



RQF LEVEL 4



GENPM401
**MANUFACTURING
TECHNOLOGY**

**Machine
Preventive
Maintenance**

TRAINER'S MANUAL

October, 2024



MACHINE PREVENTIVE MAINTENANCE



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ACRONYMS

CBA: Competency based Assessment

CBT: Competency based Training

GENPM: General Preventive Maintenance

PPE: Personnel Protective Equipment

RQF: Rwanda Qualification Framework

RTB: Rwanda TVET Board

TQUM Project: TVET Quality Management Project

TVET: Technical Vocational Education and Training

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled " **Machine Preventive Maintenance** Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer students opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that trainees review the key reading and the points to remember section.

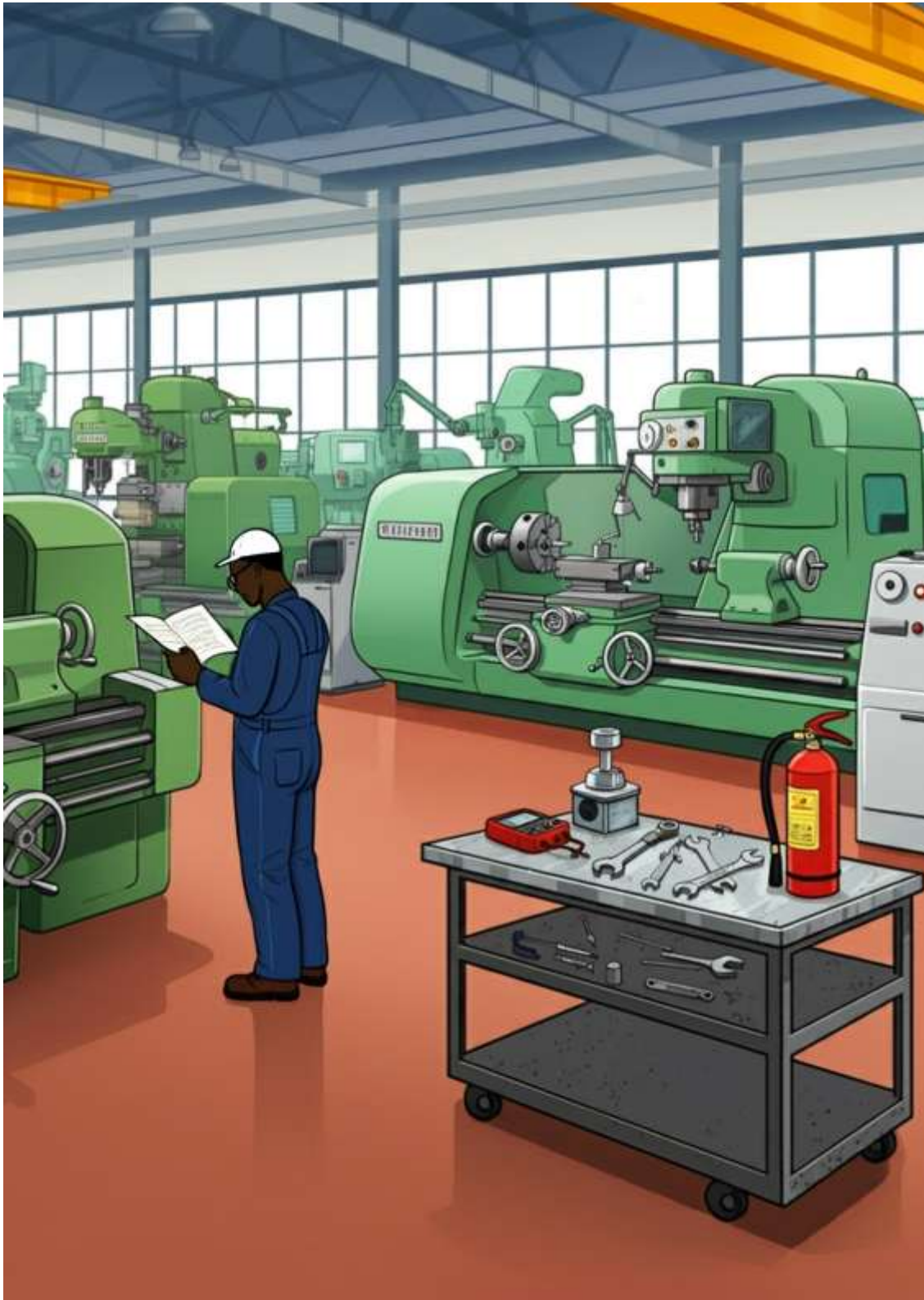
MODULE CODE AND TITLE: GENPM401MACHINE PREVENTIVE MAINTENANCE.

Learning Outcome 1: Prepare for maintenance works.

Learning Outcome 2: Maintain machine.

Learning Outcome 3: Post preventive maintenances activities.

Learning Outcome 1: Prepare for Maintenance Works.



Indicative contents

1.1 Introduction to machine preventive maintenance.

1.2 Checking out condition of machine.

1.3 Selection of tools, materials and equipment.

1.4 Applying of safety Measures

Key Competencies for Learning Outcome 1: Prepare for maintenance works.

Knowledge	Skills	Attitudes
• Description of preventive maintenance • Identification of tools, materials and equipments. • Application of safety measures • Identification of working principle of machine. • Identification the purpose of preventive maintenance	• Selecting tools, materials and equipment for machine maintenance. • Applying safety measures during machine maintenance. • Checking the condition of machine parts	• Being attentive while checking the condition of machine • Being attentive for checking machine condition. • Having attention to the selection of detergent



Duration: 10 hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Explain properly key concepts in machine preventive maintenance.
2. Identify properly the working principles of machine according to the manufacture's manual.
3. Select properly the types of tools, materials and equipment according to the work.
4. Apply properly safety practice according to lockout-tag out- try-out (LOTOTO)procedures

5. Check regularly the working conditions of the machine as per manufacturer's manual.



Resources

Equipment	Tools	Materials
• Air compressor • Grease gun • Lubrication pumps • Helmet • Goggles • Gloves • Overall	• Hammer • Screw driver • Pliers • Spanners • Wrench • Allen key • Cloths rags and mop • Wear gauges • Tension Gauges • Magnifying glasses • Micro meter • Vernier calliper	• Lubricant oil • Cleaning agents • Coolants and freeze • Grease



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail the manufacturing workshop with machines to be maintained
- Avail tools, materials and equipment required in maintenance works
- Avail the tutorial videos relating to the machine maintenance works
- Avail safety signs and symbols



Indicative content 1.1: Introduction to Machine Preventive Maintenance.



Duration: 2 hrs



Theoretical Activity 1.1.1: Explanation of key concepts in machine preventive maintenance.



Notes to the trainer:

- Trainer may use small group of trainees to explain of key concepts in machine preventive maintenance.
- Image indicating the condition of machines should be used as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking trainees to answer the following questions.

A. Explain the following key concepts in machine preventive maintenance:

- Machine
- Maintenance
- Preventive maintenance
- Breakdown maintenance

B. What are the objectives of machine preventive maintenance

Step 2: Ask trainees to write down their findings on flip chart/paper

Step 3: Ask trainees to present their findings.

Step 4: Provide expert view and address any questions or concerns.

Step 5: Ask them to read the Key readings 1.1.1 in trainee manual.



Points to Remember

- Correct understanding of machine preventive maintenance concepts matters before any maintenance action
- Machine preventive maintenance must lead to the good operating condition and reduce the breakdowns of machine.



Indicative content 1.2: Checking out Condition of Machine for Proper



Duration: 3 hrs



Practical Activity 1.2.1: Checking out condition of machine for proper operation



Notes to the trainer

- The trainer may facilitate trainees by demonstrating them how to check the condition of a machine.
- Avail a tutorial video relating to the checking the condition of machine.
- Avail a machine in workshop



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and explain the task to be performed.

In a school workshop there is a machine which operated in 2015. Take a time in manufacturing workshop and demonstrate the trainees how to perform checking out the condition of machine.

Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated)

Step 3: Demonstrate to the trainees how to check the condition of a machine.

Step 4: Ask trainees to check the condition of a machine by referring to what you have done.

Step 5: Check whether the activity of checking the condition of a machine is properly applied and provide support where necessary.

Step 6: Ask learners to read key reading 1.2.2

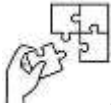
Step 7: Ask trainees to perform the task provided in application of learning 1.2



Points to Remember

- The procedures of checking out the condition of machine must be based on making visual inspection, function testing, measurement and testing for machine
- During testing machine make sure that the manufacturer instructions are respected

- The visual inspection, Function testing, Measurement and testing are the main activities based on during machine preventive maintenance
- Mechanical parts, electrical parts, pneumatic and hydraulic parts, Electronic parts of machine should be talked during checking the condition of machine.
- During machine preventive maintenance you must notice that every machine has its own operating principle.
- During machine preventive maintenance you must notice that every machine has its own operating principle.



Application of learning 1.2.

The school has been guaranteed to make the windows and doors of neighbour schools. Referring to the previous activity 1.2 1. before starting this activity ask your trainees to check out the condition of your school manufacturing machine for the work to be done.

Check list:

SN	Criteria	Indicators	Yes	No
1	Workplace is well prepared	1.1. Workplace is cleaned		
		1.2. Workplace is ventilated		
		1.3. All hazards were removed		
2	Tools, materials and equipment to be used are selected	2.1. Screw driver and tape measure are selected		
		2.2. Multimer and dial gauge are selected		
		2.3. Polisher, water and oil are selected		
3	Procedures of checking the condition of machine is are well respected	3.1. Visual inspection was conducted		
		3.2. Functional testing was conducted		
		3.3. Measurement was conducted		
		3.4. Testing was conducted		
4	The condition of machine is well checked and it is normal	4.1. Mechanical parts are well checked		
		4.2. Electrical parts are well checked		
		4.3. Pneumatic and hydraulic parts are well checked		
		4.4. Electronic parts are well checked		



Indicative content 1.3: Selection of Tools, Materials and Equipment.



Duration: 2 hrs



Theoretical Activity 1.3.1: Description of tools, materials and equipment for machine preventive maintenance.



Notes to the trainer:

This content should be delivered in classroom or other learning place; trainer may use small groups to discuss about the types of tools, materials and equipment used in machine preventive maintenance.

- Use pictures or photo of different tools, materials and equipment for more understanding. And different tangible tools, materials and equipment as didactic resources.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answers the below questions reflecting on tools, materials and equipment used in machine preventive maintenance
- What are the types of tools used in machine preventive maintenance do you know?
 - Measuring tools
 - Clamping tools
 - Miscellaneous tools
 - Cleaning tools
 - How Lubricants and oils, cleaning agent's materials used in machine preventive maintenance?
- Step 2:** Ask any trainees to write answers provided on flipchart/paper.
- Step 3:** Engage trainees to discuss the provided answers and choose correct answers
- Step 4:** Provides expert view and clarifies ideas by using didactic materials.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 1.3.1. In the trainee manual.



Points to Remember

- Tools, materials and equipment must be appropriately based on machine preventive maintenance.
- Both measuring, hand and power tools are strictly used in preventive maintenance
- Lubricant, oil and cleaning agent are the main materials used in machine preventive maintenance.



Practical Activity 1.3.2: Perform selection of tools, materials and equipment in preventative maintenance.



Notes to the trainer

- The trainer may allow individual trainee to go to the workplace and select tools, material and equipment to be used in a machine preventive maintenance.
- You need to have Store of tools, materials, and equipment basically used in a machine preventive maintenance.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
As a machinist, you are requested to go to the workshop and store to select tools, material and equipment to be used in a machine preventive maintenance based on selection criteria.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated).
- Step 3:** Demonstrate how to select tools, materials and equipment used in a machine preventive maintenance and explains selection criteria.
- Step 4:** Ask trainees to select tools, materials and equipment used a machine preventive maintenance and provides clarifications if any.
- Step 5:** Verify whether tools, materials and equipment used in a machine preventive maintenance are correctly selected.
- Step 6:** Ask trainees to read key reading 1.3.2.
- Step 7:** Ask trainees to perform the task provided in application of learning 1.3.



Points to Remember

- Tools, Material and equipment selection is one of the foremost functions of effective during performing preventive maintenance, that's why it is crucial to follow the selection criteria for fulfilling the task.



Application of learning 1.3.

The school has been guaranteed to make the 4 windows and 2 doors of neighbour schools. Referring to the previous activity 1.3.2 Ask trainees to select required tools, material and equipment which will be used during this activity

Checklist:

SN	Criteria	Indicators	Yes	No
1	Workplace is well prepared	1.1. Workplace is cleaned		
		1.2. Workplace is ventilated		
		1.3. All hazards were removed		
2	Selection criteria is respected	2.1. Types of tools and their use is respected		
		2.2. Types of materials and their use is respected		
		2.3. Types of equipment and their use is respected		
3	Tools, materials and equipment are selected according to their use.	3.1. Hand tools are selected		
		3.2. Power tools are properly selected		
		3.3. Measuring tools are selected		
		3.4. Cleaning agent, oil is selected		



Indicative content 1.4: Applying of Safety Measures.



Duration: 2 hrs



Theoretical Activity 1.4.1: Description of safety measures used in machine



preventive maintenance

Notes to the trainer:

- Trainer may guide trainees in description of safety measures used in machine preventive maintenance by asking questions relating to the safety measures.
- Avail safety signs and symbols
- Avail a tutorial video relating to the safety measures.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to answer the following questions:
- i. How do you understand by personnel protective equipment?
 - ii. Present your point of views for safety signs and symbols for working environment.
 - iii. How can you follow the Implementation of lockout-tag out- try-out (LOTOTO) procedures?
- Step 2:** Ask trainees to discuss and provides their findings on flip chart/papers.
- Step 3:** Facilitate trainees in presentation of their findings and provide clarification if any.
- Step 4:** Provide expert views and address any question
- Step 5:** Ask trainees to read key reading 1.4.1 in trainee manual



Points to Remember

- Personal protective equipment is mandatory for protecting the human being at workplace
- The main safety signs and symbols that should be available at working environment are:
 - i. Warning signs
 - ii. Prohibition signs
 - iii. Mandatory sign
- The eight basic steps to LOTO procedures should be followed during implementation



Practical Activity 1.4.2: Applying safety measures during a machine preventive maintenance



Notes to the trainer

- The trainer may demonstrate each and every trainee how to apply safety measure at workplace during a machine preventive maintenance.
- Avail a tutorial video of applying safety measures at workplace or a picture where safety measures applied.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Provides clear instruction for the task to performed
- Step 2:** Demonstrate properly how to apply safety measures at workplace and ask them to repeat according to your demonstration.
- Step 3:** Engage training in applying safety measures at workplace and provide support where necessary.
- Step 4:** Provide expert views and address concerns
- Step 5:** Ask trainees to read key reading 1.4.2 in trainees manual
- Step 6:** Ask trainee to perform application 1.4



Points to Remember

- Wear personal protective equipment before practising any activity.
- Safety signs and symbols should be clear and visible to every one



Application of learning 1.4.

AGAKIRIRO intends to implement safety measures for their machines during preventive maintenance. Referring to the previous activity (1.4.2), visit the workplace and apply the safety measures commonly used in machine preventive maintenance.

Check list:

SN	Criteria	Indicators	Yes	No
1	Workplace and materials are well prepared	1.1. Workplace is cleaned		
		1.2. Workplace is ventilated		
		1.3. Safety signs and symbols are prepared		
2	Safety measures are identified according to the workplace	2.1. Size of workplace is identified		
		2.2. Types of measures according to workplace is identified		
		2.3. All safety signs and symbols according to workplace is identified		
3	Safety measures is applied properly	3.1. Safety signs are applied		
		3.2. Safety symbols are applied		
		3.3. All location for hazards and direction are indicated		



Learning outcome 1 end assessment

Written assessment

Question1: Read the following statements and answer true if the statement is correct otherwise False

- a) Selecting tools, materials, and equipment for machine preventive maintenance involves evaluating several factors to ensure they are suitable for the specific needs of the machinery and maintenance activities. **TRUE**
- b) The selection should be done according to the functionality and Purpose **TRUE**
- c) The primary purpose of PPE is to fulfil the risk of injury or health issues by providing a barrier between the user and potential hazards. **FALSE**

Question2: Select the correct answer by circling the letter corresponding to the answer:

- A. The following are the types of PPE, except one.
 - a) Eye Protection
 - b) Boot safety protection**
 - c) Hearing protection
 - d) Foot protection
- B. The followings are importance of PPE Except:
 - a) Prevention of Injuries and Illnesses: PPE helps prevent a range of injuries and health issues by protecting against specific hazards.
 - b) Compliance: Wearing appropriate PPE helps organizations comply with safety regulations and avoid legal and financial penalties.
 - c) Safety Culture: Promoting the use of PPE fosters a safety-conscious work environment and demonstrates a commitment to worker well-being.
 - d) Engaging workers in working condition by providing all necessary tools, materials and equipment required at workplace**
- C. The following are the meaning of Safety signs and symbols, except one:
 - a) Are visual tools used in the working environment to communicate important safety information and hazards.
 - b) Protect against inhaling harmful substances, such as dust, fumes, or chemicals**
 - c) They help ensure that workers are aware of potential risks and know how to respond to them, thereby promoting a safer workplace.
 - d) These signs and symbols are standardized to provide clear and consistent messages.

Question3: Complete the following sentences aided by the words in bracket (**Mandatory, color, Yellow, warning signs, black symbol, Blue back ground**)

- a) **warning signs**Alert workers to potential hazards or unsafe conditions that require caution.
- b) Warning sign have...**Yellow**.....or amber background with ...Black **symbols**..... or text.
- c) Mandatory signs has the.....**Blue**.....color with white symbols or text.

Practical assessment

A new TVET School want to install the gained machines in their workshop, recommend your trainees to go there and perform:

- ✓ Checking out the condition of machine before installation
- ✓ Selecting tools, materials and equipment which will be used.
- ✓ Applying safety measures in workshop

Checklist

SN	Criteria	Indicators	Yes	No
1	Safety and security measures are effectively applied as per workplace policy	1.1. PPE are worn		
		1.2. Finishing operations and storage conditions		
		1.3. Safety signs are applied		
2	Equipment, tools and materials are properly selected according the shape of product	2.1. Equipment is selected		
		2.2. Tools are selected		
		2.3. Materials are selected		
3	Checking the condition of machines are conducted properly	3.1. Working principles of machine are observed		
		3.2. Pre-operation maintenance of machine is performed		
		3.3. All location for hazards and direction are indicated		
4	Training for on safety and measure are well applied	4.1. Waring, mandatory and caution signs was identified		
		4.2. Role of every sign is indicated		
		4.3. Purpose and application of every sign is identified		



Further information to the trainer

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Learning Outcome 2: Maintain Machine.



Indicative contents

2.1 Cleaning machine.

2.2 Lubricating machine parts.

2.3 Adjusting machine parts.

2.4 Performing test run of machine.

Key Competencies for Learning Outcome 2: Maintain machine.

Knowledge	Skills	Attitudes
• Description of cleaning procedures. • Explanations of lubrication techniques. • Explanations of the procedures of adjusting machine parts.	• Cleaning a machine • Adjusting machine parts • Testing machine • Testing runs of machine • Solving machine problem	• Being attentive in maintaining machine • Having a precision during machine adjustment • Being a time manager for machine maintenance activities • Being innovator in machine maintenance



Duration: 20 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Identify correctly cleaning procedures according to the machine.
2. Apply correctly cleaning procedures according to the machine.
3. Lubricate regularly machine parts as per manufacturer's requirement.
4. Adjust properly machine parts as per manufacturer's requirement.
5. Conduct properly the test run as per machine operating principles.



Resources

Equipment	Tools	Materials
• Air compressor • Grease gun • Lubrication pumps • Dust pan • Oil can	• common tools (hammer, screw driver, pliers, spanners, wrench, Allen key), • cloths rags and mop • Wear gauges • Tension Gauges • Magnifying glasses • Mops • Cleaning brushes	• Lubricants and oils • Cleaning agents • Coolants and • Freeze, Grease



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare a workshop equipped with a machines
- Avail books, tools, materials and equipment for machine preventive maintenance.
- Have an instruction manual or catalogue of machine
- Avail tutorial videos, illustration of machine maintenance.
- Avail the simulations of cleaning, lubricating and adjusting machine parts and test run of machine.



Indicative content 2.1: Cleaning Machine.



Duration: 5 hrs



Theoretical Activity 2.1.1: Description of Machine cleaning in preventive maintenance.



Notes to the trainer:

- Trainer may use small groups to describe cleaning machine in preventive maintenance.
- The use of tutorial video simulations as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking the trainees the following questions:

- What should be the cleaning techniques of a machine as used in machine preventive maintenance?
- How the machine cleaning procedures should be followed in preventive maintenance.

Step 2: Ask trainees to write down their findings on flipchart/papers.

Step 3: Ask trainees to present their findings and provide clarification if any.

Step 4: Based on trainees' presentation provide expert views and address the concerns.

Step 5: Ask them to read the Key readings 2.1.1 in their manuals.



Points to Remember

- Procedures of cleaning machine should be based on maintenance principles
- Cleaning materials should not deteriorate parts of machine-like seals, pins and circlips.
- Cleaning lugs should not be torn so that some particle should not remain in machine.



Practical Activity 2.1.2: Cleaning machine parts in preventive maintenance



Notes to the trainer

- The trainer may engage trainee individually to clean machine parts for maintaining the working condition of machine.
- Avail a tutorial video of cleaning machine parts, pictures of cleaning material, machine catalogue and illustration can be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and demonstrate to the trainees how to clean machine parts in preventive maintenance.
- Step 2:** Provide clear instructions and ask trainees to repeat the process and support where necessary.
- Step 3:** Provide expert views and address any questions or concerns.
- Step 4:** Ask learner to read key reading 2.1.2 in trainee manual
- Step 5:** Ask trainee to perform application of learning 2.1



Points to Remember

- Machine cleaning should be done by following the manufacturer recommendations and taking care about the materials for machine cleaning.
- Cleaning is done before and after performing an activity



Application of learning 2.1.

King Manufacturing Ltd is located near your school, it is specialised to produce metal products. KAMI Decollation Ltd offers a tender to produce one hundred thirty-seven (137) metal tables within a month. Before starting this activity, it is required to maintain their machines by cleaning machine parts. Referring to the previous activity 2.1.2 perform this activity.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Workplace and materials are well prepared	1.1 Workplace is cleaned		
		1.2 Workplace is ventilated		
		1.3 Light is sufficient		
2	Tools, materials and equipment are well selected	2.1. Correct lubricant is selected		
		2.2. Proper cleaning agent, Oil can, brushes is selected		
		2.3. Screwdrivers and spanners are selected		
3	Machine is well cleaned	3.1. Machine accessories are cleaned		
		3.2. Moving parts are cleaned		
		3.3. All parts of machines are cleaned		



Indicative content 2.2: Lubricating Machine Parts.



Duration: 5 hrs



Theoretical Activity 2.2.1: Identification of machine parts lubrication as part of machine preventive maintenance.

Notes to the trainer:

- Trainer may engage trainees in discussion about lubricating machine parts by using small groups.
- Avail the picture which indicates lubricating point and machine instruction manual which could be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking the question relating to the topic of the day such as:

- What do you understand by lubricating machine?
- What should be the lubricating techniques during machine preventive maintenance?
- How procedures of lubricating a machine are followed?

Step 2: Ask trainees to answer and write down their findings

Step 3: Facilitate trainees in presentation of their findings

Step 4: Provide expert views and address any question or concerns.

Step 5: Ask trainees to read key reading 2.2.1 in trainee manual for more understanding



Points to Remember

- Lubricating points are every part of machine where oil pass through
- All moving parts or lubricating points must be lubricating
- The recommended oil should be used during lubricating according to manufacturer recommendation/instructions.



Practical Activity 2.2.2: Lubricating machine parts in machine preventive maintenance

Notes to the trainer

- The trainer may use small groups to lubricate the machine parts as parts of preventive maintenance.
- The use of tutorial video, lubricating oil, illustration should be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Play a video which demonstrate the lubricating machine parts
- Step 2:** Ask trainees to lubricate machine parts according to the demonstration and provide support and correction.
- Step 3:** Ask trainees to repeat themselves
- Step 4:** Provide expert views and address questions if any or concerns
- Step 5:** Ask trainees to read key reading 2.1.2 in trainee manual
- Step 6:** Ask trainees to perform key application 2.2



Points to Remember

- PPEs should be worn to prevent injuries
- The procedures should be followed during lubricating machine parts
- Only recommended oil by manufacturer should be used in lubricating machine parts.



Application of learning 2.2.

Manufacturing Workshop machine is recommended to lubricate machine parts at every morning before starting activities, referring to the previous activity2.2.2, ask trainees to go and lubricate the machine for keeping it in good operating condition.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Workplace and materials are well prepared	1.1 Workplace is cleaned		
		1.2 Workplace is ventilated and Light is sufficient		
		1.3 Proper lubricating Oil and oil can are selected		
2	Lubricating procedures are respected	2.1. Oil tank is drained		
		2.2. Quality of oil is checked		
		2.3. Lubricating points are identified		
3	Machine is well lubricated	3.1. Machine lubricating points are lubricated		
		3.2. All moving parts are lubricated		
		3.3 Lubricating oil tank is filled		
		3.4. Machine is started to run oil for all internal lubricating points.		



Indicative content 2.3: Adjusting Machine Parts.



Duration: 6 hrs



Practical Activity 2.3.2: Adjusting machine parts as parts of machine preventive maintenance.



Notes to the trainer

- The trainer may guide individual trainees to adjust the machine parts for keeping it in good working condition.
- The use of videos, catalogue and illustration as didactic materials are required.



Key steps:

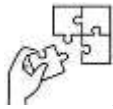
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform the following task:
The operator report a problem of machine which produce sound during operation. Ask your trainees to solve this problem after founding that the faults it is about misaligned machine parts.
- Step 2:** Ask trainees to read intensively the activity and demonstrate them how to adjust the machine parts.
- Step 3:** Ask them to align/adjust the machine parts according to the demonstration and provide support.
- Step 4:** Ask trainees to repeat them selves
- Step 5:** Provide expert views and address the question/concerns
- Step 6:** Ask trainees to read the key reading 2.3.2 and perform the application 2.3



Points to Remember

- The machine adjustment should be done after switching off all electrical connections.
- The adjustment must match with the manufacture instructions
- The adjustments procedures should be respected to prevent the machine break down



Application of learning 2.3.

The school workshop technician attempted to start the machine in the morning to begin work, but the machine provides high vibration during operation. After conducting tests, it was determined that the issue was caused by machine parts being out of position. You are tasked with adjusting the machine parts to restore its functionality and extend its lifespan. **Check list:**

SN	Criteria	Indicators	Yes	No
1	Workplace and materials are well prepared	1.1 Workplace is cleaned		
		1.2 Workplace is ventilated and Light is sufficient		
		1.3 Measuring tools are selected		
2	Misaligned machine parts are identified	2.1. Electrical parts are identified		
		2.2. Mechanical parts are identified		
		2.3. Hydraulic parts are identified		
3	Machine parts are well adjusted	3.1. Machine parts is adjusted according to manufacturer recommendations		
		3.2. All moving parts are adjusted		
		3.3 Speed of machine is settled		
		3.4. Machine is started		



Indicative content 2.4: Performing Test Run of Machine.



Duration: 4 hrs



Practical Activity 2.4.1: Performing test run of a machine as final part of preventive maintenance.



Notes to the trainer

- The trainer may guide trainees in performing the test run of a machine during finalising the machine preventive maintenance.
- The videos, Illustrations and instruction manual should be used as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and demonstrate trainees how to test a run of machine and ask them to follow attentively.

Step 2: Ask trainees to repeat according to the demonstration and provide support where necessary.

Step 3: Provide expert views and address questions or concerns.

Step 4: Ask trainees to read key reading 2.4.1 in trainee manual.

Step 5: Ask trainees to perform application 2.4



Points to Remember

- Wear a personal protective equipment before performing a test run of machine
- Test run of machine should be done safely
- All accessories must be well connected and oil tank should be filled to the proper level before test a run of machine



Application of learning 2.4.

The school workshop technician was adjusting the misaligned machine parts in the morning, today he is going to test run of machine after adjustment. By referring to the previous activity recommend your trainees to in workshop and help him to make a test a run of that machine before completing preventive maintenance.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Workplace and materials are well prepared	1.1 Workplace is cleaned		
		1.2 Workplace is ventilated and Light is sufficient		
		1.3 Testing equipment are selected		
2	All machine parts are connected	2.1. Electrical parts are connected		
		2.2. Mechanical parts are connected		
		2.3. Hydraulic parts are connected		
3	Test a run of machine is well done	3.1. Machine is started		
		3.2. Speed rotational setting is available		
		3.3. Operating range is available		
		3.4. Machine is running properly		



Learning outcome 2 end assessment

Written assessment

Q1. Read carefully the following statements below and circle the correct answer:

- A. The following are the machine cleaning techniques, except**
- a) Read the manual
 - b) Power off and disconnect
 - c) Remove loose debris
 - d) Apply Cleaning solution
 - e) None above**
- B. The functions of Oil Lubrication is to:**
- a) Friction reduction
 - b) Wear prevention
 - c) Heat dissipation
 - d) Contaminant removal
 - e) All above**
 - f) None above
- C. For solving a machine problem the following activities must take into consideration:**
- a) Plan for preventive maintenance
 - b) Lubrication and Cleaning
 - c) Adjustment of load
 - d) Both a and b**
 - e) None above
 - f) All above

Q2. Read carefully the statement and answer by true or false:

- a)** Degreasing a machine is a vital part of preventive maintenance to ensure the efficient and safe operation of equipment. **True**
- b)** Cleaning procedures for machines can vary widely depending on the human being. **False**
- c)** The steps for cleaning machine are: Safety First, Follow Manufacturer's Guidelines, Use Appropriate Cleaning Agents, Regular Cleaning Schedule, Thorough but Gentle Cleaning, Cleaning Moving Parts, Minimize Water Usage, Post-Cleaning Inspection, Environmental Considerations and Continuous Improvement. **True**
- d)** Adjusting machine parts is a critical maintenance task that requires careless preparation, precise measurements, and attention to detail. **False**
- e)** Visual Inspection, start-up test and Performance test are included in test run of machine. **True**
- f)** The function of lubrication is to maintain wear Prevention by reducing friction, oil helps to prevent the wear and tear of mechanical components. **True**

Practical assessment

The neighbour school was recently supplied the second-hand manufacturing machine which will be used in producing mechanical tables, but the machines need preventive maintenance.

Ask your trainee to go there and perform the following task:

- a) Clean correctly the machine part
- b) Adjust the machine parts
- c) Solve the machine problem
- d) Test runs of machine

Check list

SN	Criteria	Indicators	Yes	No
1	Machine is well cleaned	1.1 PPE are worn		
		1.2 Cleaning materials are available		
		1.3 Machine is well cleaned		
2	Machine parts are properly adjusted	2.1 Mechanical parts are adjusted		
		2.2 Electrical part is adjusted		
		2.3 Hydraulic and pneumatic part are adjusted		
		2.4 Electronic part is adjusted		
3	Machine problem is properly solved	3.1 Machine speed is normal		
		3.2 Machine starting is regulated		
4	Test run of machine is well conducted	4.1 Machine switch is tested		
		4.2 Machine accessories are tested		



Further information to the trainer

(n.d.). *Design Experiments*. Retrieved from <https://qualitytrainingportal.com/resources/design-experiments/>

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Agustiady, T. K. (n.d.). *Total Productive Maintenance*.

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Learning Outcome 3: Post Preventive Maintenance Activities.



Indicative contents

3.1 Monitoring machine

3.2 Setting plan for preventive maintenance

3.3 Storing Tools, equipment and materials

3.4 Reporting the work done

Key Competencies for Learning Outcome 3: Post preventive maintenances activities.

Knowledge	Skills	Attitudes
• Identification of machine monitoring techniques • Description of setting a schedule • Observation of storage template. • Identification of waste management	• Monitoring machine parts • Planning for preventive maintenance • Setting monitoring Interval • Testing a machine • Storing the productions • Reporting the work done	• Being a confident in machine monitoring • Having a precision storing tools • Having a time management • Being attentive to the plan



Duration:10 hrs

Learning outcome 3 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Identify correctly machine monitoring procedures as per maintenance manual
2. Monitor properly machine parts as per maintenance manual.
3. Plan properly the Preventive Maintenance as per machine working conditions
4. Store correctly tools, equipment and materials as per their storage conditions.
5. Report correctly maintenance activities according to the work done.
6. Fill adequately the report template as used in manufacturing



Resources

Equipment	Tools	Materials
• Ladder or scaffolding • Paintbrush or roller • Leak detectors • Crack monitors	• Screwdrivers • Wrenches • Pliers • claw hammer or rubber mallet • Chisel • Wire brush or abrasive pad • Drill and drill bits • Gloves • safety glasses • dust mask • Allen wrenches, • Wire cutters/strippers.	• Soap solution • Clothes rugs • white board • spray bottle • soft brushes • scrubber sponge • Broom • Mops • Marker pen • Black board and Chalks. • Caulk or sealant • Epoxy resin • sparkling paste • Joint compound • Adhesive • Pipe sealant or thread tape • Gaskets • Waterproof tape or patches.



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have a proper place for storing tools, materials and equipment such as shelves and boxes.
- Avail a template of maintenance chart and report.
- Have a filled and unfilled template for storing and template for reporting.
- Avail schedule/plan for next preventive maintenance.
- Avail a maintenance handbook, machine catalogue, videos, pictures and illustrations.



Indicative content 3.1: Monitoring Machine



Duration: 4 hrs



Theoretical Activity 3.1.1: Description of machine monitoring in preventive maintenance.



Notes to the trainer:

- Trainer may use small group to describe monitoring machine in preventive maintenance.
- The use of machine catalogue, tutorial video and illustration as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to provide the answers of the following questions:

- What are the machine monitoring techniques?
- What should be the machine monitoring procedures?

Step 2: Ask trainees to discuss in their respecting group and follow the given instructions

Step 3: Ask trainees to write their findings on flipchart/papers

Step 4: Engage trainees in presentation and provides clarification

Step 5: Provides expert views and address questions a/concerns if any.

Step 6: Orient trainees to read key reading 3.1.1 in trainee manual



Points to Remember

- After delivering this content make sure that the monitoring techniques and monitoring procedures was focussed on and well respected.



Practical Activity 3.1.2: Perform monitoring machine in preventive maintenance.



Notes to the trainer

- The trainer may guide trainee individually in performing monitoring machine in preventive maintenance.
- Avail machine, tutorial video and illustration which should be used as didactic materials.



Key steps:

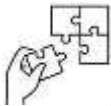
While delivering this activity, pass through the following steps:

- Step 1:** Ask trainees to follow you with attention and demonstrate them how to perform monitoring machine in preventive maintenance.
- Step 2:** Ask trainees to repeat according to demonstration and correct the present faults
- Step 3:** Let them to repeat the process for more understanding
- Step 4:** Provide expert views and clarification if any.
- Step 5:** Ask trainees to perform application 3.1



Points to Remember

- It is very important to store and keep well all information related to the machine.
- The workplace should be inclusive and well prepared. And the machine to be monitored must be secured, accessible and safe.



Application of learning 3.1.

Referring to the previous activities both theoretical 3.1.1 and practical and 3.1.2. Ask trainees to go in workshop of Agakiriro and monitor their machines before they start working by focussing on mechanical parts, hydraulic parts, electronic parts and machine feeding system.

Check list:

SN	Criteria	Indicators	Yes	No
1	Workplace and materials are well prepared	1.1 Workplace is cleaned		
		1.2 Workplace is ventilated and Light is sufficient		
		1.3 Monitoring equipment are selected		
2	All machine parts are monitored	2.1. Electrical parts are monitored		
		2.2. Mechanical parts are monitored		
		2.3. Hydraulic parts are monitored		
		2.4. Feeding system is monitored		
3	The machine is running properly	3.1. Machine is started		
		3.2. Speed rotational setting is available		
		3.3. Operating range is available		
		3.4. Machine is running properly		



Indicative content 3.2: Setting Plan for Preventive Maintenance



Duration: 2 hrs



Practical Activity 3.2.1: Setting plan for preventive maintenance



Notes to the trainer

- The trainer may demonstrate trainees how to set plan for preventive maintenance.
- Avail setting plan template, picture and illustration related to the preventive maintenance which should be used as didactic materials.



Key steps:

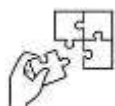
While delivering this activity, pass through the following steps:

- Step 1:** Demonstrate trainees how to fill template and to make setting plan of preventive maintenance.
- Step 2:** Ask trainees to follow attentively and repeat the demonstration and provide support by correcting where necessary.
- Step 3:** Ask trainees to repeat for more understating
- Step 4:** Present expert views and address the concerns or questions
- Step 5:** Ask trainees to perform application 3.2



Points to Remember

- For delivering this content make sure that the proper template for scheduling or setting plan for preventive maintenance is followed.
- The schedule of previous and next preventive maintenance must be available



Application of learning 3.2.

By referring to the previous activities 3.2.1 Ask trainees to attend the invitation of KARIMBA Ltd for setting plan for preventive maintenance, make sure that the schedule, standards, manufacturer guidelines, previous and next date of preventive maintenance are highlighted.

Check list:

SN	Criteria	Indicators	Yes	No
1	Tools and materials are well prepared	1.1 Laptop is available		
		1.2 Correct template is available		
		1.3 Hard template/pen are available		
		1.4 Previous schedule is available		
2	Setting plan for preventive maintenance is done	2.1. The standards and regulations were respected		
		2.2. Manufacturer guidelines were respected.		
		2.3. Previous date of preventive maintenance was noticed		
		2.4. The schedule or next date of preventive maintenance is elaborated properly		
3	Plan for preventive maintenance has good quality	3.1. The date of current preventive maintenance is mentioned		
		3.2. The duration until the exact date of maintenance is mentioned.		
		3.3. The scheduled date for next preventive maintenance is mentioned.		
		3.4. The preventive maintenance duration is available		



Indicative content 3.3: Storing Tools, Equipment and Materials



Duration: 2 hrs



Theoretical Activity 3.3.1: Identification of tools, equipment and materials storing techniques



Notes to the trainer:

Trainer may use small group to identify storing tools, materials and equipment after preventive maintenance.

The use storing template, Picture of stored tools materials and equipment, illustration as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and involve trainees in answering the following questions:

- i. What do you understand by storage template?
- ii. Suggest the designation of a specific storage area
- iii. How to make waste management in

Step 2: Ask trainees to answer and write answers on flipchart/papers.

Step 3: Facilitate trainees to present their findings and agreed whole class

Step 4: Provide expert views and address any questions or concerns.

Step 5: Ask trainees to read key reading 3.3.1 in trainee manual



Points to Remember

During delivering this content make sure that the storage template and specification of storage area are related to the field or class. You must treat the waste management so that it will not cause human dangers.



Practical Activity 3.3.2: Storing tools, materials and equipment after preventive maintenance.



Notes to the trainer

- The trainer facilitates trainees by using small groups for storing tools, materials and equipment after preventive maintenance.
- The use storing template, tutorial videos video, Picture, illustration as didactic materials is required



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and facilitates trainees by demonstrating how to store tools, materials and equipment and the way of making waste management.

Step 2: Ask trainees to follow attentively and ask clarifications if any.

Step 3: Ask trainees to store tools, materials and equipment and the way of making waste management as demonstrated by trainer, correct the sequence where necessary.

Step 4: Ask trainees to repeat themselves for more understanding.

Step 5: Provide expert views and address any questions/concerns.



Points to Remember

- During storing tools, materials and equipment make sure that there are stored in proper place which can not cause any effect.
- For waste management remember that the waste segregation is considered for facilitating sorting and separation of waste types to manage recycling and correct onward disposal.



Application of learning 3.3.

Industry manager wants a technician to store tools, materials and equipment and also treat waste management. Recommend trainees to go to the industry for storing tools, materials and equipment and perform waste management. This should be done by referring to the previous activities both theoretical activity 3.3.1 and practical activity 3.3.2.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tools and materials and equipment are well arranged	1.1 Tools are arranged properly according to their types		
		1.2 The materials are arranged properly according to their types		
		1.3 Hard template/pen/tags are available		
		1.4 Shelves and boxes are prepared		
2	Tools and materials and equipment are stored properly	2.1. The template filled correctly		
		2.2. Tools are stored correctly.		
		2.3. Materials are stored correctly		
		2.4. Equipment is store correctly		
3	Waste management is properly applied	3.1. Waste segregation is done properly		
		3.2. The waste collection is done properly		
		3.3. The wastes are well treated		



Indicative content 3.4: Reporting the Work Done



Duration: 2 hrs



Theoretical Activity 3.4.1: Description of reporting work done in preventive maintenance.



Notes to the trainer:

- Trainer may use small groups for describing the reporting the work done in preventive maintenance.
- The use of Report template filled and unfilled, maintenance chart and illustration as didactic materials are required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking the trainees to answer the following questions;

- i. What are the forms of report and report template?
- ii. What do you understand by maintenance chart?

Step 2: Ask trainees to provides their answer on flipchart/papers

Step 3: Facilitate trainees to present their findings

Step 4: Provide expert views and address any questions/concerns

Step 5: Ask trainees to read key reading 3.4.1 in trainee manual



Points to Remember

- The report template and form of report they should contains the necessary information about the used tools, materials and equipment plus the product.
- While maintenance chart indicates the rate of activities of preventive maintenance.



Practical Activity 3.4.2: Perform reporting the work done after preventive maintenance



Notes to the trainer

- The trainer may demonstrate trainees by using small groups on how to report the work done during preventive maintenance.

- Avail the report template, tutorial video, maintenance chart which should be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Demonstrate the trainees how to fill report template/creating maintenance chart after preventive maintenance.

Step 2: Ask trainees to fill report template and creating maintenance chart according to the demonstration.

Step 3: Ask trainees to repeat the process for more understanding.

Step 4: Provide expert views and address questions/concerns.

Step 5: Ask trainees to perform application 3.4



Points to Remember

- For filling the report template, you must fill the information available at field and maintenance chat must communicate with report document.



Application of learning 3.4.

Referring to the previous activities both theoretical 3.4.1 and practical activities 3.4.2 Recommend trainees to go to the workshop of school and indicate the workshop technician how to report the work done, use maintenance chart and show them the way of filling report template after differentiating the forms of report.

Check list:

SN	Criteria	Indicators	Yes	No
1	Materials and equipment are well prepared	1.1 Report template and form of report are availed		
		1.2 Laptop is availed		
		1.3 Quantity of product is availed		
		1.4 Maintenance chart is availed		
2	Maintenance chat and report template are filled	2.1. All product is available on report		
		2.2. Date and time are mentioned		
		2.3. Maintenance chart indicate rate of preventive maintenance		
3	Report of work done is available	3.1. Filled report is available and banded		
		3.2. The address is indicated		
		3.3. The report is classified		



Learning outcome 3 end assessment

Written assessment

Q1. Read carefully the statement and answer by true or false

- a) Machine monitoring techniques are essential for maintaining optimal performance, reducing downtime, and extending the lifespan of machinery. **True**
- b) Setting up a preventive maintenance (PM) plan involves identifying, scheduling, and executing maintenance tasks that prevent equipment failure and ensure optimal performance. **True**
- c) When observing and creating a storage template, especially for a warehouse or inventory management system, it is important to consider several only the key elements. **False**
- d) Labelling, items and description are only the component which must be available on storage template. **False**

Q2. Read intensively the following steps for setting the schedule of preventive maintenance. Arrange them from the beginning up to the last. (Equipment Assessment and Inventory, Historical Data and Maintenance Logs, Criticality and Priority, Manufacturer's Guidelines and Manuals, Continuous Improvement, Industry Standards and Regulations, Maintenance Tasks and Intervals, Resource Allocation, Training and Skill Development, Collaboration and Communication)

Answer

Step1: Equipment Assessment and Inventory

Step2: Manufacturer's Guidelines and Manuals

Step3: Criticality and Priority

Step4: Maintenance Tasks and Intervals

Step5: Industry Standards and Regulations

Step6: Historical Data and Maintenance Logs

Step7: Resource Allocation

Step8: Collaboration and Communication

Step9: Training and Skill Development

Step10: Continuous Improvement

Q3. To day you have done the machine maintenance. Here there is a template of maintenance chart/schedule, you are asked to fill it.

Maintenance Schedule

Approved By: _____

[illegible]

The school has bought a machine in 2008. This machine was installed in workshop but it is not working up to date. The school is in need to use this machine for making a dining hall mechanical table. You are requested to perform the machine preventive maintenance by focusing on the following element: Make a machine monitoring

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Checklist:

SN	Criteria	Indicators	Yes	No
1	Machine monitoring is well conducted	1.1 PPE are worn		
		1.2 Monitoring techniques are respected		
		1.3 All parts of Machine are monitored		
2	preventive maintenance plan is settled	2.1. The correct template is used		
		2.2. The planned activities are available		
		2.3. Previous and next activities are availed		
		2.4. Address, date and name of school are highlighted		
3	Tools, equipment and materials are stored correctly	3.1. Materials, tools and equipment are separated		
		3.2. Materials, tools and equipment are stored in proper locations (box, shelves)		
		3.3. Report template is respected		
4	Work done is reported	4.1. Address, date and work done are available		
		4.2. Quantity, quality, and duration of activity are mentioned		



Further information to the trainer

(n.d.). *Design Experiments*. Retrieved from
<https://qualitytrainingportal.com/resources/design-experiments/>

Agustiady, T. K. (n.d.). *Total Productive Maintenance*.

Mobley, R. K. (n.d.). *The Basics of Preventive Maintenance and Maintenance Management*.



October, 2024