CONFECTIONERY PROCESSING

LEVEL-II

Based on Oct 2019, Version 2 Occupational standards

Unit of Competence: - Operate Waste Water Treatment System

Module Title: - Operating a Waste Water Treatment System

LG CODE: - IND COP2 M26 (LO1-5)-(LG-85-88)

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Table of Contents

LG #85	LO #1- Prepare the waste water treatment process for operation

Instruction sheet

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

- Making available chemicals and test equipment ready for use.
- Confirming services ready for operation.
- conducting pre-operational checks
- calibrating instrumentation and test equipment to manufacturer's
- Identifying and reporting health and safety hazards/maintenance to appropriate personnel

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:

- Make available chemicals and test equipment ready for use.
- Confirm services ready for operation.
- Conduct pre-operational checks
- Calibrate instrumentation and test equipment to manufacturer's
- Identify and report health and safety hazards/maintenance to appropriate personnel

Learning Instructions:

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

Information Sheet 1- Making available chemicals and test equipment ready for use.

1.1 Making available chemicals and test equipment ready for use.

Equipment is most commonly refers to a set of tools or other objects commonly used to achieve a particular objective**.**

1.1.1 **Test Equipment may include** :

- screens
- pH correction
- oil/grease skimmers
- settling and treatment ponds
- aeration units
- lagoons
- first flush systems and wetlands
- Pumps and valves.

1.1.2 Chemicals

The four main types of chemicals used in wastewater treatment are pH neutralizers, anti-foaming agents, coagulants and flocculants. Chemicals which are used for waste water treatment. Chlorine and ozone are two chemicals used to purify water.

The term “pH” refers to the measurement of hydrogen ion activity in the solution. Determination of pH plays an important role in the wastewater treatment process. Extreme levels, presence of particulate matters, accumulation of toxic chemicals and increasing alkalinity levels are common problems in wastewater.

Pollutants in waste water are removed, converted or broken down during the treatment process. The main by-product from wastewater treatment plants is sewage sludge which is usually treated in the same or another wastewater treatment plant. Biogas can be another by-product if anaerobic treatment processes are used.

The most widely employed method for sludge treatment is anaerobic digestion. In this process, a large fraction of the organic matter (cells) is broken down into carbon dioxide (CO2) and methane (CH4), and this is accomplished in the absence of oxygen.
Wastewater treatment is the process of converting wastewater – water that is no longer needed or is no longer suitable for use – into bilge water that can be discharged back into the environment. It may be formed by a number of activities including bathing, washing, using the toilet, and rainwater runoff. Although treated wastewater is generally of slightly poorer quality than rainwater and it is clear and odorless and well-suited for flushing toilets, for water art and for irrigation.

The most straightforward class of chemicals is pH neutralizers, although why and how they are used varies depending on the process producing the wastewater. Essentially, wastewater effluent flowing into the sewer system should be neither too acidic nor too basic (ideally completely neutral at pH 7), as this will help to prevent undesirable chemical reactions when the wastewater mixes with other effluent. PH neutralization is even more important if the wastewater outlets directly into a lake or river, as changing the localized pH can harm wildlife and cause knock-on issues for the local ecosystem.

- ❖ Common chemicals used to increase alkalinity and pH includes:

1. Calcium oxide or calcium hydroxide (as lime slurry)
2. Sodium hydroxide (caustic soda)
3. Sodium carbonate (soda ash) or sodium bicarbonate.
4. Magnesium hydroxide or magnesium bicarbonate.

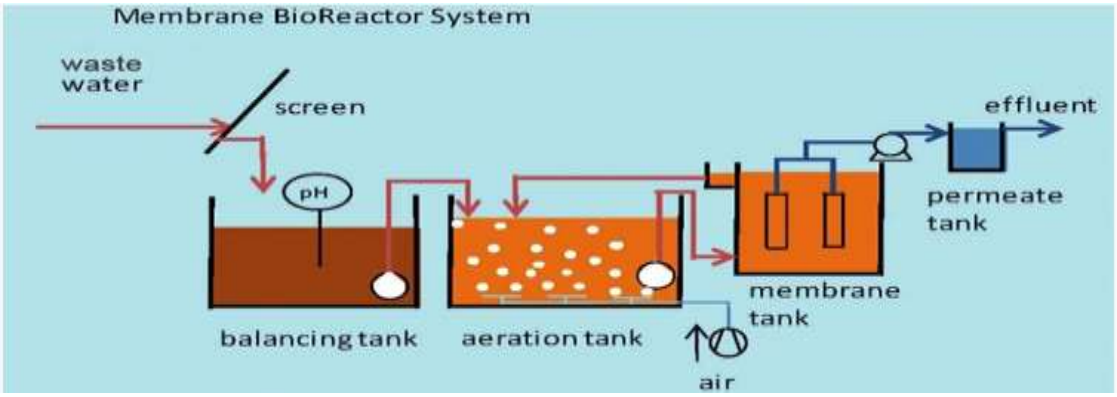

Fig.1 waste treatment system

Chlorine and ozone are two chemicals used to purify water.

Explanation:

- Chlorine can be used as a purifier by either using it as a gas or by adding an amount of sodium hypochlorite to the sample of water.
- Chlorine is available as compressed elemental gas.
- The purification by ozone lasts for a shorter amount of time. The process of purifying water by ozone is termed as Ozonation.
- Ozone is a disinfectant with the ability to destroy the viruses and biological contaminants found in water.
- Other chemicals can also be used in the process. Some of them are potassium permanganate wherein we have to wait for the water to become light pink in color.
- The process of bromination can also be used but it's not always recommended.

1.2 The Benefits of Wastewater Treatment

Wastewater treatment has a number of benefits. For example, wastewater treatment ensures that the environment is kept clean, there is no water pollution. The last two major categories of water treatment chemicals are coagulants and flocculants, which work in combination to remove suspended solids and clarify wastewater.

Fig. 2 Waste water treatment system

Self-Check 1	Written Test

Name…… ID…… Date……

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

Test I: Say true/ false

1. The main by-product from wastewater treatment plants is sewage sludge (3point)

Test II: Choose the best answer

1. What are the two major categories of water treatment chemicals (3point)?

A. Coagulants B. Flocculants C. Chlorine D.A and B

2. Which one of the following chemicals used to purify water (5point)?

A. Chlorine B. Ozone C. Chlorine D.A and B

Test II: Short answer

1. List two chemicals which is used for ware treatment (4point)

_____

_____

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

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

Information Sheet 2- Confirming services ready for operation.

2.1 Confirming services ready for operation.

It covers basic ingredient preparation such as inspecting and weighing materials and operating simple preparation equipment. Method used to depends on materials and specification requirements can include:

- Confirming type of materials
- Visual inspection
- Sorting and grading
- Equipment preparation

Prepare materials as required by recipe/specification. This can include:

- Measuring and weighing
- Sample preparation methods

Fig.1 maintaining ready for operation

Fig. 2 Ready for operation

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: Choose the best answer

1. Which one of the following Method used to depends on materials and specification requirements (5point)

A. Confirming type of materials

B. Visual inspection

C. Sorting and grading

D. All

Test II: Short answer

1. Write the materials which is used for operation (5points)

_____

_____

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

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

Information Sheet 3- conducting pre-operational checks

3.1 conducting pre-operational checks

Pre-operational check is important for the workers safety. It involves a daily check of the machines health. Any forklift or warehouse machine that needs repairs, maintenance or is observed to be unsafe to operate has to be taken out until such repair or maintenance has been done. Check to ensure there is a fire extinguisher, first aid kit, and any tools or supplies that you will need to perform your task. Check that the communication system, such as CB or two-way radio, is operational. If using a cell phone, make sure to keep it on your person. Don't leave it in the tractor.

The purpose of a pre-operation check is to make sure that no hazards exist before you start your production for the day. Find out what you should be checking as part of these checks.

A pre-start inspection involves a routine examination of a piece of equipment by its operator that is standardized via a checklist. Whether it be a light vehicle, heavy vehicle, mobile plant or tools, pre-start inspections are an important task with financial, and more importantly, safety implications.

The purpose of an inspection is to identify whether work equipment can be operated, adjusted and maintained safely – with any deterioration detected and remedied before it results in a health and safety risk. The need for inspection and inspection frequencies should be determined through risk assessment. Check that the outer cover of the equipment is not damaged in a way that will give rise to electrical or mechanical hazards. Check for burn marks or staining that suggests the equipment is overheating. Position any trailing wires so that they are not a trip hazard and are less likely to get damaged.

The purpose of inspection is to check whether the product is manufactured according to the standards and specification by checking the products randomly.

The pre-operation inspection helps to:

1. Reduce the risk of injury to you due to defective equipment.
2. Verify that the equipment you will operate is in safe working order

❖ Aside from being an OSHA(Occupational health and safety assurance) ,requirement, a pre-operational inspection helps to

- Reduces the risk of injury to you and other employees.
- Improves the condition of the lift truck.
- Increase productivity.
- Reduces downtime and maintenance costs.

A pre-start inspection involves a routine examination of a piece of equipment by its operator that is standardized via a checklist.

Fig.1 pre-operation check

Self-Check 3	Written Test

Name…… ID…… Date…….

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

Test I: Say true /false

The purpose of a pre-operation check is to make sure that no hazards exist before you start your production for the day (3point)

Test II: Choose the best

1. Which one of the following is true about pre-operation inspection?

. A. Reduce the risk of injury to you due to defective equipment.

. B. Verify that the equipment you will operate is in safe working order

C. A and B

Test III: Short answer

1. Define pre-operational check (3points)

_____

_____

_____

2. Write the importance of pre-operation inspection (5point)

-

_____

_____

_____

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

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

Information Sheet 4- Calibrating instrumentation and test equipment to manufacturer's

4.1 Calibrating instrumentation and test equipment to manufacturers

Calibrations are the documented comparison of the measurement device to be calibrated against a traceable reference device. The reference standard may be also referred as a "calibrator." Logically, the reference is more accurate than the device to be calibrated.

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Instrumentation is the basic process control in industry. In industrial control a wide number of variables temperature, flow, level, pressure, and distance can be sensed simultaneously. The goal of calibration is to minimize any measurement uncertainty by ensuring the accuracy of test equipment.

- **The basic principle of calibration**

Calibration is the activity of checking, by comparison with a standard, the accuracy of a measuring instrument of any type. It may also include adjustment of the instrument to bring it into alignment with the standard.

The 5 reasons for calibrating our measuring equipment. It's the most importance that you have your equipment regularly calibrated for the following reasons.

- Maintain industry compliance and consistency.
- Reduce costly errors.
- Eliminate safety risks.
- Minimize downtime.
- Keep your customers satisfied

- **Principles of instrumentation**

- Accessibility (operator's posture and patient positioning).
- Visibility, illumination, and retraction.
- Selection of proper instrument.
- Condition of instruments (sharpness).

- Instrument stabilization.
- Instrument activation.

❖ Instruments are used to measure and control the condition of process streams as they pass through a Plant. Instruments are used to measure and control process variables such as: Temperature; Flow; Level; Pressure; Quality.

……..

Fig.1 Calibration instrument

4.2 Test equipment's to

Test equipments are:

1. screens
2. pH correction
3. oil/grease skimmers
4. settling and treatment ponds
5. aeration units
6. lagoons
7. first flush systems and wetlands pumps and valves

Tests may include:

- pH
- solids
- color/turbidity
- flow rate
- settling rate
- settled volume

DO and BOD/COD levels

Self-Check 4	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. Instruments are used to measure and control the condition of process(3point)

Test II: Choose the best answer

1. Which one of the following equipment used for testing purpose (3point)

A. Screens

B. PH correction

C. Oil/grease skimmers

D. All

Test III: Short answer

1. What are the goals of calibration (4points?)

_____

_____

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

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

Information Sheet 5- Identifying and reporting health and safety hazards/maintenance to appropriate personnel

5.1 Identifying and reporting health and safety hazards/maintenance to appropriate personnel

Food safety is best ensured through the identification and control of hazards in the production, manufacturing and handling of food as described in the Hazard Analysis and Critical Control Point (HACCP) system, adopted by the joint WHO/FAO Codex Alimentarius Commission, rather than relying on end product standards alone.
safe work procedures including awareness of health and safety hazards related to waste water system operation and associated control measures

- **What is HACCP?**

HACCP, or the Hazard Analysis Critical Control Point system, is a way of ensuring that food is safe.

A 'hazard' is defined in Standard as 'a biological, chemical or physical agent in, or condition of, food that has the potential to cause an adverse health effect in humans'. The hazards are listed below.

2. Microbiological Hazards

The hazards are:-

- *Food poisoning bacteria such as Salmonella spp., Campylobacter jejune, Escherichia coli,*
- *Listeria monocytogenes, Staphylococcus aurous, Bacillus cereus and Clostridium perfringens.*
- *Foodborne viruses such as hepatitis A and nor viruses.*
- *Foodborne parasites such as Cryptosporidium parvum and Giardia lamblia.*
- *Toxin-producing molds such as Aspergillus flavus, which produces afflatoxin.*

3. Chemical

Food can become contaminated with unwanted chemicals such as cleaning agents, pesticides, Fungicides, fertilizers and veterinary chemicals. For example, food could become contaminated with cleaning agents if care is not taken to store and use the chemicals correctly.

4. Physical

Food can be contaminated with physical objects such as glass, metal, plastic, insects, and adhesive dressings and jewelers. If these things are found in food they may introduce microbial hazards and may also result in physical harm to the consumer, for example choking, laceration and broken teeth.

Note that safety procedures (acceptable to the Health and Safety Authority) must be adopted in operating small wastewater treatment systems and nothing in this manual should be construed as advice to the contrary.

Fig 1 safe food

Report health and safety hazards to appropriate person

- Waste water treatment machine breakdown
- Waste water treatment storage area problem

- Useless/expired waste treatment chemicals

Self-Check 5	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. HACCP, or the Hazard Analysis Critical Control Point system, is a way of ensuring that food is safe (3point).

Test II: Choose the best answer

1. Which one of the following are examples of Chemical hazard (3point)

A. Cleaning agents,

B. Pesticides,

C. Fungicides

D. All

Test I: Short answer

1. Define HAZARD (4points)

_____

_____

2. List the three types of hazards (3points)

_____

_____

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

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

Operation Sheet 1- pre-operational checks waste water treatment

Procedure

Step 1: prepare operation equipment.

Step 2: Check operating machine

Step 3: Check Filtration equipment

Step 4: Disinfection equipment.

Step 5: Start operating.

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task- 1. Pre-operational checks

LG #86	LO #2- Operate and monitor the waste water treatment process

Instruction sheet

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

- Starting the waste water system
- Operating plant within limits of manufacturer's
- Monitoring equipment
- Monitoring, testing and adjusting waste water quality
- Operating first flush systems during rainfall events
- Meeting the workplace housekeeping standards

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 the waste water system
- Operate plant within limits of manufacturer's
- Monitor equipment
- Monitor, test and adjust waste water quality
- Operate first flush systems during rainfall events
- Meet the workplace housekeeping standards

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
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Information Sheet 1- Starting the waste water system

1.1 Starting the waste water system

Waste water is water whose physical, chemical or biological properties have been changed as result of the introduction of certain substances which render it unsafe for some purposes such as drinking. The day to day activities of man is mainly water dependent and therefore discharge 'waste' into water. Wastewater treatment is a fairly new practice although drainage systems were built long before the nineteenth century.

1.1.1 Objectives of starting waste water treatment system

- Reduction of biodegradable organic substances in the environment**:** organic substance such as carbon, nitrogen, phosphorus, and sculpture in organic matter needs to be broken down by oxidation into gases which is either released or remains in solution.

- Reduction of nutrient concentration in the environment**:** nutrients such as nitrogen and Phosphorous from wastewater in the environment enrich water bodies or render it eutrophic leading to the growth of algae and other aquatic plants. These plants deplete Oxygen in water bodies and this hampers aquatic life.

- Elimination of pathogens**:** organisms that cause disease in plants, animals and humans are called pathogens. They are also known as micro-organisms because they are very small to with the naked eye.

Fig. 1 West water treatment process

Fig 2 Disposed water

Irrigation with wastewater is both disposal and utilization and indeed is an effective form of wastewater disposal (as in slow-rate land treatment).

- Process of wastewater treatment due to the nature of contaminants in waste water physical, chemical and biological, the Unit operations and processes in wastewater treatment can also be categorized as such.

Fig .2 waste water treated chemical process

1.2 Challenges of wastewater management

Wastewater management though not technically difficult sometimes be faced with Socio-economic challenges. A few of the challenges are discussed below.

- **Infrastructure**

Most often than not, wastewater infrastructure are not the priority of most politicians and Therefore very little investment is made. It is however important to consider wastewater infrastructure as equally important as water treatment plant because almost all the water produced ends up as wastewater.

- **Pollution of water sources**

Effects of wastewater effluent on receiving water quality is enormous, it changes the aquatic environment thus interrupts with the aquatic ecosystem. The food we eat contains Carbonaceous matter, nutrients, trace elements and salts and are contained in urine and faces (black water).Medications (drugs), chemicals and in recent times hormones (contraceptives) are also discharged into the wastewater treatment plant. Discharge guidelines must be strictly adhered to. Waste water has proven to be very efficient in the industrialized countries and should be adapted in developing countries as well.

- **Choice of appropriate technology**

Because the economy of most developing countries is donor driven, funds for waste water. Plants are mainly from donors. For this reason, they tend to propose the technology which should be adopted.

- **Sludge production**

Treatment of wastewater results in the production of sewage sludge. There must be a reliable disposal method. If it must be used in agriculture, then the risks involved must be taken into consideration.

❖ **Reuse**

Effluents which meet discharge standards could be used for agricultural purposes such as aquaculture or for irrigation of farm lands.

Waste water treatment flow diagram

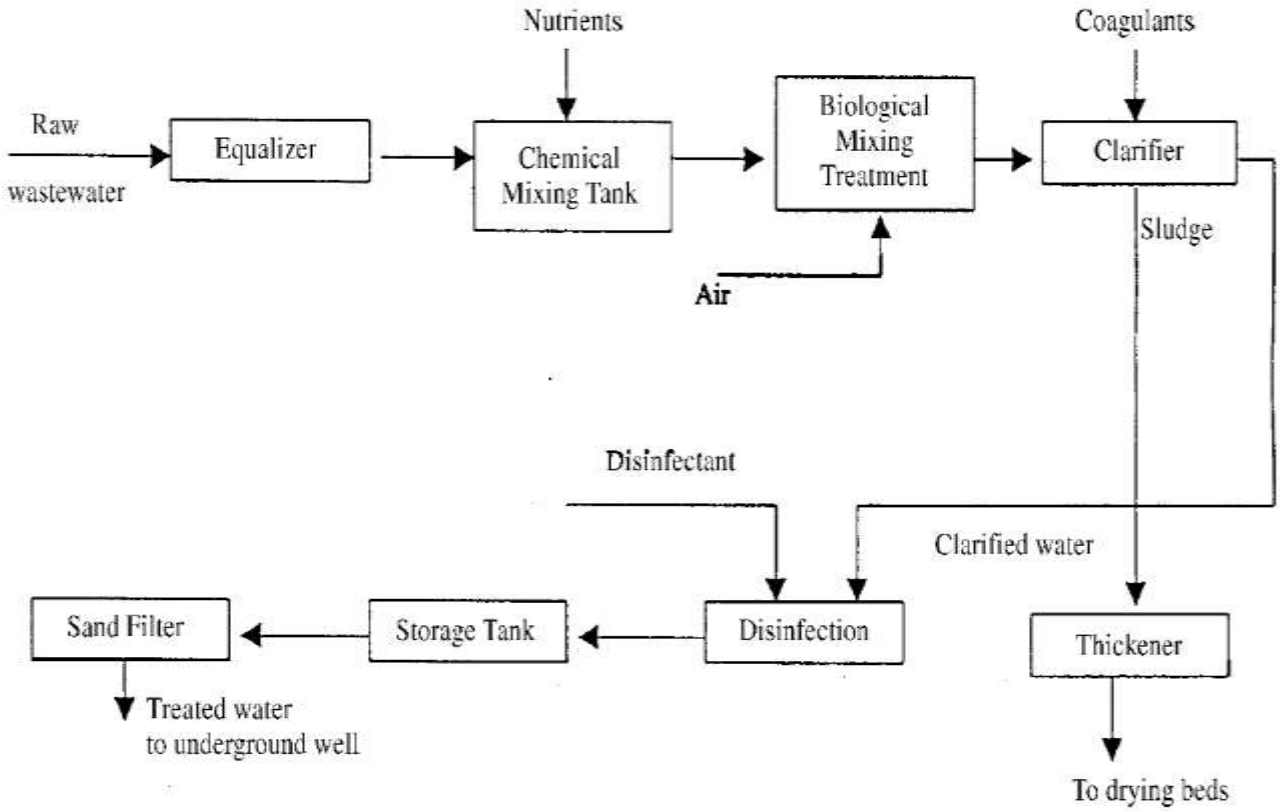

Fig. 1Raw waste water treatment flow diagram

Self-Check 1	Written Test

Name…… ID…… Date…….

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

***Test I:* Say true/ false**

2. Objectives of wastewater treatment is elimination of pathogens (4point)

Test II: Choose the best answer

1. Which one of the following objectives of starting waste water treatment system (3point)

A.Reduction of biodegradable organic substances

B. Reduction of nutrient concentration

C. Elimination of pathogens

D. All

Test III: Short answer

1. Write the objectives of wastewater treatment (3points)

_____

_____

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

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

Information Sheet 2- Operating plant within limits of manufacturer's

2.1 Operating plant within limits of manufacturer's

Performance of a practical work or of something involving the practical application of principles or processes Practice until you can go through the whole operation without thinking.

Food processing activities such as plant cleaning, material conveying, bottling, and product washing create wastewater. Many food processing facilities require on-site treatment before operational wastewater can be land applied or discharged to a waterway or a sewer system. High suspended solids levels of organic particles increase BOD and can result in significant sewer surcharge fees. Sedimentation, wedge wire screening, or rotating belt filtration (micro screening) is commonly used methods to reduce suspended organic solids loading prior to discharge.

Industrial wastewater treatment describes the processes used for treating wastewater that is produced by industries as an undesirable by-product. After treatment, the treated industrial wastewater (or effluent) may be reused or released to a sanitary sewer or to a surface water in the environment. Most industries produce some wastewater. Recent trends have been to minimize such production or to recycle treated wastewater within the production process.

Self-Check 2	Written Test

Name…… ID…… Date…….

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

Test I: Short answer

1. Write does it mean operation (5points)

_____

_____

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

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

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Information Sheet 3- Monitoring equipment waste water treatment

3.1 Monitoring equipment

Monitoring is the systematic process collecting, analyzing and using information to track a process progress toward reaching its objectives and to guide waste water treatment equipment management decision**.**

Equipment operations and monitoring may include but not limited to:

- Operation and monitoring of equipment and processes typically requires the use of control panels and systems.

The treatment system should be designed so that sampling of the inflow and- outflow is ptacticable.The design should also permit easy access to most parts of the treatment system. The equipment necessary to any out a sampling programmer includes: a fixed or portable sampling device, a data logger, a flow measuring device and a power supply.

Flows and wastewater characteristics should be monitored. Operational monitoring generally includes mixed liquor suspended solids (MLSS).solids contact aeration basin DO, pH, sludge settle ability, inflow, percolating filter recirculation flow, return sludge glow sludge wasting rate.

Monitoring requirements include stem in flow and final wastewater flows, suspended solids concentrations and substrate concentrations. Operational monitoring generally includes RBC basin dissolved oxygen (DO) levels, pH, sludge settle ability, sludge flow from secondary to primary settlement tank and sludge wasting rate. If the RBC is overloaded, there will be odor problems at the inlet end of the biological zone. Monitoring requirements may include' stem inflow and wastewater flows, suspended solids Concentrations and substrate concentrations.

Self-Check 3	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

2. Monitoring is the systematic process collecting, analyzing and using information(3point)

Test II: Choose the best answer

1. Which one of the following includes operational monitoring(3point)?

A. pH, sludge settles ability,

B. sludge flow from secondary to primary settlement tank

C. A and B

D. All

Test III: Short answer

1. Define monitoring (4points)

_____

_____

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

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

Information Sheet 4- Monitoring, testing and adjusting waste water quality

4.1 Monitoring, testing and adjusting waste water quality

Waste water Quality monitoring can evaluate the physical, chemical, and biological characteristics of water. Monitoring requirements may include' system inflow and final waste water flows, suspended solids Concentrations and substrate concentrations. Water quality monitoring is commonly defined as the sampling and analysis of water (lake, stream, river, estuary, or ocean) and conditions of the water body.

Operational monitoring should include MLSS, Reactor DO, pH, sludge settle ability, alkalinity, and return Sludge flow, and sludge wastage rate. The treatment system should be designed so that sampling of the inflow and- outflow is ptacticable.The design should also permit easy access to most parts of the treatment system without dismantling any fixed components. The equipment necessary to any out a sampling program. Includes: a fixed or portable sampling device, a data logger, a flow measuring device and a power supply. Flows and wastewater should be monitored.

4.1.1 Waste Water Quality

Water quality sampling and test procedures including the purpose of test and safe use, care and storage of relevant test equipment, interpretation and recording of results

The objective of water quality monitoring is to obtain quantitative information on the physical, chemical, and biological characteristics of water via statistical sampling

- **Water Quality Indicators**

- Temperature and dissolved oxygen.
- Conventional variables (pH, total dissolved solids, conductivity, and suspended sediment)
- Nutrients.
- Metals.
- Hydrocarbons.

- Industrial Chemicals (PCBs and dioxins/furans)

Seven ways to testing and monitoring the waste water quality, encouraging a clean and healthy aquatic ecosystem**.**

- CDOM/FDOM Monitoring.
- Chlorophyll Fluorescence Analysis.
- Conductivity, Salinity, and TDS Monitoring.
- Recording the Water Temperature.
- Measuring the Dissolved Oxygen Levels.
- PH and KH Testing.

Self-Check 4	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. Temperature and dissolved oxygen are water quality Indicators (3point)

Test II: choose the best answer

1. Which one of the following are water quality indicators (3points)

A. CDOM/FDOM Monitoring B. PH and KH Testing C.A and B

Test III: Short answer

1. Write at least three Water quality Indicators (4points)

_____

_____

_____

2. What is the Objective of water quality monitoring (5points?)

_____

_____

_____

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

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

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Information Sheet 5- Operating first flush systems during rainfall events

5.1 Operating first flush systems during rainfall events

First flush device is one that takes the first water from your roof and diverts it from your tank. If it important to flush the roof and divert water from your tank, because over time your roof gets dust and dirt and debris from the environment. The rainwater effectively washes your roof.

Primary treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment.

The major aim of waste water before releasing wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. As solid material decays, it uses up oxygen, which is needed by the plants and animals living in the water.

Primary treatment removes material that will either float or readily settle out by gravity. It includes the physical processes of screening, commination, grit removal, and sedimentation. Screens are made of long, closely spaced, narrow metal bars.
Wastewater Primary Treatment is the first step in the water treatment process meant for removing suspended solids (TSS), oil and grease, color, and odor. The key components in this step are screens, grit chamber, flow equalization tank, and clarifier.

The COD value (chemical oxygen demand) indicates how much oxygen, measured in mg/L is required to oxidase most of the organic material including cellulose in 1litre of dirty water. This test method oxidizes more organic material than the BOD test and therefore the COD value is always higher than the BOD value.

The greater the BOD, the more rapidly oxygen is depleted in the stream. This means less oxygen is available to higher forms of aquatic life. The consequences of high

BOD is the same as those for low dissolved oxygen: aquatic organisms become stressed, suffocate, and die.

Fig. 1 treated water tank

Self-Check 5	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. The COD value is always higher than the BOD value. (3points)

_____

Test II: Choose the best answer

1. Which one of the following is takes the first water from your roof and diverts it from your tank (3point).

A. First flush device B.COD C.BOD D. None

Test I: Short answer

1. Write primary waste water treatment system (4points)

_____

_____

_____

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

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

Information Sheet - 6 Meeting the workplace housekeeping standards

6.1 Meeting the workplace housekeeping standards

Effective housekeeping can help to control or eliminate workplace hazards.

Housekeeping is not just cleanliness. It includes keeping work areas neat and orderly, maintaining halls and floors free of slip and trip hazards, and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas.

The seven-steps of cleaning process includes emptying the trash; high dusting; sanitizing and spot cleaning; restocking supplies; cleaning the bathrooms; mopping the floors; and hand hygiene and inspection. Good housekeeping practices help ensure neat, organized, and safe workspaces, which can reduce stress and improve morale. An increase in productivity and lower operating costs may also result when workers spend less time tracking down a needed tool or other item. Reducing workplace injuries will also help lower costs.

Practice good housekeeping in the workplace

- Ensure all spills are immediately cleaned up.
- Maintain clean light fixtures to improve lighting efficiency.
- Keep aisles and stairways clear. ...
- Regularly inspect, clean and repair all tools.

5S or good housekeeping involves the principle of waste elimination through workplace organization. 5S was derived from the Japanese words seiri, seiton, seiso, seiketsu, and shitsuke. In English, they can be roughly translated as sort, set in order, clean, standardize, and sustain.

Workplace housekeeping checklist is a tool used to ensure that the workplace is well organized, hygienic, and safe for all employees. Good housekeeping prevents workplace hazards such as slips, trips, falls, and more.

Self-Check 6	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. Effective housekeeping can help to control or eliminate workplace hazards (3point)

Test II: Choose the best answer

1. Which one of the following is true about good housekeeping (3point)?

A. Ensure all spills are immediately cleaned up.

B. Maintain clean light fixtures to improve lighting efficiency.

C. Keep aisles and stairways clear

D. All

Test III: Short answer

1. Write at least 3 workplace good housekeeping (4points)

_____

_____

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

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

Operation Sheet 1– Operating waste water plant

Procedure:

1. Use personal protective equipment
2. Check the equipment or treatment machine
3. Start the waste water treatment system
4. Monitor the equipment
5. Test waste water quality

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task-1 Operate waste water treatment

Operation sheet 2	testing waste water quality

Procedure

1. Prepare equipment for testing purpose.
2. Prepare chemicals for testing waste water .
3. Separate tested water and dispose water
4. Store treated water in correct or proper manner

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task-1 Test waste water quality

Operation sheet 3	First flush waste water treatment systems

Procedure:-

1. Use personal protective equipment
2. Remove small and large particles from sewage
3. Remove initially floating debris
4. Remove soil and small pebbles
5. Flush waste water treatment

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task-1 Operate first flush systems

Operation sheet 4	workplace housekeeping standards

Procedure:-

1. Apply safety rules or use PPE
2. Remove Dust and Dirt particles.
   1. Clean Surfaces
   2. Maintain Light Fixtures.
3. Spill Control.
4. Keep Tools and Equipment safety
5. Apply 5s

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task-1 Perform the workplace housekeeping standards

LG #87	LO3 # Analyze and respond to abnormal performance

Instruction sheet

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

- Analyzing water condition and plant operating conditions
- Taking corrective action to hazards, out-of-specification test results and/or plant performance.
- Implementing emergency 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:

- Analyze water condition and plant operating conditions
- Take corrective action to hazards, out-of-specification test results and/or plant performance.
- Implement emergency 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 1- Analyzing water condition and plant operating conditions

1.1 **Analyzing water condition and plant operating conditions**

During treatment, the pH is reduced because of the reaction between the coagulant and the alkalinity of the raw water. To avoid corrosion in the distribution system, the pH must be adjusted upwards (usually with lime) before treated water is discharged from the plant - but this can conflict with disinfection. Measurements of pH should be made routinely (and recorded) for raw water, settled water, filtered water and water discharged to the distribution system

Most treatment plants do not routinely adjust the pH for coagulation except if additional alkalinity is essential for the reaction to proceed. The coagulant dose to produce a good settle able flock is usually determined in the laboratory and through experience. The main reason for this practice is convenience - the pH may not be optimum but in the opinion of the operators it may be satisfactory.

Water departments should maintain at least a basic set of equipment and reagents which can be used by appropriately-trained personnel to measure accurately the physical, chemical and biological characteristics of raw and treated water. Complete and accurate information is an essential element of water quality monitoring and of the design of treatment plant improvements.

Self-Check 1	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. During waste water treatment, the pH is reduced (5point)

Test II: Choose the best answer

1 Which one of the following water measurements of pH should be made routinely (and recorded)

A. raw water B. Settled water C. Filtered water D. All

Test II: Short answer

1. Write at least 3 workplace good housekeeping (5points)

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

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

Information Sheet 2- Taking corrective action to hazards, out-of-specification test results and/or plant performance

2.1 Taking corrective action to hazards, out-of-specification test results and/or plant performance

Hazard is a potential that cause harm to the consumer. Foods can become unsafe and have the potential to cause harm through hazards. They cause harm by spoiling of food, or causing sickness, disease, or death in people consuming the food.

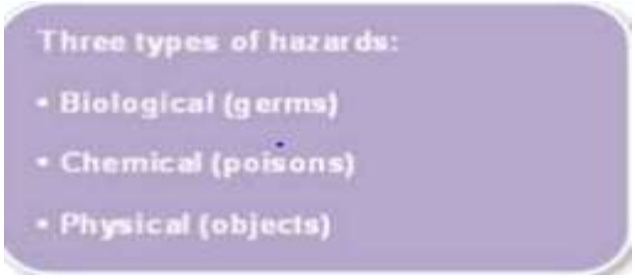

Fig 1 Hand microscopy

These are harmful micro-organisms such as bacteria, viruses, helminthes, protozoa, algae, and certain toxic products they may produce. For example, Salmonella, Escherechia coli, Listeria, Yersinia,

Safe work procedures including awareness of health and safety hazards related to waste water system operation and associated control measures. Hazard analysis each

hazard is then analyzed along the source, what can go wrong, how, when etc. and understanding the conditions that may cause the hazard to be present or to increase.

Hazard characterization the qualitative and/or quantitative evaluation of the nature of the adverse health effects. Hazard identification is the identification of biological, chemical, and physical agents capable of causing adverse health effects and which may be present in a particular food or group of foods. Risk characterization the qualitative and/or quantitative estimation of the probability of occurrence and severity of adverse health effects.

2.2- Taking corrective action to hazards

Actions are identified and implemented to reduce or eliminate the hazard.

Hazards may include:-

- Handling chemicals,
- Manual handling and
- Flammable gases.

Self-Check 6	Written Test

Name…… ID…… Date…….

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

Test II: Say true/false

1. Hazard is a potential that cause harm to the consumer (2point)

Test I: Choose the best answer

1. Which one of the following is control measure of waste water system operation (2point?)

A. Hazard analysis B. Hazard characterization

C. Hazard identification D. All

5. Which one of the following is types of hazards(2points)

A. Biological hazard B. Physical hazard C. Chemical hazard D. All

Test III: Short answer

2. List three types of hazard (4points)

_____

_____

_____

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

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

Information Sheet 3- Implementing emergency procedures

3.1. Implementing emergency procedures

Emergency procedure is identifying the responsibilities, actions and resources necessary to deal with an emergency. Once drafted, a procedure may require a consultative period with those who could be involved or affected by the emergency, and a program set out for testing, training and periodic review. Summoning the emergency services and continuing to liaise with them. Crowd management, including evacuation, where necessary.

Implementing Emergency plan promotes safety awareness and shows the organization's commitment to the safety of workers. The lack of an emergency plan could lead to severe losses such as multiple casualties and possible financial collapse of the organization. Since emergencies will occur, preplanning is necessary.

Laboratories need to have procedures in place for how staff should deal with accidents and emergencies. General written procedures for first aid should be developed and made available to all staff so they know the first things to do, and who to call or notify in case of minor cuts and bruises, major wounds or skin contamination.

Emergency procedures should be in place in the workplace your emergency action plan must include the following:

- A preferred method for reporting fires and other emergencies;
- An evacuation policy and procedure;

Emergency escape procedures and route assignments, such as floor plans, workplace maps, and safe or refuge areas

Practice and Review Your Emergency Action Plan.

The purpose of an EAP is to facilitate and organize employer and employee actions during workplace emergencies.

The fundamental principles of emergency management are based on four phases – **mitigation**, **preparedness**, **response** and **recovery.**

- **Emergency evacuation procedures?**

On hearing an evacuation alarm, or on instruction of emergency control personnel, immediately cease all activity and secure personal valuables. Assist any person in immediate danger, but only if safe to do so. In a fire, do not use a lift to evacuate a building.

Self-Check 6	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. The purpose of an EAP is to facilitate and organize employer and employee actions during workplace emergencies (3point)

Test II: Choose the best answer

1. Which one of the following is the fundamental principles of emergency management (3points)

A. Mitigation B. Preparedness C. Response D. All

Test III: Short answer

2. Write the purpose of an EAP **(**Emergency Action Plan) (5points)

_____

_____

_____

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

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

LG #88	LO4 # Handover waste water treatment system

Instruction sheet

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

- Maintaining Workplace records
- Carrying out handover according to workplace procedure.
- Awaring waste water treatment operators system status

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:

- Maintain Workplace records
- Carry out handover according to workplace procedure.
- Aware waste water treatment operators system status

Learning Instructions:

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

Operation sheet 1	Taking corrective action in response to out-of-specification

Procedures

Step1. Collect information on hazards

Step2. Evaluate information on hazards

Step3. Understand condition leading to hazards

Step4. Decide on significant hazards to address in HACCP plan

Step5. Take the correct action

LAP TEST	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task1. Corrective action for waste water treatment

Operation sheet 2	**Implementing emergency procedures**

Procedure

Step 1: Assemble Your Team.

Step 2: Conduct a Risk Assessment.

Step 3: Establish Performance Objectives.

Step 4: Create a Written Policy.

Step 5: Develop an On-Site Emergency Response Team.

Step 6: Implement / sustain the procedure

LAP TEST	**Performance Test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task1. Implement emergency procedures

Information Sheet 1- Maintaining Workplace records

1.1 Maintaining Workplace records

Workplace records are an important part of any work environment and should be accurately maintained within the required timeframes

Types of workplace records

A. Staff records

- These are records relating to any and all aspects of staffing the premises. May be divided into overall records and individual staff records

Overall records

- ✓ Staffing rosters
- ✓ Training details by operational area
- ✓ Annual leave planning chart
- ✓ Salary and overtime payments
- ✓ Injury records.

Individual staff records

- ✓ Leave records
- ✓ Record of uniform orders
- ✓ Training schedule
- ✓ Direct salary deduction details
- ✓ Injury claims.

- Overall records are those records kept that relate to staff as a whole

Types of records

Staff may be given required to complete records such as:

- Time sheets
- Requisitions
- Internal transfers

- Requests for maintenance
- Daily takings sheets.

❖ **Importance of records**

- For continuous monitoring of quality system
- For specimen tracking throughout process
- To identify failures in equipment
- To revisit information; reference
- For use as a management tool

❖ **Workplace information**

- batch/recipe instructions
- verbal or written operating procedures
- specifications: detailed description of design criteria for a piece of work
- production schedules

Self-Check 1	Written Test

Name…… ID…… Date…….

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

Test I: Say true/false

1. Workplace records are an important part of any work environment (3point)

Test II: Choose the best answer

1. Why are records essential? (3points)

   A. For continuous monitoring of quality system B. To identify failures in equipment

   C. To revisits information; reference D. All

Test III: Short answer

2. Write five Types of records (4points)

   _____

   _____

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

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

Information Sheet 2- Carrying out handover according to workplace procedure.

2.1 Carrying out handover according to workplace procedure.

2.1.1 Handover responsibility procedure

- Handover according to the required legal or regulatory requirements, organizational health, safety, environmental and hygiene standards or instructions
- Take precautions to ensure that production is not interrupted during handover
- Maintain quality standards during task handover
- Provide information in accordance with organizational procedures
- Exchange information in accordance with organizational procedures

Shift handover should be:

1. conducted face-to-face;
2. two-way, with both participants taking joint responsibility;

3. done using both verbal and written communication;
4. based on an analysis of the information needs of incoming staff;
5. Given as much time and resource as necessary.

'Be prepared and make the time for a good handover. Remember: right person, right place, and right time. Keep handovers succinct and avoid repetition.

❖ Key Components of a Handover Report

- The Precise Status of Ongoing Tasks. Specifically, this section entails a brief but detailed description of all the unfinished projects and tasks.
- Upcoming Deadlines.
- Forthcoming Events.
- Distinctive Roles

Checklist of what could be included in the project handover plan: Identifying and managing key stakeholders including the group who will receive the handover. A clear date for handover of the part. A communication plan that starts early in the life of the project and includes the target group.

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: Say true/false

1. Shift handover conducted face-to-face (3point

Test II: Choose the best answer

1. Which one of the following is key Components of a handover report (3points?)

A. Upcoming Deadlines.

B. Forthcoming Events.

C. Distinctive Roles

D. All

Test III: Short answer

1. Write at least three hands over responsibility (4point)

_____

_____

_____

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

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

Information Sheet 3- Awaring waste water treatment operators system status

3.1 Awaring waste water treatment operator's system status

Treatment plant operators have many responsibilities ranging from:

• Planning and Design

• Operations and Maintenance

• Public relations

• Supervision

• Laboratory procedures

- ❖ Roles of the Treatment Plant Operator
- Duties and Responsibilities of the Treatment Plant Operator
- Planning, Design, and Construction of New Facilities
- Administration
- Wastewater Treatment Plant Operations and Maintenance
- Public Relations

- Safety
- Continuing Education

Self-Check 3	Written Test

Name…… ID…… Date…….

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

Test II: Say true/false

1. Supervision is treatment plant operator's responsibilities (3point)

Test I: Choose the best answer

1. Which one of the following is a treatment plant operator not responsible for:

A. Plant tours

B. Process control decisions

C. Upgrading the electrical service panel

D. Collecting samples

Test II: Short answer

1. Write at least three roles of the treatment plant operator(4point)

_____

_____

_____

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

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

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LG #89	**LO5 # Shutdown the waste water treatment system**
Instruction sheet	
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Shutting down waste water treatment system and prepared for storage mode • 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: • Shut down waste water treatment system and prepared for storage mode • Identify and report maintenance requirements	
Learning Instructions:	

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

Information Sheet 1- Shutting down waste water treatment system and prepared for storage mod

1.1 Shutting down waste water treatment system and prepared for storage mod

1.1.1 Shut down the process

At process plants, most alteration, inspection, repair, replacement, and minor maintenance work can be done while the plant is in operation. In spite of these activities, however, without scheduled maintenance outages equipment will eventually fail. An unscheduled outage is in most cases substantially more expensive than a scheduled one, and the cost is substantially higher again if the outage is due to a catastrophic failure. Therefore, in order to minimise costs, a plant needs to undergo scheduled process outages for major maintenance work and for possible modifications

of the facility. Such an outage is referred to as a plant shutdown. Most major scheduled plant shutdowns are of high intensity involving sometimes hundreds of people.

Water treatment is the process of removing all those substances, whether biological, chemical or physical, those are potentially harmful in water supply for human and domestic use.

Storage should be in a secure area, away from an excessive heat source, and free from combustible materials that could react in the presence of chlorine. They should be located above ground level, and have adequate ventilation. The area should be protected from direct sunlight since temperature control is essential.

1.1.2 Plant turnarounds, shutdowns and outages

Often the terms plant turnaround, plant shutdown and plant outage is used as synonyms. Here we have adopted the sometimes used alternative definitions for these terms.

According to this approach a plant turnaround is the management process of a plant shutdown. Only the execution phase of a plant turnaround procedure is called a plant shutdown, which in turn is defined as a scheduled event wherein an entire process unit of an industrial plant is shut down for an extended period for revamp and/or maintenance.

Shutdown procedures, your water system will be in good shape and need fewer repairs and maintenance work before you re-open it.

1. Evaluate the water system
2. Drain and repair the storage tank
3. Pressure tanks
4. Shut down treatment

• Turn off the power to all treatment systems.

• Discard unused chlorine solutions and stock.

Fig. 1 storage area

Fig .2 Stored water

Self-Check 1	***Written Test***

Name…… ID…… Date…….

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

Test I: Say true/False

1. waste water should be storage in secure area (5point).

Test II: Short answer

1. Write at least three shutdown procedures(5point)

_____

_____

_____

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

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

Information Sheet 2- Identifying and reporting maintenance requirements

2.1 Identifying and reporting maintenance requirements

Maintenance helps to protect the capital investment and ensures an effective and economical expenditure in operating and maintaining the sewerage facilities. Preventive maintenance is more economical and provides for reliability in operations of the sewer facilities.

To operate and maintain a sewer collection system to function as intended, the maintenance engineer should try to strive towards the following objectives:

- Minimize the number of blockages per unit length of sewer, and
- Minimize the number of odor complaints.

Maintenance of production equipment in industrial enterprises plays an increasingly important role. It is quite obvious that it can eliminate a number of risks associated with the business and ensure effective use of financial resources necessary to ensure the working order of the machinery and equipment of the businesses.

Properly performed maintenance can contribute to gaining a competitive advantage. The maintenance process enhances customer satisfaction (Chan, Prakash, 2012), that is often directly dependent on the reliability, flexibility and speed of suppliers (Branska et al., 2016).

Increasing satisfaction through better products or services is accepted as an essential step leading to customers' repurchase intentions and/or reducing switching intensions (Park, Jang 2014). This is essential for increasing the profit of the manufacturer

Maintenance of production equipment is accentuated especially in those businesses that:

- Cannot afford to disappoint its customers mainly due to the technical quality of their products and/or due to delivery times,
- Have limited production capacities,
- Own outdate production equipment that requires high investments and
- Pose a significant threat to the environment and/or its own staff as a result of accidents with production equipment.

The main routine maintenance activities are:-
Removal of screenings and grit from the preliminary treatment units

- Periodically cutting the grass on the pond embankments
- Removal of scum and floating macrophytes from the surface of facultative ponds and maturation ponds. This is done to maximize the light energy reaching the pond algae, increase surface re-aeration, and prevent fly and mosquito breeding
- if flies are breeding in large numbers on the scum on anaerobic ponds, the scum should be broken up and sunk with a water jet
- Removal of any material blocking the pond inlets and o

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: Say true/False

1. Maintenance helps to protect the capital investment and ensures an effective and economical expenditure (5point).

Test II: Choose the best

1. Which of the following is true about properly performed maintenance (5point)?

A) Contribute to gaining a competitive advantage.
B) Enhances customer satisfaction that is often directly dependent on the reliability, flexibility and speed of suppliers
C) Increasing satisfaction through better products or services
D) All

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

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

Operation sheet 1	**Shutting down procedure**

Procedure:-

1. Discard unused chlorine solutions and stock.
2. Clean shut down machine by dry materials
3. Turn off the power to all treatment systems.

LAP TEST	**Performance Test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task 1. Implement Shutting down procedure

Operation sheet 2	**Waste water treatment system**

Procedure:-

1. Prepare the waste water treatment process for operation
2. Operate and monitor the waste water treatment process
3. Analyze and respond to abnormal performance
4. Handover waste water treatment system

LAP TEST	**Performance Test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

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

Task 1. Waste Water Treatment System

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