spring powered actuator strongest in the beginning, when less power required, and weaker at the end, when more power required.
- It is therefore an advantage to use actuators, which designed so that they provide the correct power at the right time.
- Another type of the butterfly valve the flange valve
- It is the same type of butterfly valve as described above, but it fitted between two flanges welded to the line
- Its function the same as an ordinary butterfly valve.
- During operation, it clamped between the flanges with screws. For servicing, the screws loosened. The valve part pulled out for easy servicing.

G. Mix proof valves

Mix proof valves either double-seat or double-seal, but when discussing mix proof valves, it generally the double-seat type that referred. A double-seated valve has two independent plug seals separating two liquids, forming a leakage chamber between them under atmospheric pressure during every working condition.

5.2 Purging (removing) product/materials from lines

The point of a shutdown is to create a plan for a complete cessation of all plant activities in order to perform necessary maintenance, repairs, equipment replacements, and to perform internal maintenance. Shut down the line can have a major impact on your capacity to restart production promptly. In an upcoming article, restart your machinery, taking the best steps and precautions.

A. **Air purge**

Once the machine out of service, the next thing we recommend purge any air that may be present in the equipment. Machines often use compressed air to activate the different cylinders, and most machines have an air purge valve that allows for bleeding off any accumulated air.

B. **Protection**

When your equipment is in an industrial environment, certain activities such as cutting materials, welding, generate dust and debris.

This poses the risk of generating contaminants and damaging all that is mechanical, such as seals. Accumulated metal shavings, for example, can cause internal damage and pose a risk to operators when the machine switched back on after the shutdown period. Normally, when the fans in the factory are running, dust or contaminants filtered. At Orientate, when a machine is on physical hold at the customer's request, we always cover it with plastic wrap to protect the machine and fragile components from contaminants. This simple step can save you from these problems at restart.

C. **Electricity**

We highly recommend you to start by making a backup of all of machines. There is a very specific procedure to change the batteries of robotics to ensure that programming is not lost or altered. When you have backed up everything and replaced the parts and batteries that needed, you should determine if you should cut off the power source, or maintain power during shutdown. It may be preferable to cut

off the power to avoid any power surge. Electrical components must also protect during dormancy. If there is dust, contaminants, oil, grease that go under the sensors, you will have issues when it comes time to start the machine again.

5.3 Cleaning and preparing equipment for further transfer

Cleaning and Sanitizing Equipment and Instruments include the use of sanitizing agent's leads to effective sanitation of tools, equipment and utensils. Sanitation with the use of physical and chemical sanitizing agents will kill residual microorganisms that remain after cleaning. Cleaning by washing with soap and water is very important as it ensures the removal of dirt or debris by physical and/or mechanical means.

Clean water is to be used to finally wash and rinse all utensils tools and equipment Sanitizing or disinfecting, on the other hand, rids or reduces the number of micro-organisms on surfaces where food comes in contact with It cannot be accomplished until surfaces where dairy product clean. Moreover, it cannot be effective without a good pest control program Chlorine is one of the cheapest and most easily available sanitizers in the market. It popularly used in the treatment of water for both household and plant. Likewise, chlorine also used to sanitize processing equipment.

A. Tanker cleaning

- Tankers cleaned every day, as a rule at the end of a collection round.
- If the tanker makes several rounds a day, cleaning should take place after each round.
- Cleaning can be carried out by connecting the tanker to a cleaning system while in the reception area, or by driving it to a special cleaning station
- Many dairies also clean the outside of their tankers every day so that they always look clean when they are on the road.
- In more and more countries new rules are introduced about disinfection of tankers to avoid spreading animal diseases

B. Principle of the centralized Clean In Place (CIP) system.

Cleaning unit (within the broken line) include

- Tank for alkaline detergent
- Tank for acid detergent
- Plate heat exchanger

Water and detergent solutions pumped from storage tanks in the central station to various CIP circuits. The detergent solutions and hot water kept hot in insulated tanks. The required temperatures maintained by heat exchangers. The final rinse water collected in a rinse-water tank and used as pre-rinsing water in the next cleaning programmed. The milk/water mixture from the first rinsing water collected in a rinse-milk tank

The detergent solutions must discharged when they have become dirty after repeated use. The storage tank must clean and refilled with fresh solutions.

C. Decentralized Clean In Place (CIP)

Decentralized CIP an attractive alternative for large dairies, where the distance between a centrally located CIP station and peripheral CIP circuits would be extremely long. The large CIP station replaced by a number of smaller units located close to the various groups of process equipment in the dairy.

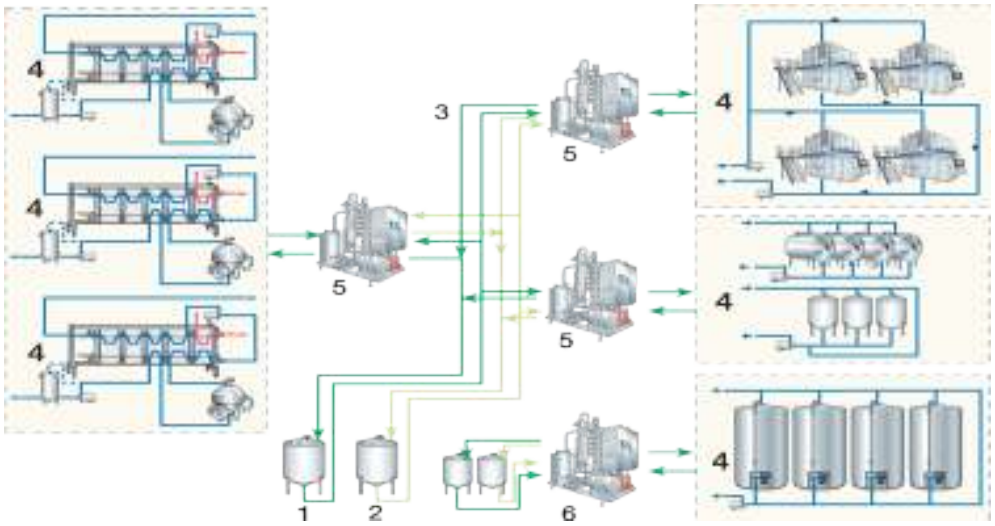

Figure 5.2: Decentralized CIP system

1. Storage tank for alkaline detergent
2. Storage tank for acid detergent
3. Ring lines for detergents
4. Objects to be cleaned
5. Decentralized CIP units
6. Decentralized CIP system with its own detergent tanks

This still has a central station for storage of the alkaline and acid detergents, which individually distributed to the individual CIP units in main lines. Supply and heating of rinsing water (and detergent, when required) arranged locally at the satellite stations

Figure 5.3: CIP with detergent

5.4 Recording information on the transfer operation

A milk recorder designated dairy herds once or twice per day for milking involving a commitment of approximately 5-10 days per month. Duties will involve collecting milk samples, recording milk yields of individual cows and updating all herd information. Milk Recording helps make informed decisions about the future herd; from feeding to breeding. Milk recorders visit farms on a regular basis to take samples, deliver to the laboratory and return results by post or electronically.

Record of dairy product processing safety includes a description of each of the hazards identified in the hazard analysis process and control measures that will implemented to address each hazard prepared by dairy product operators.

A. Record of received milk

Records of production, processing and distributions must maintained in understandable manner and booked in good condition for a period of one year or the shelf life of the product that include:

- Incoming bulk milk from collection centres
- inspection and testing
- calibration of bulk milk collection equipment's

- water testing
- Operational controls (such as temperature, pressure, time etc.)
- product recall and traceability
- storage cleaning and sanitation
- pest control

B. Health Recording

Medical examination and health status of milk collector and milk product processing operator and handler must record in causes to secure the dairy product safety and quality.

Record of dairy product processing safety include

- Description of each hazards identified
- Hazard analysis process and control measure implemented to address each hazard prepared by dairy product operators.

C. Record of collected bulk liquid/ milk measurement

milk collected measure received milk in two ways

i. Weighing the tanker before and after unloading then subtracting one value from the other

ii. Using special weighing tanks with load cells in the feet.

5.5 Identifying and reporting maintenance requirements

In dairy product, processing maintaining designed to keep equipment, machines and buildings operating optimal the preventive maintenance programmer includes many sections, an essential one is the maintenance work done directly on the machine. It performed by skilled handicrafts worker and made to provide the engineering staff of milk plants with a guide to maintenance comprising like

1. Basic rules concerning safety at maintenance work
2. Essential information on hygiene requirements relating to milk plants
3. Diagnosis of faults
4. Examples of routine maintenance procedures

5.6 Hygienic working practices

After completing and/or before starting processing and manufacturing operations.

A. Personal hygiene

Includes medical clearance for working in dairy product processing plants, which needs

- To renew at pre-determined intervals.
- Clean protective clothing must be worn
- No smoking' notices observed and all tools and equipment must be carried in closed toolboxes or bags.

B. Hygiene precautions

During maintenance operations must concentrate on preventing the dairy product from begin contaminated by extraneous material. Washers or split pins used when in direct contact with the product or passing above the product. Further precautions are strictly:

- Oil grease, solvents and compounds used on food machinery must be those recommended for such use;
- All electrical equipment must be correctly waterproofed;

- Glass instruments such as thermometers must be properly encased, so that they remain in position if broken;
- There must be no leakages of services, especially refrigerants and cleaning solutions;
- Recycled water systems must be frequently treated
- Cleaning nozzles in washing devices must not be blocked or excessively worn;
- Cold storage units must adequately ventilated when not in use..

Self-check-5	Written test

Name……

…… ID……Date…….

Directions: Answer all the questions listed below.

1. Define sanitizing and cleaning (3 points)
2. What is shut down process? (4 points)
3. What are positioning valves and related equipment settings? (4points)
4. What are maintenance requirements? (4points)
5. Write the methods of data records? (5 points)

Note: Satisfactory rating 10 points Unsatisfactory below 10 points

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

Operation Sheet -5

A. Procedure in Cleaning Tools and Equipment :

1. Wearing appropriate Personal Protective Equipments (PPE) such as boats, face mask, hand glove, gown, overall and helmet etc.
2. Wash all the equipment / tools with soap.
3. Rinse with clean water.
4. Sanitize by dipping into approved sanitizer solution.
5. Remove from the solution.
6. Allow to air dry.

B. Procedure in Sanitizing Tools and Equipment:

1. Wearing appropriate Personal Protective Equipments (PPE) such as boats, face mask, hand glove, gown, overall and helmet etc.
2. Prepare all the materials needed.
3. Measure a certain amount of chlorine and water.
4. Mix and dip the equipment / instruments in the mixture
5. Remove from the sanitizing solution.
6. Dry thoroughly.

Lap Test-5	Performance Test

Name _____

_____ IDNO. _____ Date _____

Time allocated: 1 hrs. Starting time _____Ending time _____

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

Task 1 Perform cleaning tools and equipments

Task 2 Perform sanitizing tools and equipments