POULTRY PRODUCTION

Level- III

Learning Guide -09

Unit of Competence: Prevent and Eliminate MUDA

Module Title: Preventing and Eliminating MUDA

LG Code: AGR PLP3 M03 LO1-LG-09

TTLM Code: AGR PLP3 TTLM 0120v1

LO1: Prepare for work

Instruction Sheet	Learning Guide #09

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

- Using work instructions to determine job requirements
- Reading and interpreting Job specifications following working manual
- Observing OHS requirements
- Selecting appropriate material for work
- Identifying and checking Safety equipment and tools for safe and effective operation

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

- Use work instructions to determine job requirements
- Read and interpret Job specifications following working manual
- Observe OHS requirements,
- Select appropriate material for work
- Identify and check Safety equipment and tools for safe and effective operation

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheets 1-4. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1-4 **in page 6,9,12 and 25 respectively.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #9.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Using work instructions to determine job requirements

Work Instructions: refers an instruction designed to ensure that processes are consistent, timely and repeatable.

1.1. Job Requirements

A Job can be defined as:

- A piece of work, especially a specific task done as part of the routine of one's occupation or for an agreed price.
- A post of employment; full-time or part-time position
- Anything a person is expected or obliged to do; duty; responsibility
- An affair, matter, occurrence, or state of affairs.
- The material, project, assignment, etc., being worked upon.
- The process or requirements, details, etc., of working.
- The execution or performance of a task.

The requirements for a job vary according to the nature of the job itself. However, a certain work ethic must be cultivated to succeed in any job and this is fundamental to an individual's sense of himself as a worker, as part of production relations and a fundamental economic being. The basic requirements for a job remain the same no matter what the job is, where it is located or what professional and educational qualifications are required for it. These are as follows:

Discipline*:* Nothing is possible without discipline. Any job requires a fundamental core of discipline from the worker or the employee and this is a quality which is independent of age, post, stature, job and so on. Discipline is absolutely indispensable and provides the impetus for work that can be strenuous, repetitive, boring and even unsatisfactory at times.

Enthusiasm: Enthusiasm for work is also a pre-requisite for any job. An innate love for the job, which in modern parlance is known as job satisfaction, is a core requirement for any job. The drive to succeed, to innovate, to do well and to make one's profession into one's livelihood is a critical drive which needs to be present in the employee or cultivated as soon as possible. No job, however perfectly carried out, can evoke the feeling of satisfaction of a job well done without the instinct for success.

Qualifications: This is a more material, tactile need for a job which can be conveyed through degrees and certificates. However education is not limited to what is taught in colleges or vocational training courses. It is the burning desire to learn more, to reach the depths of knowledge about a particular field of interest, to complete the job and learn from it that marks the true enthusiast and the truly learned.

Soft Skills: Soft skills include those skills which ensure that a poultry job is executed well, and the employee can carry himself in the proper manner too. For example, good and smooth communication, computer skills, proficiency in language if needed, presentable appearance, the ability to manage crises are all soft skills which are fundamentally important in any job and which must be cultivated consciously. Thus, the requirements of a job, though specific to it, cover also a general spectrum. These make for better employees and better individuals.

1.2. Work Instruction

Information about the work

- Describe what workers need to be able to do on the job
  - ✓ Work functions
  - ✓ Key activities of each work function
  - ✓ Performance indicators
- Describe what task to be done or work roles in a certain occupation

Work instruction is a description of the specific tasks and activities within an organization. A work instruction in a business will generally outline all of the different jobs needed for the operation of the firm in great detail and is a key element to running a business smoothly. In other words it is a document containing detailed instructions that specify exactly what steps to follow to carry out an activity. It contains much more detail than a Procedure and is only created if very detailed instructions are needed. For example, describing precisely how a Request for Change record is created in the Change Management software support tool.

Procedures vs. Work Instructions

Many people confuse “procedures” with “work instructions”. In fact, most people write work instructions and call them procedures. Knowing the differences of procedures versus work instructions can help you understand the documentation process much better and, therefore, procedure documentation.

Procedures describe a process, while a work instruction describes how to perform the conversion itself. Process descriptions include details about the inputs, what conversion takes place (of inputs into outputs), the outputs, and the feedback necessary to ensure consistent results. The procedures process approach (Plan, Do, Check, Act) is used to capture the relevant information.

Questions that need to be answered in a procedure include:

- Where do the inputs come from (suppliers)?
- Where do the outputs go (customers)?
- Who performs what action when (responsibilities)?
- How do you know when you have done it right (effectiveness criteria)?
- What feedback should be captured (metrics)?
- How do we communicate results (charts, graphs and reports)?
- What laws (regulations) or standards apply (e.g., ISO 9001, 8th EU Directive, IFRS, Sarbanes-Oxley)?

Self-Check -1	Written Test

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

1. List the requirements of job. (2 points)
2. What is the meaning of work? (2 points)
3. Describe work instruction in your own words. (2 points)

Note: **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
   _____
2. _____
   _____
   _____
3. _____
   _____
   _____

Information Sheet-2	Reading and interpreting Job specifications following working manual

2.1. Job Specification

A statement of employee/workers characteristics and qualifications required for satisfactory performance of defined duties and tasks comprising a specific job or function. Job specification is derived from job analysis.

Also known as employee specifications, a job specification is a written statement of educational qualifications, specific qualities, level of experience, physical, emotional, technical and communication skills required to perform a job, responsibilities involved in a job and other unusual sensory demands. It also includes general health, mental health, intelligence, aptitude, memory, judgment, leadership skills, emotional ability, adaptability, flexibility, values and ethics, manners and creativity, etc.

Purpose of Job Specification

- Described on the basis of job description, job specification helps candidates analyze whether are eligible to apply for a particular job vacancy or not.
- It helps recruiting team of an organization understand what level of qualifications, qualities and set of characteristics should be present in a candidate to make him or her eligible for the job opening.
- Job Specification gives detailed information about any job including job responsibilities, desired technical and physical skills, conversational ability and much more.
- It helps in selecting the most appropriate candidate for a particular job.

2.2. Job Description

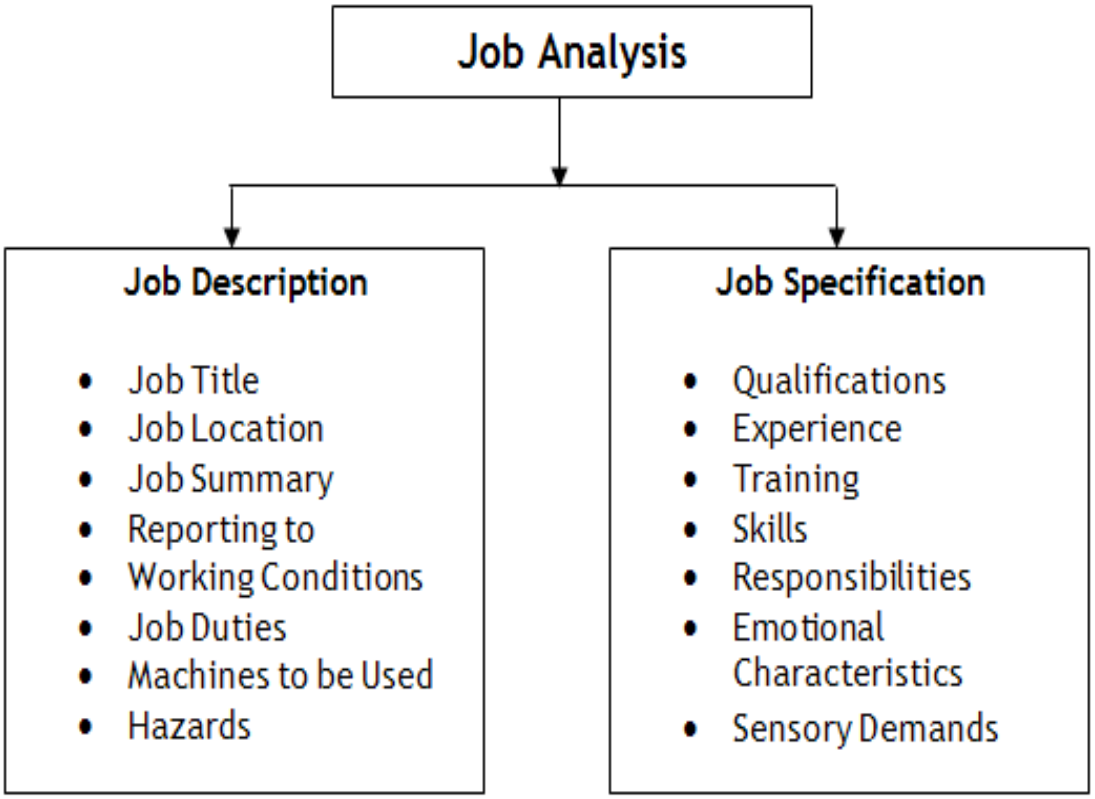
Job description includes basic job-related data that is useful to advertise a specific job and attract a pool of talent. It includes information such as job title, job location, reporting to and of employees, job summary, nature and objectives of a job, tasks and duties to be performed, working conditions, machines, tools and equipments to be used by a prospective worker and hazards involved in it.

Purpose of Job Description

- The main purpose of job description is to collect job-related data in order to advertise for a particular job. It helps in attracting, targeting, recruiting and selecting the right candidate for the right job.
- It is done to determine what needs to be delivered in a particular job. It clarifies what employees are supposed to do if selected for that particular job opening
- It gives recruiting staff a clear view what kind of candidate is required by a particular department or division to perform a specific task or job
- It also clarifies who will report to whom

2.3. Job Specification versus job description

Job description and job specification are two integral parts of job analysis. They define a job fully and guide both employer and employee on how to go about the whole process of recruitment and selection. Both data sets are extremely relevant for creating a right fit between job and talent, evaluate performance and analyse training needs and measuring the worth of a particular job.



Self-Check -2	Written Test

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

1. What is a job specification? (2 points)
2. What is job description? (2 points)

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
   _____
2. _____
   _____
   _____

Information Sheet-3	Observing OHS requirements

3.1. Introduction

OHS requirements are legislation/regulations/codes of practice and enterprise safety policies and procedures. This may include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of fire-fighting equipment, enterprise first aid, hazard control and hazardous materials and substances.

Personal protective equipment includes those prescribed under legislation/ regulations/codes of practice and workplace policies and practices. Safe operating procedures include the conduct of operational risk assessment and treatments associated with workplace organization. Emergency procedures include emergency shutdown and stopping of equipment, extinguishing fires, enterprise first aid requirements and site evacuation.

Occupational safety and health (OSH) also commonly referred to as occupational health and safety (OHS) or workplace health and safety (WHS) is an area concerned with the safety, health and welfare of people engaged in work or employment. The goals of occupational safety and health programs include fostering a safe and healthy work environment. OSH may also protect co-workers, family members, employers, customers, and many others who might be affected by the workplace environment. In the United States the term occupational health and safety is referred to as occupational health and occupational and non-occupational safety and includes safety for activities outside work.

What should your employees know before moving, handling, and storing tools and equipments?

In addition to training and education, applying general safety principles such as proper work practices, equipment, and controls can help reduce workplace accidents involving the moving, handling, and storing of materials. Whether moving materials manually or mechanically, your employees should know and understand the potential hazards associated with the task at hand and how to control their workplaces to minimize the danger.

Because numerous injuries can result from improperly handling and storing materials, workers should also be aware of accidents that may result from the unsafe or improper handling of equipment as well as from improper work practices.

In addition, workers should be able to recognize the methods for eliminating or at least minimizing the occurrence of such accidents. Employers and employees should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.

What precautions should workers take when moving materials manually?

When moving materials manually, workers should attach handles or holders to loads. In addition, workers should always wear appropriate personal protective equipment and use proper lifting techniques. To prevent injury from oversize loads, workers should seek help in the following:

- When a load is so bulky that employees cannot properly grasp or lift it,
- When employees cannot see around or over a load, or
- When employees cannot safely handle a load.

Using the following personal protective equipment prevents needless injuries when manually moving materials:

- Hand and forearm protection, such as gloves, for loads with sharp or rough edges.
- Eye protection.
- Steel-toed safety shoes or boots.
- Metal, fiber, or plastic metatarsal guards to protect the instep area from impact or compression.

Employees should use blocking materials to manage loads safely. Workers should also be cautious when placing blocks under a raised load to ensure that the load is not released before removing their hands from under the load. Blocking materials and timbers should be large and strong enough to support the load safely. In addition to materials with cracks, workers should not use materials with rounded corners, splintered pieces, or dry rot for blocking.

Personal protective equipment (PPE): Personal Protective Clothing and Equipment of the Regulation provides the applicable requirements. Generally, workers are expected to provide clothing for protection against the natural elements such as weather, and general purpose

work gloves, footwear, and safety headgear if needed. However, the Regulation also recognizes that an employer may provide any or all of these items.

An employer must provide any other PPE required for the protection of workers. This might include protective gloves, clothing, or respirators if workers may be exposed to pesticides or other harmful materials, and hearing protection if workers will be working near noisy equipment. Typically, the grower controls the circumstances where workers may be at risk on the worksite and would have the expertise on appropriate PPE. In such cases, the grower would have a primary responsibility for provision of such equipment, but the FLC shares in that responsibility.

First aid: Under the requirements for first aid (Rights and Responsibilities) of the Regulation, the employer is responsible for the provision of first aid for farm workers in their employ. First aid equipment must be provided with appropriate fire extinguishers. Typically the equipment required will be a Level 1 first aid kit, except where a very small number of workers are transported, in which case a basic kit may be sufficient.

Once workers have been transported to a worksite, the hazard assessment is likely to change, as many agricultural worksites are at least moderate risk. First aid for the poultry farm workers would have to be adjusted accordingly. In addition, if the grower employs workers other than those provided by the workers, then the first aid for the site needs to take account of the total number of workers on site.

Training: Under section 115(2) of the Act, an employer has the responsibility to ensure workers are made aware of all known or reasonably foreseeable hazards, as well as their rights and duties under the Act and Regulation, and are provided with the information, instruction, training, and supervision to ensure their health and safety. A number of specific training requirements are covered in the Regulation.

Orientation: all young and new workers must receive orientation and training specific to the workplace. New workers include workers who are relocated to a new workplace if the hazards in that workplace are different from the hazards in their previous workplace. These provisions will have substantial application to poultry industry worker given that their workers are often assigned to new workplaces. Records must be kept of the orientation and training provided

Self-Check -3	Written Test

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

1. What precautions should workers take when moving materials manually?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
   _____
   _____

Information Sheet-4	Identifying, checking and selecting safety equipments for effective operation

4.1. Introduction

Many times workers do not adhere to safety equipment or personal protective equipment (PPE) requirements because they feel it is a nuisance to wear or slows them down during a task. But PPE is used only when some type of hazard has been identified and cannot be eliminated or controlled through other means. Simply stated, when we have personal protective equipment requirements, it means there is a hazard that may cause you injury and failing to use the prescribed equipment puts you in potential danger.

4.2. Selecting safety equipments

Selecting the right safety equipments to sufficiently reduce exposure to hazards is essential to laboratory safety. The purpose of this section is to provide resources allowing researchers to identify and classify various types of PPE so the appropriate safety precautions are taken when conducting research.

For the purpose of this site, PPE will be classified into categories: eye and face protection, hand protection, body protection, respiratory protection and hearing protection. Each category includes its own corresponding safety equipment that will be described below.

Eye and Face Protection

Eye protection is achieved by wearing eyewear specifically designed to reduce the risk of exposure to chemical splashes, laser radiation and/or flying debris. There are four primary types of eye protection — of which each has its own limitations — including general safety glasses, laser safety glasses, chemical splash goggles and impact goggles. Full face protection is achieved by wearing face shields.

1. **General safety glasses**

It has side shields or a one-piece lens that wraps around the temple. It is the minimum levels of eye protection that must be worn in the laboratory. Are not effective in protecting the eyes from splashes, and are only recommended for use with solutions that are not likely to damage the eye, such as some buffers and salts.

Figure 1. General safety glasses

2. Laser safety glasses

Figure 2. laser safety glasses

3. Chemical splash goggle

Are recommended any time a splash of chemicals or infectious substances could reach the eyes. It can use as impact goggles to prevent flying debris from reaching the eyes.

Figure 2. Chemical splash goggle

Hand Protection

Appropriate selection of gloves is essential to protecting hands. Chemically protective gloves are one of the most important tools to minimize dermal exposures to chemicals in research laboratories. Gloves should only be used under the specific conditions for which they are designed, as no glove is impervious to all chemicals.

It is also important to note that gloves degrade over time, so they should be replaced as necessary to ensure adequate protection. Laboratory personnel should use the information below, and manufacturer compatibility charts (found under useful resources in the above right menu), to choose the type and style of glove.

Type		**Use**	Figures
Light latex, vinyl or nitrile gloves	Disposable latex (powdered or unpowdered)	Working with biological hazards (human blood, body fluids, tissues, blood borne pathogens, specimens), BSL1, BSL2, BSL2+, BSL3	
	Disposable nitrile (puncture and abrasion resistant, protection from splash hazards)	Working with biological hazards and chemical splash hazards	

Light to heavy chemical resistant gloves	Nitrile (chemical resistant, good puncture, cut and abrasion resistance)	Using apparatus under pressure, air or water reactive chemicals	
			↑ Return to top of page

Foot Protection

When steel-toed safety shoes are required, make sure they are used in designated areas. When purchasing steel toed safety shoes, make sure the shoe is commercial-grade and the metal toe will not collapse if struck.

Figure 3. Rubber boots

Body Protection

Lab coats are required for all wet labs. Cotton or cotton/poly blends are sufficient for labs without risk of fire. Nomex coats are required for work with pyrophorics, flammable liquids in quantities of more than 4 liters or when work involves flammable liquids and an ignition source such as a burner. Barrier coats must be worn when working with infectious materials. Barrier coats can be autoclaved by placing the coats in a pan and placing an additional pan of water in the autoclave.

Type	**Use**	Figure
Flame resistant (e.g. Nomex or other flame-resistant cotton — resists ignition)	Working with water or air reactive chemicals, large volumes of organic solvents, and potentially explosive chemicals	

Coverall	Working with biological and chemical hazards	

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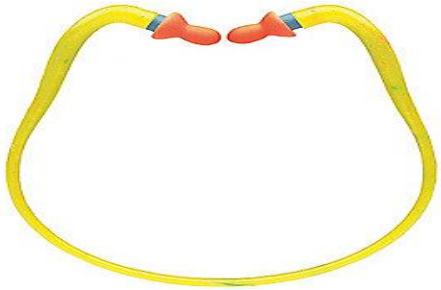
Respiratory Protection

Type		**Use**	
Surgical masks	Protect against large droplets and splashes (*does not require fit-testing*)	Working with live animals; working with infectious material in BSL-2+ level labs but only protects your sample from you, not the other way around.	
Half-mask respirators	Purifies air: protects against variety of particulates, vapors, dust, mists, fumes; depends on filter cartridge used (*requires fit-testing*)	Working with live animals or infectious materials with known airborne transmissible disease; dusty environments; chemical vapors; particulates	

Hearing Protection

All laboratory personnel shall contact EH&S to request noise monitoring in their laboratory settings to perform noise monitoring and advice on the specific use of hearing protectors.

Laboratory workers whose eight-hour time-weighted average noise exposure exceeds the 85 dBA Action Level will be enrolled in the UC Merced Hearing Conservation Program. These individuals will receive annual audiometric testing, will have hearing protectors made available to them by their supervisors, and will be provided training on the fitting, use and care of these devices.

Disposable earplugs	Polyvinyl chloride (PVC) or polyurethane foam, one-time use design (no cleaning), one size fits all, light weight, low cost, blocks all sound. Useful when working in areas where sound levels average over 85 dBa; EH&S can assist in assessments	
Reusable earplugs	Silicone, tapered fit, reusable (needs cleaning), corded or uncorded, light weight, more durable than disposable earplugs. Useful when working in areas where sound levels average over 85 dBa; EH&S can assist in assessments	
Hearing band	Earplugs connected to a flexible band that can be worn around the neck when not needed. Useful when working in areas where sound levels average over 85 dBa; EH&S can assist in assessments	

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Cleaning tools and detergents

Figure 4. Cleaning detergents

Figure 5. Cleaning tool

FIRST AID

Basic first aid refers to the initial process of assessing and addressing the needs of someone who has been injured or is in physiological distress due to choking, a heart attack, allergic reactions, drugs or other medical emergencies. At its most basic, first aid is the **initial assistance given to a victim of injury or illness**. Comprised of relatively simple techniques that can be performed with rudimentary equipment, first aid is usually carried out by a layperson until professional medical assistance arrives.

Figure 6. First aid kit

Importance of first aid

Knowledge of **first aid** promotes a healthy, secure and a safer environment, and instills confidence amongst people, their families, their colleagues and associates. Basic first aid knowledge is very helpful in dealing with trauma situations. Not just the medical help they provide, but the confidence they exhibit is very helpful during casualties.

Self-Check -4	Written Test

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

1. List at least five safety equipments with their function(10pts)

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1._____

_____

_____

_____

List of Reference Materials

https://kuiyem.ku.edu.tr/wp-content/uploads/2016/12/American-College-of-Emergency.

https://www.monash.edu/ohs/policies-procedures-and-guidelines/document-folders

https://www.swinburne.edu.au/.../policies-regulations/procedures-guidelines/ohs-procedures

https://www.osha.gov

Poultry Production

NTQF Level -III

Learning Guide -10

Unit of Competence: - Prevent and Eliminate MUDA

Module Title: - Preventing and Eliminating MUDA

LG Code: AGR PLP3 M03 LO2-LG-10

TTLM Code: AGR PLP3 TTLM 0120v1

LO2: Identify MUDA

Instruction Sheet	Learning Guide #10

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

- Preparing and implementing plan of MUDA identification.
- Discussing causes and effects of MUDA.
- Using tools and techniques to draw and analyze current situation of the work place.
- Identifying and measuring wastes/MUDA based on ***relevant procedures***.

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- Prepare and implementing plan of MUDA identification.
- Discuss causes and effects of MUDA.
- Use tools and techniques to draw and analyze current situation of the work place.
- Identify and measuring wastes/MUDA based on ***relevant procedures***.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 20.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” **in page -.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #10.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Preparing and implementing plan of MUDA identification.

1.1. The Concept of Muda/Waste

Muda is a Japanese word meaning Wasteful Activity which use resources, time or cost without adding value and is a key concept in lean process thinking, like the Toyota Production System (TPS) as one of the three types of deviation from optimal allocation of resources (the others being *mura* and *muri*).

In other words, it is anything unnecessary in operation that affects the quality of the product/service, productivity, delivery time and also production cost. Muda can be eliminated immediately. It may be Unnecessary motion/searching for tools, unnecessary transportation of materials, over production, Inventory, Waiting /idle time, making defects and over processing, etc. Waste reduction is an effective way to increase profitability.

From an end-customer's point of view, value-added work is any activity that produces goods or provides a service for which a customer is willing to pay; Muda is any constraint or impediment that causes waste to occur.

Classification of Waste

A number of methods for categorizing types of waste have emerged. We will review some of these models to get a deeper understanding of what waste is and how to find it and eliminate it.

- The three Mus
- The 5M + Q + S
- The flow of goods
- The seven deadly wastes

The Three MUs

In this way of thinking about waste, the goal is to achieve a condition where capacity and load are about equal. In other words, there are just the right amount of workers, materials and machines to make just the right amount of product that is being ordered and deliver it on time to the customer. In Japanese this is expressed with the terms muda, mura and muri.

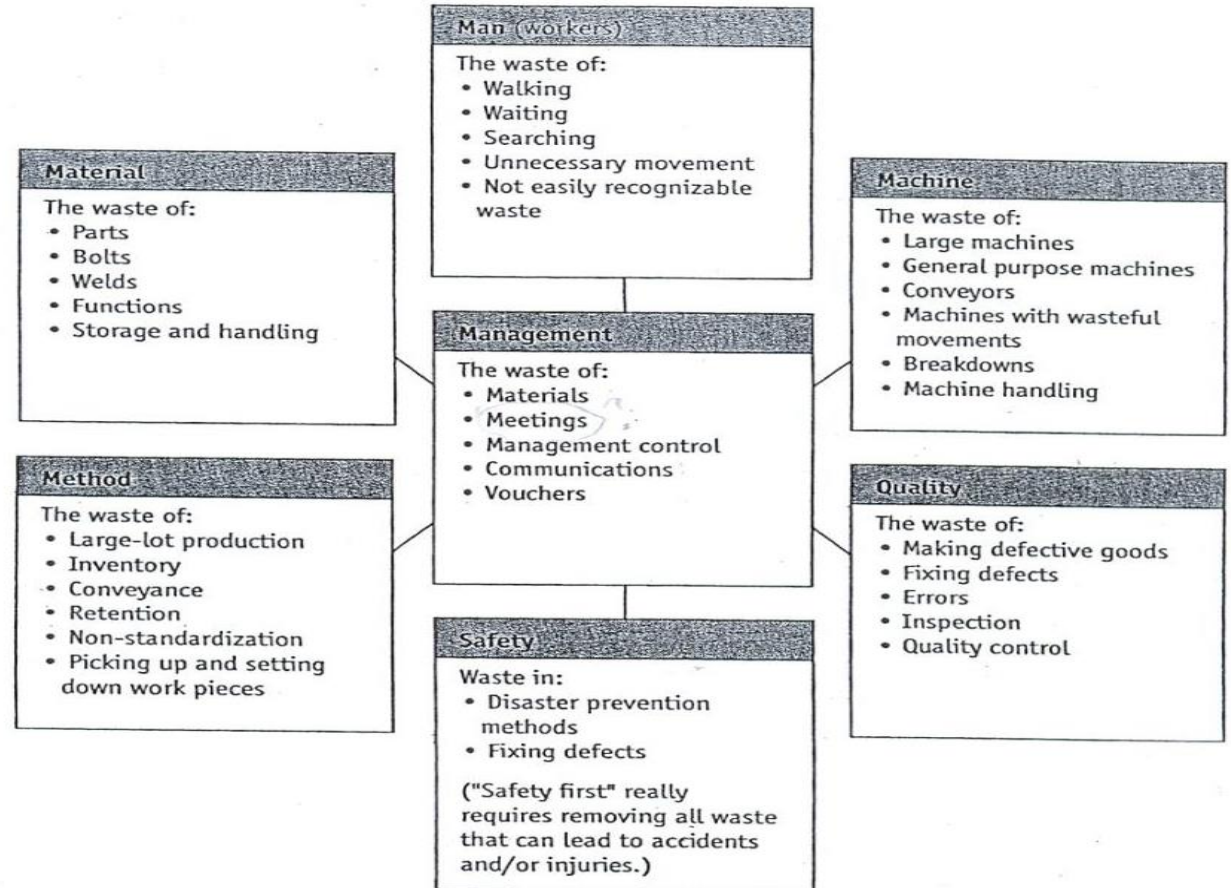
- Muda(waste) = Capacity exceeds load.
- Mura (inconsistency or variation) = capacity sometimes exceeds the load and the load sometimes exceeds capacity.

- Muri(irrationality/physical or mental overburden) = load exceeds capacity.

By focusing improvement activities on eliminating the non-value added activities throughout the production/service delivering process, and establishing production flow, a balance is naturally achieved between capacity and load.

The 5M + Q + S

Another way of thinking about waste is to focus on the areas where waste may occur: the 5M (man, material, machine, method and management), plus quality and safety. See the next figure.



The Flow of Goods

A third way of thinking about waste is to focus on the flow of goods in production. The flow of goods typically looks like this:

Materials are procured __ Materials are retained in the warehouse____ Materials are conveyed to processes on the production line_____ Materials are retained at the process equipment(WIP) ___ Materials are picked up for processing ___ Materials are processed goods are set down and retained on the other side of the processing machine(WIP) ____ Goods are conveyed to an inspection point Goods are retained until inspection____ Goods are picked up and inspected ___ Goods are set down and retained on the other side of inspection process Inspected goods are conveyed to the finished goods warehouse

_____ Finished goods are retained prior to shipment ___ Finished goods are delivered to the customer.

There are two types of MUDA:

- **Muda Type I**: non value-adding, but necessary for end-customers. These are usually harder to eliminate because while classified as non-value adding, they may still be necessary.
- **Muda Type II**: non value-adding and unnecessary for end-customers. These contribute to waste, incur hidden costs, and should be eliminated

E.g. Very simple drill to elaborate the three Categories of Operation

Operation:-To staple two papers using a stapler where the work place is disorganized.
Needed materials and tools for the activity

- Two pieces of paper
- Stapler
- Staples

The result in the disorganized sample work place is summarized below.

No.	Activities	Time taken	Category of the operation	Action to be taken to eliminate/reduce	How
1	Searching for Stapler	35 Sec	Muda	Eliminate	5S(Set-in-order)
2	Searching for Staples	30 Sec	Muda	Eliminate	5S(Set-in-order
3	Putting the Staples into the stapler	8 Sec	Non-Value adding	Minimize	Load staples ahead
4	Putting the two papers together	3 Sec	Non-Value adding	-	
5	Staple the papers	2 Sec	Net Operation (Value Adding)	-	

Lessons from the drill

Total time of operation=78 Sec

- Net Operation (Value adding) = 2 Sec (2.6%)
- Non-Value adding operation=11 Sec (14.1%)
- Muda (Unnecessary operation)=65Sec(83.3%

Can you imagine by how much the total time of the operation can be improved if we try to eliminate the Muda and minimize non value adding operations by applying 5S?

The three Categories of Operation

(1)Net Operation/Value Adding Operation

(2)Non-Value Adding Operation

(3)”Muda’’

(1) Net Operation/Value Adding Operation

It is a part of an operation that adds value to make parts and products or deliver service. In other words, it is part of the operation that the customer exactly needs / willing to pay for.

Exles - Milling, Turning, Grinding, Assembling and Welding

- Printing/photocopying a document etc.

(2)Non-Value Adding Operation

Part of operation that adds no value but cannot be avoided rather it can be reduced.

Example:- Setting up / adjustments, Loading paper to a photo copy machine/printer,etc

Value

Value is defined by the next customer

The next process is your customer. The activity/effect exactly what the next customer needs is value adding activity.

There are two types of customers:-

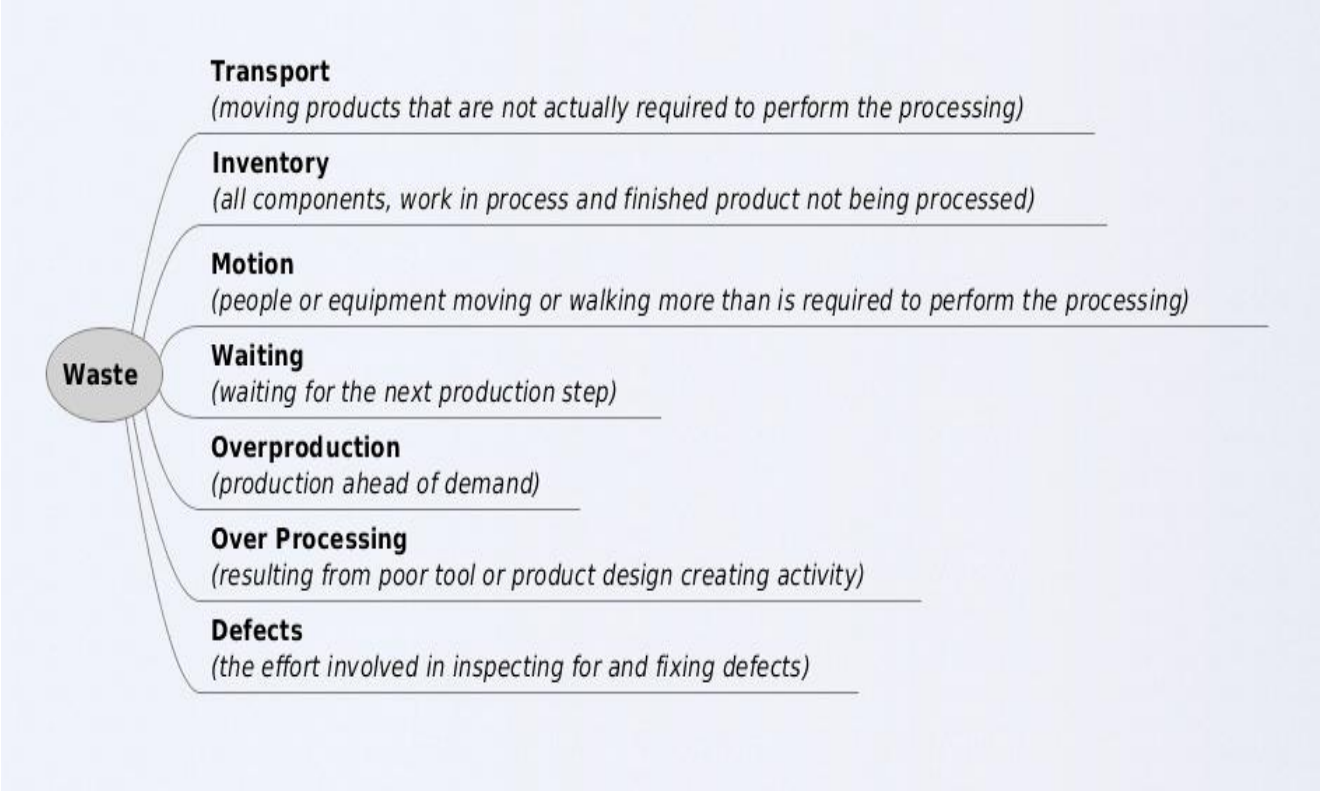
- Internal customer
- External customer

Internal customer: - is the customer within a production line/service delivering sequence that is next to the previous process and makes his/her own process.

External customer: - is the customer that buys the final out put product/service of the enterprise

The seven forms of waste

One of the key steps in lean process and TPS is to identify which activities add value and which do not, then to progressively work to improve or eliminate them. Taiichi Ohno, "father" of the Toyota Production System, originally identified seven forms of muda or waste:



Preparing and implementation MUDA Identification

Waste management plans have a key role to play in achieving sustainable waste management. When we talk about waste, we refer to any activity that consumes resources but does not create when we talk about waste, we refer to any activity that consumes resources but does not create value for the end consumers. But the reality is quite different. Only a small portion of the activities that are part of the process creates real value. That's why businesses should focus on reducing wasteful activities as much as possible. And by doing that, they can identify numerous ways to improve their performance.

But don't be mistaken. You can't eliminate all wasteful activities from the process. Some of them are truly necessary. In fact, there are two major types of waste: **necessary muda (waste) and pure muda (waste).**

The necessary waste actions may not be value-adding in an obvious way, but they ensure work is properly done, and the product/service doesn't lose quality. The pure waste actions though are not only non-value adding, but also unnecessary. These actions can be removed from the process. Therefore, save resources and cut time and costs.

While traditionally, there are seven muda, but today's modern work environment produces one more type of waste. As a result, we have the acronym: DOWNTIME that stands for:

- Defects
- Overproduction
- Waiting

- Not using talent
- Transportation
- Inventory excess
- Motion waste
- Excess processing

Defects

Defects are mistakes. And when they happen, those part or components require additional work. They are reworked, repaired or scraped. Defects can happen due to machine or human errors. If the reason is not identified and resolved, otherwise, the defects can lead to more defects and other wastes. Complete elimination of this **MUDA** is impossible. But can be limited by applying stricter control and documentation of procedures.

Overproduction

The wastes created by overproduction are due to workers continuing to work and create output. Even if that output can't be processed because workers responsible for the next step are not ready or do not need the output till a specific moment? One way to resolve overproduction is to improve planning and coordination. Additionally, implementation of process standardization can help regulate all processes. And also assist with bottlenecks' identification and removing. In addition to implementing standardization, you should also set a monitoring a measuring system to improve the transparency of the entire process.

Waiting

Waiting times are a result of interruptions. They can happen when there's a lack of materials or information, pending approval, or perhaps due to a machine malfunction. As a result, workers cannot continue working.

One way to remove this muda is to improve communication. This allows for better coordination and adds flexibility to the operational processes.

Not using talent

This is a new waste, and not part of the original seven wastes (muda) of TPS. But not utilizing employees' talents (and creativity) is increasingly considered as waste. Many employees have talents, abilities, and knowledge that can be very beneficial to the organization. But they are never included during decision-making. Not-utilizing talent directly lowers employee motivation and engagement, and worst, employees' productivity. The best

way to not let talent go to waste is to encourage decision-making and providing training, processes, and tools for continuous improvement and measurement.

Transportation

The transportation muda happens when things move from one point to the other. Transportation of resources doesn't add value, but actually increases costs. So instead of excessively moving materials, you can lower transportation waste by reorganizing your physical space to simplify the process. When you set less frequent movements of materials or products and shorter distances, the waste is reduced too.

Inventory excess

Keeping excess inventory is almost never good. It causes additional costs and additional muda. And when inventory piles up, it can mask other problems too that must be identified and resolved in order to improve the process. Some problems that excess inventory creates are increasing lead times, blocking the production floor space, or delaying the identification of problems. You can get around this by improving the organization (using a Kanban board) and communication between teams and team members so you can level production with demand and supply.

Motion waste

Motion waste is similar to transportation waste but refers to the movement of goods inside the organization. When goods need to move from one department to the other or employees need to move to get work done. It can a result of poor working standards, not optimal process design to work area layout. Rearranging work stations, or using proper tools and machines can greatly help in the reduction of motion waste.

Excess processing

Excess processing is another waste that happens when the work process is not organized well, or there's a lack of documentation. As a result, there are many versions of the same task, several entries of the same data, or more processed goods than necessary. One of the best and most efficient ways to overcome over-processing is to standardize processes. Including: reduction of redundant steps, excess documentation, approvals, and meetings.

Self-Check -1	Written Test

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

1. Define muda. (2pts)
2. List types of muda.(8pts)
3. List out the three categories of operation (3 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
   _____
   ___
2. _____
   _____
   _____
   _____
3. _____
   _____
   _____

Information Sheet-2	Discussing causes and effects of MUDA

A problem solving methodology that focuses on resolving the underlying problem instead of applying quick fixes that only treat immediate symptoms of the problem. A common approach is to ask why five times – each time moving a step closer to discovering the true underlying problem. It helps to ensure that a problem is truly eliminated by applying corrective action to the “root cause” of the problem.

Causes of Muda of Overproduction

- Large-lot production
- Anticipatory production (producing product in advance of demand)
- Inability to achieve short changeover times with the large equipment used in mass production systems
- Creating enough stock to replace the number of defective parts produced
- Overstaffing or too much equipment
- Machines that turn out parts too quickly

Effects of Muda of Overproduction

Companies often have overproduction as a result of large-lot manufacturing methods or mass production. There are several unfortunate effects of over production:

- Anticipatory buying of parts and materials
- Blocked flow of goods
- Increased inventory
- No flexibility in planning
- Occurrence of defects

Causes of Muda of Inventory

- Acceptance of inventory as normal or as a “necessary evil”
- Poor equipment lay out
- Long changeover times
- Shish-kabob or large lot production
- Obstructed flow of goods
- Anticipatory production
- Defective parts
- Upstream process is too fast for the downstream process

Effects of Muda of Inventory

- Waste of space

- Needs for inspection, and transportation
- Expansion of working fund
- Shelf life may expire
- It ties up cash
- Makes FIFO inventory management more difficult

Causes of Muda of motion

- Isolated operations
- Low employee morale
- Poor work layout
- Lack of training
- Undeveloped skill

Effects of Muda of motion

- Increase in manpower and processing
- Unstable operation
- Increases production time
- Can cause injury

Causes of Muda of Conveyance/Transportation

- Poor layout
- Shish-skilled workers
- Sitting to perform operations
- The need for conveyance systems is assumed

Effects of Muda of Conveyance/Transportation

- Waste of space
- Production deterioration
- Expansion of transportation
- facilities
- Occurrence of scratches
- Increase production time and cost
- wastes time and energy

Causes of Muda of Waiting/ Idle time

- Obstruction of flow
- Poor equipment layout
- Trouble at the upstream process
- Capacity imbalances

- Large Lot-production

Effects of Muda of Waiting/ Idle time

- Waste of manpower, time, & machines
- Increase in the in-process inventory
- Failed delivery dates
- Poor workflow continuity

Causes of Muda of Defect making

- Emphasis on downstream inspection
- No standard for inspection work
- Omission of standard operations
- Material handling and conveyance

Effects of Muda of Defect making

- Increase in material cost
- Productivity deterioration
- Increase in personnel & processes for inspection
- Increase in defects and claims
- Invite reworking costs

Causes of Muda of Processing

- Inadequate study of processes
- Inadequate study of operations
- Incomplete standardization
- Materials are not studied

Effects of Muda of Processing

- Unnecessary processes or operation
- Increase in manpower and man-hour
- Lower workability
- Increase in defects
- Can reduce life of components

Self-Check -2	Written Test

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

1. Write at least two causes and effects of each type of the seven deadly wastes /Muda. (20 points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____-
   _____
   _____

Information Sheet-3	**Using tools and techniques to draw and analyze current situation of the work place.**

An important thing for every organization nowadays is to make profit, i.e. to improve the ratio between earned and invested money. This consideration is based on the fact, that if resources (money, labor, material, etc.) are used more efficiently, the whole process of making profit and supporting competitiveness of the organization will be enhanced. The organization should therefore try not only to analyze the waste but also to eliminate it with correctly chosen tools and techniques. Most probably it is applied by using of lean manufacturing tools.

Lean manufacturing is a philosophy to provide better quality of products with lower cost and on time with lesser efforts. It is defined as “A philosophy based on Toyota production system and other Japanese Management Practices that strives to shorten the time line between the customer order and the shipment of the final product by consistent elimination of waste”. **Lean manufacturing** aims for Identification and elimination of waste in all aspects of a business and there by enriching value from the customer perspective.

The basic purpose of LM is to manufacture the product with minimum waste and continuous improvement of all activity and process involved in any form of work.

For that following are key elements which have been recognized like:

- Process flow
- Other Analysis tools
- Do time study by work element
- Measure Travel distance
- Take a photo of workplace
- Measure Total steps
- Make list of items/products, who produces them and who uses them & those in warehouses, storages etc.
- Focal points to Check and find out existing problems
- 5S
- Layout improvement
- Brainstorming
- Andon
- U-line

- In-lining
- Unification
- Multi-process handling & Multi-skilled operators
- A.B. control (Two point control)
- Cell production line
- TPM (Total Productive Maintenance)

Self-Check -3	Written Test

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

1. What is lean philosophy?(2
2. Write the aim of lean manufacturing (3pts)
3. Write key tools /elements to analyze waste in work place(6pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
   _____
2. _____
   _____
3. _____
   _____

Information Sheet-4	Identify and measuring wastes/MUDA based on relevant procedures

There are two types of wastes: obvious wastes (type I muda) and hidden wastes (type II). It is important to uncover and eliminate the latter since they are usually bigger. Wastes take the shape of an ice berg; the tip consists of the obvious wastes while the seen bulk under the water contains the hidden wastes. Wastes are not necessarily ugly, and most are outside the waste can! Waste can be in the form of unnecessary output, input, or processing. It can be in the form of materials, stocks, equipment, facilities, man hours, utilities, documents, expenses, motion, and other activities that do not add value.

The steps to effective waste elimination are:

- Make waste visible.
- Be conscious of the waste.
- Be accountable for the waste.
- Measure the waste.
- Eliminate or reduce the waste

In other words, before one can stop waste, he should able to see it, recognize it as waste, identify who is responsible, and finally appreciate its size and magnitude. Waste that is not

seen cannot be eliminated. When something is denied as waste, it also cannot be stopped. When one refuses to accept responsibility for the waste, then he will not eliminate it. Finally, when the waste is not measured, people may think it is small or trivial and therefore will not be motivated to stop it. As the saying goes “What is not measured, is not improved”.

Self-Check -4	Written Test

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

1. What is relevant procedure to eliminate waste? (2pts
2. Write process of identification and elimination of waste (4pts

Note: **Satisfactory rating - 6 points** **Unsatisfactory – below 6 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
   _____
2. _____
   _____-

List of Reference Materials

- Reference Book: Identifying Waste on the Shopfloor (1996).
- Ethiopian Kaizen Manual (2011).
- Journals/publications/magazines

POULTRY PRODUCTION

Level -III

Learning Guide-11

Unit of Competence:-Prevent and Eliminate MUDA

Module Title: - Preventing and Eliminating MUDA

LG Code: AGR PLP3 M03 LO3-LG-11

TTLM Code: AGR PLP3 TTLM 0120v1

LO3: Eliminate wastes/MUDA

Instruction Sheet	Learning Guide # 11

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

- Preparing and implementing elimination plan of MUDA
- Adopting necessary attitude and the ten basic principles for improvement
- Using tools and techniques
- Reducing and eliminating Wastes/MUDA.
- Reporting Improvements

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- Prepare and implement elimination plan of MUDA
- Adopt necessary attitude and the ten basic principles for improvement
- Use tools and techniques
- Reduce and eliminate wastes/MUDA.
- Report Improvements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 20.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” **in page -.**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #11.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Preparing and implementing elimination plan of MUDA

1.1. Introduction

The muda of overproduction is caused by producing more than is necessary or required. It is a terrible waste of resources and time. It puts needless wear on office machines, uses up more supplies than are needed and tasks employees to do work that is not needed. It is anything that adds time, resources, or cost without adding value. The muda of over production is the greatest of all of the 7 wastes. Here are some of the forms of the muda of overproduction you will find in the office and IT environment. This is a short list and you can find much more;

- Creating reports that nobody reads
- Creating reports that contain more information than is needed.
- Compiling more data than is needed for the task
- Printing paperwork that is not needed
- Preparing more equipment than is needed
- Too many redundant systems
- Duplicate records and systems

Elimination of muda is the next logical step in improvement for your 5S team. You can tackle muda without a 5S System, but having a 5S System and a 5S Team already in place will give you a foundation and a structure to work with.

Figure-1.1 work team

Figure-1.2 5s

How to Plan a 5S System Launch

A 5S System is a low-cost system that will clean and organize your workplace. It will increase productivity and raise employee morale. This article that will give you some basic information on how to set up a 5S system in your workplace. One of the keys to the success of a 5S system is to have the full support of the management of your company. While a 5S system is low-cost to set up, it will require changes to the work habits of employees and needs the support and reinforcement of management.

5S System Steps

The first three steps, sort, straighten and shine are mainly housekeeping measures. Remember a 5S System is not a one-time event. It is a continuous process of improving the workplace. For a 5S System to succeed the first three steps should be part of the daily work routine, usually carried out at the end of each shift or workday.

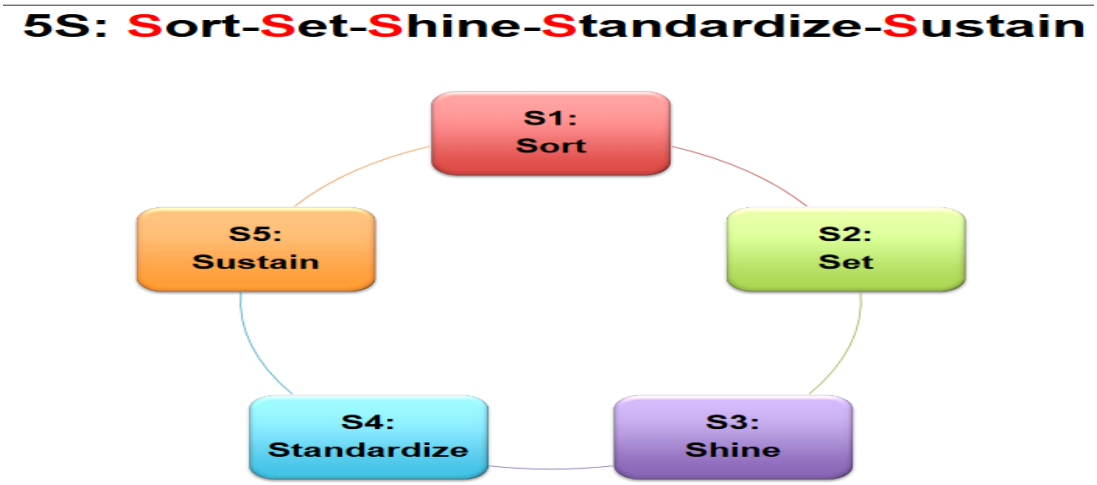


Figure-1.3.5s

- **The Sort step** should include a plan for both sort events and the daily work habits of employees. Limits on the amount of work in progress should be set so as not to

overload a workstation. You will need designated areas where items tagged for removal from a workstation can be taken during a red tag sort event phase. These can be temporary areas near the workstations. In planning for the sort step consider a red tag event will disrupt work. You may need to plan for this event to be done during off work hours.

- **The Straighten step** has as its foundation “There should be a place for everything and everything should be in its place”. Your 5S team will need to set up designated areas for everything from parts to cleaning supplies. These areas should be marked and documented. One of the greatest benefits of the straighten step is employees will know where to go to find what they are looking for.
- **The Shine step** is all about cleanliness. Decide if more trash and recycling containers are needed and where they should be placed. If you do not have a green workplace plan, a 5S System is a good place to lay the foundation of recycling items such as paper and cardboard. Decide if you have enough cleaning supplies or any tools such as a shop-vac are needed and where they will be stored. These items will be used every day.
- **The Standardize step** of the 5S System is about your systems. Examine areas such as how your parts and supplies are received. They should be put in place immediately. Examine your workflow system to see how efficient it is. Parts, tools and work to be done should be close to the workstation. If an employee has to walk 500 feet to get something they routinely use, find a way it can be moved closer. The standardize step can be a framework for an overall process and quality management system. This step should be revisited often to look for areas of improvement.
- **The Sustain step** is the last and most important step in the 5S System. No matter how well laid out the plan you must be able to continue it. Continuing the program needs employees to be educated on the benefits of a 5S System and it should be made a requirement of their daily work routine. Old habits are hard to break so checking the system is being following is a requirement.

Some tools that may help you with your 5S System include:

- Educational materials for the 5S team and employees. Posters placed around the workplace will remind employees of the 5S System.

- A bulletin board dedicated to the 5S System. You can post educational material, event notices and location charts of designated areas. Before and after pictures are useful to show how bad things were and how much better they are now.
- Rewards such as recognition of areas, groups or teams for their efforts in support of the 5S System
- 5S is a team oriented system, allows anyone to offer suggestions on improvements. You will be surprised at what employees can come up with. Plus, no one knows better how the work flows than the ones doing the work. This is useful information for the standardization step

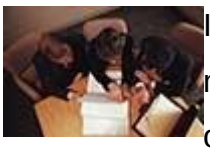
Once you have picked your team hold your first meeting and educate your team members. Teach those about 7 categories of muda which include:

Figure-1.3 seven categories of muda

Elimination of these seven kinds of waste can help companies reduce costs, increase employee engagement and customer happiness, and increase profits and how eliminating muda will improve your organization. Setup a planning meeting on how to tackle the first muda of overproduction. To be able to eliminate overproduction you must first examine your products and your customers, both internal and external that use what you produce. This will

help you understand what is being produced and how the customer uses it. With this knowledge you will be able to see what can be eliminated.

1.2. Planning



If your company is large enlist the help of leaders in each department. You may need to create separate teams for specific departments and treat each one as a separate project. The theme is the same, but due to the amount of products and customers involved you may find it easier to manage by using smaller, specific groups.

The first task for your team is to make a list of all of the products, who produces them and who uses them. These products come in many forms. They can be reports, data produced, or equipment produced or prepared. These products may be created for internal and external customers. You will be surprised just how much is produced.

An example of a product is a weekly report of statistics on the call volume to your service desk. This report is produced by your service desk manager and is read by top-level and mid-level management. Log this report by naming it, who produces it and the individuals who read it.

You will also need to match a product with the process used to create it. Include the process and any standard work instructions used to produce your products. If a product is needed and you cannot eliminate it you can reduce muda by improving the process used to create them. The muda of overproduction is the most wasteful of all. It wastes resources, time and money. First you need to establish a team and plan for muda elimination. Next interview or survey your customers to determine what products they receive, use and do not need. Examine your processes for creating reports, producing data and all other products. Excess steps and duplication are wastes that can easily be eliminated.

Your goal is to identify the waste in processes and products and eliminate them. The time, resources, reduction in machine usage and money saved will make the effort more than worthwhile. Once is not enough when it comes to eliminating muda. Hold regular meetings to examine all of these areas again to see if overproduction or other muda has crept back in.

Self-Check -1	Written Test

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

1. List seven categories of muda (5)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Adopting necessary attitude and the ten basic principles for improvement

2.1. Adopting the Necessary Attitude

First you must adopt an attitude that supports your ability to see waste. Waste is hard enough to find when you want to find it; if you don't want to find it, or if your response to find it is denial or resistance, then it will never be possible for you to root out waste and make your work environment stress free. It is very important that you understand that one purpose of discovering waste is to take the frustration out of your work. Many people will resist seeing the waste in their work. Just don't let it be you. You may hear yourself or others saying things like: "Let's not fix what is not broken." "Can't we live well enough alone?" "This is just another attempt to make us work harder for the same amount of money." "It looks good on paper, but it will never work on the floor." "We tried those twenty years ago. It didn't work then; it won't work now." "That is not my job." And so on.

You know the lines. You have probably said one or two of them at one time or another. We all have. Resistance is normal. Just don't let it keep you from learning to see the waste in your work. In the end, you are the one who suffers most from the results of waste.

2.2. The Ten Basic Principles for Improvement

1. Throw out all of your fixed ideas about how to do things.
2. Think of how the new method will work-not how it will not.
3. Don't accept excuses. Totally deny the status quo.
4. Don't seek perfection. A 50 percent implementation rate is fine as long as it is done on the spot.
5. Correct mistakes the moment they are found.
6. Don't spend a lot of money on improvements.
7. Problems give you a chance to use your brain.
8. Ask "Why?" at least five times until you find the ultimate cause.
9. Ten people's ideas are better than one person'.
10. Improvement knows no limit.

❖ **How to eliminate the seven types of Wastes/Muda.**

In order to balance capacity and load without overproducing, you must implement the advanced methods of lean production:

- Full work

- Line balancing
- Pull production using kanban.
- Quick-changeover operations.
- Level production - small-lot, mixed production.

❖ **How to Eliminate Inventory Wastes**

- U-shaped manufacturing cells, layout of equipment by process instead of operation.
- Production leveling
- Regulating the flow of production
- Pull production using kanban
- Quick changeover operations

❖ **How to Eliminate Motion Wastes**

- Gradually switch to flow production
- Create U-shaped cell layout of equipment
- Make standardization through
- Increase training
- Increase operator awareness about motion during an operation

Where as many kinds of movement may be unnecessary, work is the movement you do to add value to the product. Movement that does not add value is waste. Find ways to reduce the amount of movement to do your value added work. Start by looking at the movement of your feet, then your hips, shoulders, arms, hands and fingers.

❖ **How to Eliminate Conveyance/Transportation Wastes**

Basically, conveyance waste is corrected by redesigning equipment layout to create a flow between operations. Then you will be able to take out much of the complexity in the conveyance system and decrease material handling to a minimum. Some of the lean production methods that address conveyance flow:

- U-shaped manufacturing cells
- Flow production
- Multi skill workers
- Standing to perform operations
- Higher utilization rate
- Water beetles (material handlers in the kanban system of pull production)

❖ **How to Eliminate Waiting/Idle Time Wastes**

- Production leveling
- Product-specific layout

- Mistake-proofing
- Human automation
- Quick changeover
- Autonomous maintenance
- Line balancing

❖ **How to Eliminate Defect Wastes**

- Standard operations
- Mistake-proofing devices
- Full-lot inspection
- Building quality in at each process
- Flow production
- Elimination of the need to pick up and set down work pieces
- Improvement of jigs using human automation
- Promotion of value analysis and value engineering

To reduce defects, their root cause must be found. Inspection that only sorts out the defective parts is not a solution to defective waste; it is actually one of the major defect-related wastes. Until you initiate back-to-the-source inspection and build quality into every process through standardization, the effects of defects will continue to disrupt the flow of goods and decrease productivity.

❖ **How to Eliminate Processing Wastes**

- More appropriate process design
- Review of operations
- Improvement of jigs using automation
- Thorough standardization
- Promotion of value analysis(VA) and value engineering(VE) techniques

Self-Check -2	Written Test

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

1. List the basic Principles for Improvement(10)

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Using tools and techniques

3.1. **Tools and techniques**

It is a technique to reduce waste which occurs due to fluctuating customer demand. Lean techniques are used to create processes that have no non-value add parts. Any part of a process that does not add value the consumer is eliminated using Lean techniques. Five of the most helpful lean Tools. However, Kaizen, 5S, Kanban, Value Stream Mapping, and Focus PDCA are among the most useful lean tools.

3.1.1. Some Tools and Techniques to eliminate Wastes/Muda.

- 5S
- Layout improvement
- Brainstorming
- Andon
- U-line
- In-lining
- Unification
- Multi-process handling & Multi-skilled operators
- A.B. control (Two point control)
- Cell production line
- Line balancing
- Build in quality at each process… Etc.

✓ **5S (Five S):** Implementing 5S/workplace organization to eliminate Wastes/Muda.

✓ **Layout improvement:** Is to plan the placement of machineries, raw materials, workers, etc. in order to produce raw materials, parts or products economically.

When the layout of a shop floor is decided, it is necessary to plan considering production conditions and environmental conditions appropriately. Layout improvement is important technique to avoid”Muda, Mura and Muri” due to placement in production activities.

✓ **Brainstorming**

Brainstorming can be defined as the methodology used to encourage every individual in the KPT to express freely their opinions or give ideas in an open discussion. Brainstorming can be used to list down all the problems faced by an organization, their causes and the potential effects if a certain suggestion is implemented.

- To ensure the success of the brainstorming process, it is important for the KPT to follow the following rules:
  1. The subject for brainstorming should be clear and accurate. For example, members may brainstorm to identify the causes and reasons why a certain task cannot be completed on schedule.
  2. Each member will give only one opinion / idea at each turn regardless of the number of ideas he / she may have.
  3. A tension-free atmosphere must be maintained to encourage free expression of ideas.
  4. Every idea expressed should be written on the black / white board, flip chart or noted down by a secretary.
  5. At the end of the brainstorming session, all the ideas expressed should be evaluated one by one and short-listed.
  6. Voting is used to list the ideas according to priority. The prioritization is based on the number of votes received for each idea.

✓ **Andon:** Is an indicator informing team leaders and supervisors of the current workshop situation with color boards, flash lights, and automated announcement.

- Types of Andon

1) Calling “Andon” -Used for requesting parts.

2) Warning “Andon” -Used to inform occurrence of irregularities on the lines.

3) Progress “Andon” -Used to identify the progress of operation on the lines with a short Takt Time.

✓ **U-line:** Is a layout in which the inlet and outlet are positioned in the same direction to avoid walking back for a single operator.

Figure:-3.1 U-line

✓ **In-lining:** Is a way to make the production lines simple and effective by integrating the parts processing into the main line in the unit production**.**

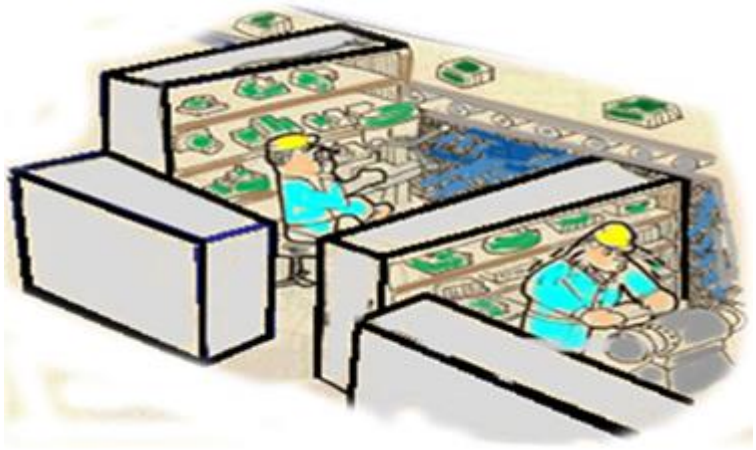


Figure 3.2 In-lining

- ✓ **Unification:** Even if a flowing line cannot be formed, odd operations can be combined together in a place into an operator's work.

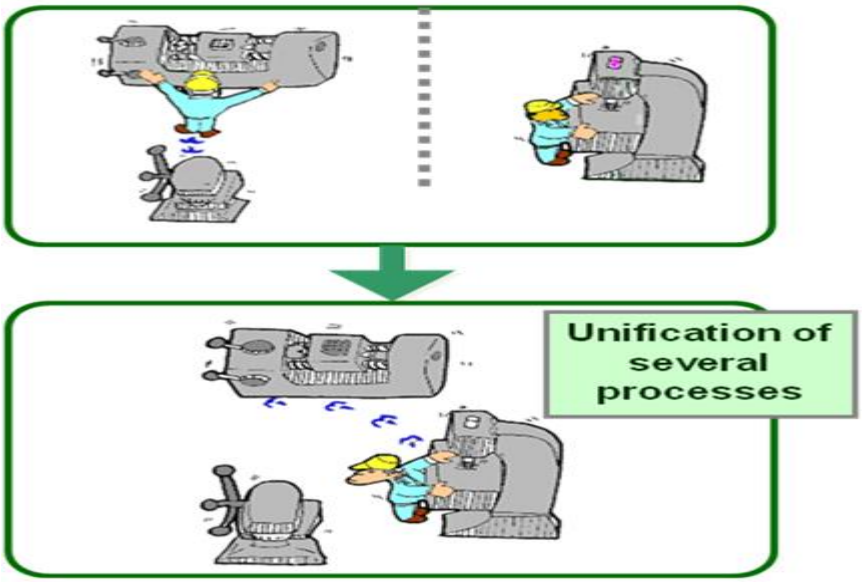


Figure-3.3 Unification

- ✓ **Multi-process handling and Multi-skilled operators**

-**Multi-process handling-** means that a single operator manages multiple machines and processes in product processing and assembling. This is the primary factor for constructing lines by a small number of operators.

-A multi-skilled Operator- can deal with several machines or processes as described above. The supervisor can make a flexible placement of operators when someone within the same team or section is absent.

A.B. control (Two point control): Is a devised automatic control function. It controls the machine movement when they come to start or stop working depending upon the number of work pieces piled up between the preceding process and the following process.

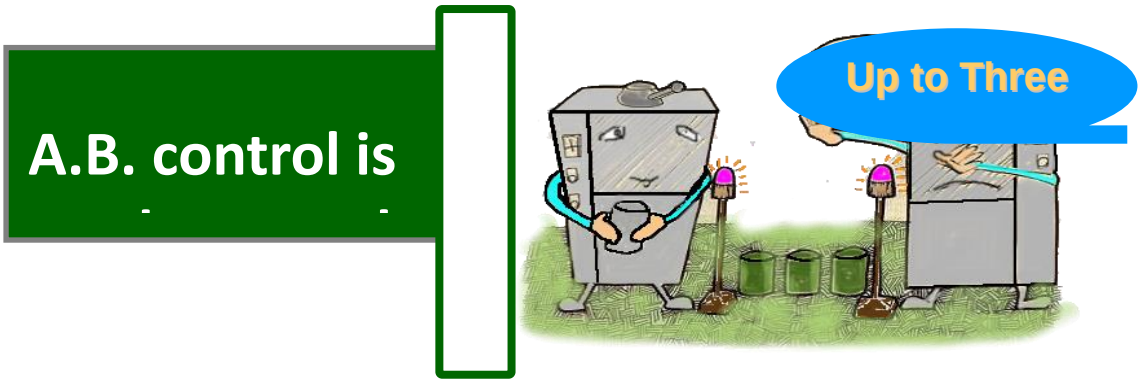


Figure 3.4 Two point control

- ✓ **Cell production line:** This is a production line that a single operator manages all the machining or assembly operations in unit production.

Advantages

- Quality assurance can be ensured.
- The production output or efficiency of each operator can be clarified.
- Operators can obtain a feeling of work achievement.

- ✓ **Line balancing:** Refers to the state where there is a difference in time required for each process of a production line. It is determined that the line balance is good if this difference is small (usually smaller than 15%), but in a bad case the line balance should be improved by leveling out the work time through shortening that of a very time-consuming process and increasing loads of processes consuming less time.

- ✓ **Build in quality at each process**

1. Quality should be built into each process.

2. Guarantee the quality in each process.

   - ➢ Do not make Defect
   - ➢ Do not pass defect
   - ➢ Work to standard

The machine stops, if abnormality is caused.

- Worker stops operation, if he/she finds abnormality.
- Don’t send the next process the defects.
    - Abnormality will understand simply.
    - “Visual control” visually control the states, ANDON,
    - Production analysis board, Standardized work chart etc.

✓ **Kanban System**

It’s a *TOYOTA Production System manufacturing tool.* Kanban is not inventory control system rather it is scheduling system.

In production it tells us:

- What to produce
- When to produce it
- How much to produce

Kanban prevents over production and it is used to give instruction for production and conveyance in every process.

Self-Check -3	Written Test

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

1. List and explain tools and techniques to eliminate Wastes/Muda (10)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-4	Reducing and eliminating Wastes/MUDA

4.1. Identifying and eliminating the seven wastes or muda

- What is Waste?

The elimination of waste is the primary goal of any lean system. In effect, lean declares war on waste – any waste. Waste or muda is anything that does not have value or does not add value. Waste is something the customer will not pay for. When the great Italian sculptor Michelangelo was asked what he was sculpting, he responded he was not sculpting but releasing the figure (value) inside by removing the unnecessary rocks (wastes). Like Michelangelo, we should eliminate all forms of wastes in any process or product until only what is valuable remains. The key is to spot waste and then stop waste.

There are two types of wastes: obvious wastes and hidden wastes. It is important to uncover and eliminate the latter since they are usually bigger. Wastes take the shape of an iceberg; the tip consists of the obvious wastes while the seen bulk under the water contains the hidden wastes. Wastes are not necessarily ugly, and most are outside the waste can! Waste can be in the form of unnecessary output, input, or processing. It can be in the form of materials, stocks, equipment, facilities, man hours, utilities, documents, expenses, motion, and other activities that do not add value.

- **The steps to effective waste elimination are**:

1. Make waste visible.
2. be conscious of the waste.
3. be accountable for the waste.
4. Measure the waste.
5. Eliminate or reduce the waste

In other words, before one can stop waste, he should able to see it, recognize it as waste, identify who is responsible, and finally appreciate its size and magnitude. Waste that is not seen cannot be eliminated. When something is denied as waste, it also cannot be stopped. When one refuses to accept responsibility for the waste, then he will not eliminate it. Finally, when the waste is not measured, people may think it is small or trivial and therefore will not be motivated to stop it. As the saying goes “What is not measured, is not improved”.

- **Muda, Mura, Muri**

Aside from “muda” or wastes, the lean system also attacks and avoids “mura” or overload or Over burden and “muri” or unevenness. Mura refers more specifically to overloading an Equipment, facility, or human resource beyond its capacity. This undue stress may cause Down time, defects, delays, and even disasters. Muri refers to unevenness in production volume. The wild fluctuations due to extreme highs (peaks) and lows (valleys) in production scheduling cause periods of overload and long idle time. One way to reduce muri is to implement heijunka or production leveling. In a way, Mura and muri also cause wastes but in a particular way. Muda, Mura, and muri cause inefficiencies and high costs in any operation.

- **What are the seven types of wastes or “muda”?**

A lean system declares war on wastes or “muda”. These wastes are classified into 7 types:

1. Over-production waste
2. Processing waste
3. Transport waste
4. Waiting-time waste
5. Inventory waste
6. Motion waste
7. Defects

- **Over-production waste**

Definition

• producing more than what is needed

• producing faster than what is needed

Causes

- Volume incentives (sales, pay, purchasing)
- high capacity equipment
- line imbalance; poor scheduling/shifting
- poor production planning
- cost accounting practices that encourage buildup of inventory

Over-production waste occurs when more goods are produced than can be sold, resulting in idle finished goods inventory. Over-produced goods are often hidden wastes since many think they are assets with value, when in fact most of them may be obsolete or costing the company unnecessary expenses just to keep them until they can be sold if ever. The just-in-time, pull system, and kanban rules prevent over-production wastes.

Also, lean systems favor smaller equipment over large ones to avoid overproduction due to high but unnecessary capacity utilization.

- **Processing waste**

Definition

• Non-value added man processing

• Non-value added machine processing

Causes

- unclear customer specifications
- frequent engineering changes
- excessive quality (refinements)
- inadequate value analysis/value engineering
- unclear work instructions

Processing waste comes from unnecessary processing that does not add value to the item being produced or worked on. Examples are additional steps that do not enhance quality or steps that simply adds excess quality which customers do not require. Unnecessary documentation is also a form of processing waste. Identify value-adding and non-value adding activities in the process using techniques such as value stream analysis and the waterfall diagram.

- **Transport waste**

Definition

• Unnecessary material movement

• Unnecessary tools or equipment movement

Causes

- poor route planning
- distant suppliers
- complex material flows
- poor layout
- disorganized workplace
- line imbalance

When anything – people, equipment, supplies, tools, documents, or materials – is moved or Transported unnecessarily from one location to another, transport waste is generated. Examples are transporting the wrong parts, sending materials to the wrong location or at the wrong time, transporting defects, and sending documents that should not be sent at all.

One way to cut transport waste is co-location, wherein customers are served by nearby suppliers, usually less than one-hour driving distance away. Departments working with each other or serving each other are also put near each other to cut transport waste. For example, materials and tools departments may be moved, relocated, or pre-positioned beside or nearer the user departments or their internal customers.

- **Waiting time waste**

Definition

• Man idle or waiting time

• Machine idle or waiting time

Causes

- unsynchronized processes; line imbalance
- inflexible work force
- over-staffing
- unscheduled machine downtime
- long set-up
- material shortage or delay
- manpower shortage or delay

When resources like people and equipment are forced to wait unnecessarily because of delays in the arrival or availability of other resources including information, there is waiting time waste. Waiting for late attendees in a meeting, waiting for tools to start work, waiting for a signature for a process to continue, waiting for a late vehicle to transport workers to a project site are examples of this waste.

- **Inventory Waste**

Definition

• Excessive process (WIP) inventories

• Excessive raw material inventories and supplies

Causes

- over-production
- imbalanced line
- big batch sizes
- long lead times
- local optimization (turf mentality)
- large minimum order quantities
- high rework rate

- JIT-incapable suppliers
- lack of material requisition and issuance standards

Inventory wastes come from the purchasing, issuance, storage of excess or excessive supplies, materials, and other resources. This waste can also be caused by overproduction as excess materials and work-in-process is accumulated. Inventory waste is often due to lack of planning and failure to match purchases with the actual consumption or usage rate of a particular resource. Another example is the storing of slow-moving and obsolete stocks like tools and materials.

❖ **Motion Waste**

Definition

• Unnecessary movement and motions of worker

Causes

- Poor lay-out and housekeeping
- disorganized work place and storage locations
- Unclear, non-standardized work instructions
- Unclear process and materials flow

Motion waste happens when unnecessary body movements are made when performing a task. Examples are searching, reaching, walking, bending, lifting, and other unnecessary bodily movements. Workers commit this form of waste by searching for tools or documents when their workplace is cluttered or disorganized. Motion waste often delays the start of work and disrupts workflow.

❖ **Defects**

Definition

• processing due to the production of defects

• processing due to rework or repair of defects

• Materials used due to defect and rework

Causes

- unclear customer specifications
- incapable processes
- lack of process control
- unskilled personnel
- departmental rather than total quality
- incapable suppliers

Quality is doing the right thing right the first time. It is about prevention and planning, not correction and inspection. Bad quality or defects do not only result in customer dissatisfaction mand damage to company image, but also in wastes due to additional costs and time to recall, Rework, repair, and replace the defective items. Continuous quality improvement and preventive measures are the most effective means to cut defect wastes.

Self-Check -4	Written Test

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

1. List and explain seven types of wastes or “muda (10)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-5	Reporting Improvements

5.1. Understanding improvement

Lean Process Improvement is the process of continually reviewing a process identifying waste or areas in a process map that can be improved. It is an ongoing feedback process of loop that over time improves the business through better processes. Bland and Altman have developed a measure called "limits of agreement" to assess correspondence of two methods of clinical measurement. In many circumstances, comparisons are made using several paired measurements in each individual subject. If such measurements are considered as statistically independent pairs, rather than as sets of measurements from separate individuals, limits of agreement will be too narrow.

In addition, the confidence intervals for these limits will also be too narrow. Suitable software to compute valid limits of agreement and their confidence intervals is not readily available. Therefore, we set out to provide a freely available implementation accompanied by a formal description of the more advanced Bland-Altman comparison methods. We validate the implementation using simulated data, and demonstrate the effects caused by failing to take the presence of multiple paired measurements per individual properly into account. We propose a standard format of reporting that would improve analysis and interpretation of comparison studies.

5.2. Kaizen Effect Evaluation Sheet

Name of the process:_____

Work Place:_____

Problem Solving Title:_____

✓ **Part one –Quantitative Results**

S.No	Improvement Indicators	Before Kaizen	Target	After Kaizen	Improvement (%)	Remark
1	**Muda Elimination Indicators**					
	1.1 Tools& Equipment					
	1.2 Parts Saving					
	1.3 Raw Material saving					
	1.4 Transportation					
	1.5 Motion in Meter					
	1.6 Transaction Time					
	1.7 Excess Stock/Inventory					
	1.8 Expired material/Stock)					
2	**Productivity indicators**					
	2.1 Lead time					
	2.2 Machine down time					
	2.3 Frequency of Machine failure					
	2.4 Production volume per day					
	2.5 Labor saving					
	2.6 labour productivity					
	2.7 Delivery Time					
3	**Quality Indicators**					
	3.1 Defect rate					
	3.2 Raw Material damage in %					
	3.3 Number of Customer complaints					
4	**Other Indicators**					
	4.1 Number of New inventions					
	4.2 Minimized Cost of Production					

✓ **Part Two –Qualitative Results**

1. Describe the Qualitative results and change that are achieved by Muda Elimination/Reduction based on the indicators listed below

S.No	Improvement Indicators	Description of the Result
1	Muda Elimination capacity of workers	
2	New inventions and Improvements by workers	
3	Motivation of workers	
4	Awareness about Safety	
5	Corporate culture of kaizen	
6	Team work	
7	Transaction Time	

Self-Check -5	Written Test

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

1. List Qualitative Results indicator (10)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet 1	Planning and procedures for elimination of Muda.

❖ procedure

1. The documents of the already identified wastes in several processes or work areas are analyzed.
2. Rank the improvements that are needed. Focus on improvements on the process with the greatest total when you add up the magnitude of its wastes.
3. Choose the first process to be improved from the workshop checklist.
   a. Using the more detailed waste-finding checklists provided, find more specific instances of waste.
   b. Observe the types and magnitude of the detailed waste.
4. Set target
   What? Decrease/Eliminate the amount of the waste specified.
   When? By the End of ----
   How many? Minimize the problem from –to –
5. Prepare Activity Plan

S.N	**Why?**	**What?**	**Where?**	**Who?**	**When?**	**How?**
	Objectives	**Items to be implemented**	**Location**	**Person(s) charge**	**Time/Duration**	**Method**
1						
2						
3						

6. Examine causes of the waste.
7. Brainstorm improvement ideas.
8. Implement the countermeasure.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Task 1: show the step planning and procedures for elimination of Muda.

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Corsten D. and T. Gruen. 2005.On Shelf Availability. pp131-139 in Doukidis, Georgios J; Vrechopoulos, Adam P. (Eds.) 'Consumer Driven Electronic Transformation Applying New Technologies to Enthuse Consumers and Transform the Supply Chain', Springer-Verlag: Berlin and Heidelberg.

POULTRY PRODUCTION

NTQF Level - III

Learning Guide -12

Unit of Competence: - Prevent and Eliminate Muda

Module Title: - Preventing and Eliminating Muda

LG Code: AGR PLP3 M03 LO4-LG-12

TTLM Code: AGR PLP3 TTLM 0120v1

LO4: Prevent occurrence of Muda

Instruction Sheet	Learning Guide #12

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

- Preparing and implementing plan of muda prevention
- Discussing and preparing standards
- Preventing occurrence of muda/waste
- Creating waste free workplace
- Doing completion of required operation
- Facilitating updating of standard procedures
- Ensuring capability of work team

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

- Prepare and implement plan of muda prevention
- Discuss and prepare standards
- Prevent occurrence of muda/waste
- Create waste free workplace
- Do completion of required operation
- Facilitate updating of standard procedures
- Ensure capability of work team

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the “Information Sheets 1, 2, 3, 4, 5, 6 and 7 in page 3, 6, 20, 27, 35, 39 and 44 respectively”. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1, 2, 3, 4, 5, 6 and 7 ” in page 5, 19, 26, 34, 38, 43 and 54 respectively
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work.
6. If you earned a satisfactory evaluation proceed to “next Information Sheets”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #12.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Preparing and implementing plan of Muda prevention

1.1. Planning a waste prevention program

A waste prevention programme should not be a mere list of top-down-measures prescribed by the national government but a plan which integrates the interests and concerns of interested and affected parties (stakeholders) based on a commitment to carry on the programme. There are hundreds of potential or existing waste prevention measures, instruments and initiatives which could be integrated into the programme. The main task of the programme therefore is to provide a global vision and a framework that builds up on existing initiatives and to add the most efficient and effective complementary measures. For dealing with such a large number of options while providing a vision and a focus, it is advisable to follow a multistep approach;

- from a vision of how the total economic system of a nation which generates waste can and should work in for example 10 years
- to defining the objectives which shall lead the programme
- to setting the priority areas on which the programme should focus
- to selecting and combining the measures which shall bring about efficient low environmental impact material systems

In each of the steps the scope should be opened up first to include all efficient options and then narrowed down to the most effective options.

Implementation plan to see whether it:

- contained clear objectives
- set realistic priorities, identified specific actions, defined the expected results, and set time frames for achieving those results
- identified agencies responsible for the actions

The implementation plan focuses on:

- co-coordinating funding, resources, and research
- highlighting ways in which agencies and organizations involved with falls prevention can contribute to implementing the Strategy

The implementation plan contains five clear objectives, for each of which the plan defines:

- action areas
- activities that describe what needs to be done for the actions to take place

- the expected results
- the estimated date or time frame for completing the activities
- the agency primarily responsible for completing the relevant activities
- other agencies and organizations that are associated with relevant activities and that may be involved in supporting their implementation

The objectives and expected results are varied. Some objectives relate to processes (such as evidence of collaboration) and others to activities (such as preparing standards, plans, or reports). Some expected results are more readily and directly measurable than others. Therefore, meaningful evaluation of the effects of the Strategy will require an approach that takes account of those different types of activities and expected results. The evaluation will need to be carried out to verifiable standards of evidence, and in close collaboration with the falls prevention sector.

The Strategy and its implementation plan refer to the goals of reducing the incidence, severity and effects of injuries from falls. However, the plan does not set targets for a reduction in falls, or contain measures to assess the achievement of these goals. We consider it reasonable that ACC has yet to set these targets and measures, given that the plan is in its early stages and involves significant work collaborating and co-coordinating with other agencies and organizations. However, we consider it critical that ACC prepare an evaluation framework that includes clear measures for assessing the implementation of the Strategy in the short and long term.

Self-Check-1	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. Write steps in planning waste production program (5pts)
2. List on what implementation plan focuses in planning waste production program (4pts)
3. Mention five objectives of implementation plan in planning waste production program (5pts)

Note: **Satisfactory rating - 14 points** **Unsatisfactory - below 14 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____

   _____

   _____

2. _____

   _____

3. _____

   _____

Information Sheet-2	**Discussing and preparing Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement**

2.1. Total Productive Maintenance (TPM)

Total means all individuals in the organization working together.
Productive means Production of goods that meet or exceed customer's expectations.
Maintenance means keeping equipment and plant in good condition at all times**.**

What is Total Productive Maintenance (TPM)?

It can be considered as the medical science of machines. Total Productive Maintenance (TPM) is a maintenance program which involves a newly defined concept for maintaining plants and equipment. The goal of the TPM program is to markedly increase production while, at the same time, increasing employee morale and job satisfaction.
TPM brings maintenance into focus as a necessary and vitally important part of the business. It is no longer regarded as a non-profit activity. Down time for maintenance is scheduled as a part of the manufacturing day and, in some cases, as an integral part of the manufacturing process. The goal is to hold emergency and unscheduled maintenance to a minimum.

Why TPM?

TPM was introduced to achieve the following objectives. The important ones are listed below.

- Avoid wastage in a quickly changing economic environment.
- Producing goods without reducing product quality.
- Reduce cost.
- Produce a low batch quantity at the earliest possible time.
- Goods send to the customers must be non-defective.

Types of maintenance

1. Breakdown maintenance

This refers to the maintenance strategy, where repair is done after the equipment failure/stoppage or upon occurrence of severe performance decline. This concept has the disadvantage of unplanned stoppages, excessive damage, spare parts problems, high repair costs, excessive waiting and maintenance time and high trouble shooting problems.

2. Preventive maintenance

PM comprises of maintenance activities that are undertaken after a specified period of time or amount of machine use. This type of maintenance relies on the estimated probability that the equipment will breakdown or experience deterioration in performance in the specified interval. The preventive work undertaken may include equipment lubrication, cleaning, parts replacement, tightening, and adjustment. The production equipment may also be inspected for signs of deterioration during preventive maintenance work.

It is further divided into periodic maintenance and predictive maintenance. Just like human life is extended by preventive medicine, the equipment service life can be prolonged by doing preventive maintenance.

A. Periodic maintenance (Time based maintenance - TBM)

Time based maintenance consists of periodically inspecting, servicing and cleaning equipment and replacing parts to prevent sudden failure and process problems.

B. Predictive maintenance

This is a method in which the service life of important part is predicted based on inspection or diagnosis, in order to use the parts to the limit of their service life. Compared to periodic maintenance, predictive maintenance is condition based maintenance. It manages trend values, by measuring and analyzing data about deterioration and employs a surveillance system, designed to monitor conditions through an on-line system.

3. Corrective maintenance

This is a system in which the concept to prevent equipment failures is further expanded to be applied to the improvement of equipment so that the equipment failure can be eliminated (improving the reliability) and the equipment can be easily maintained (improving equipment maintainability). The primary difference between corrective and preventive maintenance is that a problem must exist before corrective actions are taken.

The purpose of corrective maintenance is improving equipment reliability, maintainability, and safety; design weaknesses (material, shapes); existing equipment undergoes structural reform; to reduce deterioration and failures, and to aim at maintenance-free equipment. Maintenance information, obtained from CM, is useful for maintenance prevention for the next equipment and improvement of existing manufacturing facilities. It is important to form setups to provide the feedback of maintenance information.

4. Maintenance prevention

It indicates the design of new equipment. Weakness of current machines are sufficiently studied (on site information leading to failure prevention, easier maintenance and prevents of defects, safety and ease of manufacturing) and are incorporated before commissioning a new equipment.

History of TPM

TPM is innovative Japanese concept. The origin of TPM can be traced back to 1951 when preventive maintenance was introduced in Japan. However the concept of preventive maintenance was taken from USA. Nippondenso was the first company to introduce plant wide preventive maintenance in 1960. Preventive maintenance is the concept wherein, operators produced goods using machines and the maintenance group was dedicated with work of maintaining those machines, however with the automation of Nippondenso, maintenance became a problem as more maintenance personnel were required. So the management decided that the routine maintenance of equipment would be carried out by the operators. (This is Autonomous maintenance, one of the features of TPM). Maintenance group took up only essential maintenance works.

Thus Nippondenso which already followed preventive maintenance also added Autonomous maintenance done by production operators. The maintenance crew went in the equipment modification for improving reliability. The modifications were made or incorporated in new equipment. This lead to maintenance prevention. Thus preventive maintenance along with Maintenance prevention and Maintainability Improvement gave birth to **Productive maintenance**. The aim of productive maintenance was to maximize plant and equipment effectiveness to achieve optimum life cycle cost of production equipment.
By then Nippon Denso had made quality circles, involving the employee's participation. Thus all employees took part in implementing Productive maintenance. Based on these developments Nippondenso was awarded the distinguished plant prize for developing and implementing TPM, by the Japanese Institute of Plant Engineers (JIPE). Thus Nippondenso of the Toyota group became the first company to obtain the TPM certification.

TPM Targets:

Productivity
Obtain Minimum 80% OPE (Overall Plant Efficiency)

Obtain Minimum 90% OEE (Overall Equipment Effectiveness)

Run the machines even during lunch. (Lunch is for operators and not for machines!)

Quality - Operate in a manner, so that there are no customer complaints.

Cost - Reduce the manufacturing cost by 30%.

Delivery time - Achieve 100% success in delivering the goods as required by the customer.

Safety - Maintain accident free environment.

Moral - Increase the suggestions by 3 times. Develop Multi-skilled and flexible workers.

Motives of TPM	1. Adoption of life cycle approach for improving the overall performance of production equipment. 2. Improving productivity by highly motivated workers which is achieved by job enlargement. 3. The use of voluntary small group activities for identifying the cause of failure, possible plant and equipment modifications.
Uniqueness of TPM	The major difference between TPM and other concepts is that the operators are also made to involve in the maintenance process. The concept of "I (Production operators) Operate, You (Maintenance department) fix" is not followed.
TPM Objectives	1. Achieve Zero Defects, Zero Breakdown and Zero accidents in all functional areas of the organization. 2. Involve people in all levels of organization. 3. Form different teams to reduce defects and Self Maintenance.
Direct benefits of TPM	1. Increase productivity and OPE (Overall Plant Efficiency) by 1.5 or 2 times. 2. Rectify customer complaints. 3. Reduce the manufacturing cost by 30%. 4. Satisfy the customers' needs by 100 % (Delivering the right quantity at the right time, in the required quality.) 5. Reduce accidents. 6. Follow pollution control measures.
Indirect benefits of TPM	1. Higher confidence level among the employees. 2. Keep the work place clean, neat and attractive.

	3. Favorable change in the attitude of the operators. 4. Achieve goals by working as team. 5. Horizontal deployment of a new concept in all areas of the organization. 6. Share knowledge and experience. 7. The workers get a feeling of owning the machine.

Factors affecting equipment effectiveness

- Equipment failure (breakdown)
- Setup and adjustment downtime
- Idling and minor stoppages
- Reduced speed
- Process defects
- Reduced yield

Cycle Time and Set-Up Reduction

The amount of time that elapses between the completions of two parts completed on the same line. Cycle time may also be defined as the amount of time it takes for a single operation to complete a single part. Both working definitions are based on shop floor observation. The general term “Cycle Time” should be specified as “Observed Cycle Time”. It is important to note that with all variations of “Cycle Time” definitions, the starting and ending point of each cycle must be exactly the same point to ensure a complete cycle.

Shorter runs produce customer orders with less lead time. However, equipment breakdowns, idling and minor stoppages will make it very difficult to reduce cycle times. Hence, cycle time reductions result in shorter and more frequent production runs. Suddenly, set-ups and adjustments become crucial in reducing cycle times. Past OEE (Overall Equipment Efficiency) studies show that set-up and adjustments can consume up to 50% of total production time.

The Equipment Losses (you can and must measure)

Equipment Availability	Set up and adjustments including: – Changeovers – Programming – Test runs Equipment Failures: – Sporadic breakdowns. – Chronic breakdowns.
Equipment Efficiency	Idling and Minor Stoppages – Jams and other short stoppages. – No parts, no operator. – "Blocked". Reduced Speed – Equipment worn out. – Lack of accuracy.
Quality	Process defects - Scrap - Rework
Others	Equipment warm up etc. No parts, no operator.

Availability

Loading time = Total available time per day (or month) – Planned downtime

Planned downtime: amount of downtime officially scheduled in the production plan

OEE (Overall Equipment Efficiency):

OEE = A x PE x Q

Possibly there are three ways that failure may occur.

1. A - Availability of the machine. Availability is proportion of time machine is actually available out of time it should be available. (the equipment can stop working completely known as a total failure),

$$Availability\ (\%) = \frac{total\ time\ available - downtime}{total\ time\ available} * 100\%$$

2. The equipment can work slower than it is capable of known as the partial failure (throughput rate/Performance), and

$$Performance\ (\%) = \frac{number\ of\ units\ manufactured}{possible\ number\ of\ manufacturable\ units} * 100\%$$

3. The equipment or product can lose quality known as quality failure (Quality).

$$Quality\ (\%) = \frac{number\ of\ units\ produced - number\ of\ defects}{number\ of\ units\ produced} * 100\%$$

OEE Exercise

Calculate Availability, Performance, Quality and OEE based on the following information.

Item	**Data**
Shift Length	8 hrs = 480 min
Short Breaks	2@15 min = 30 min
Meal Breaks	1@30min=30min
Down Time	47min
Ideal Run Time	60 pieces per min
Total Pieces	19,271 pieces
Reject Pieces	423 pieces

a. Availability = $\frac{\text{Operating time}}{\text{Planned production time}}$

= 373 minutes / 420 minutes

= **0.8881 = 88.81%**

b. Performance = $\frac{\text{(Total pieces /Operating time)}}{\text{Ideal Run Time}}$

= (19,271 pieces/373 minutes)/60 pieces per minute

= **0.8611 = 86.11%**

c. Quality = $\frac{\text{Good Pieces}}{\text{Total Pieces}}$

= 18,848 / 19,271 pieces

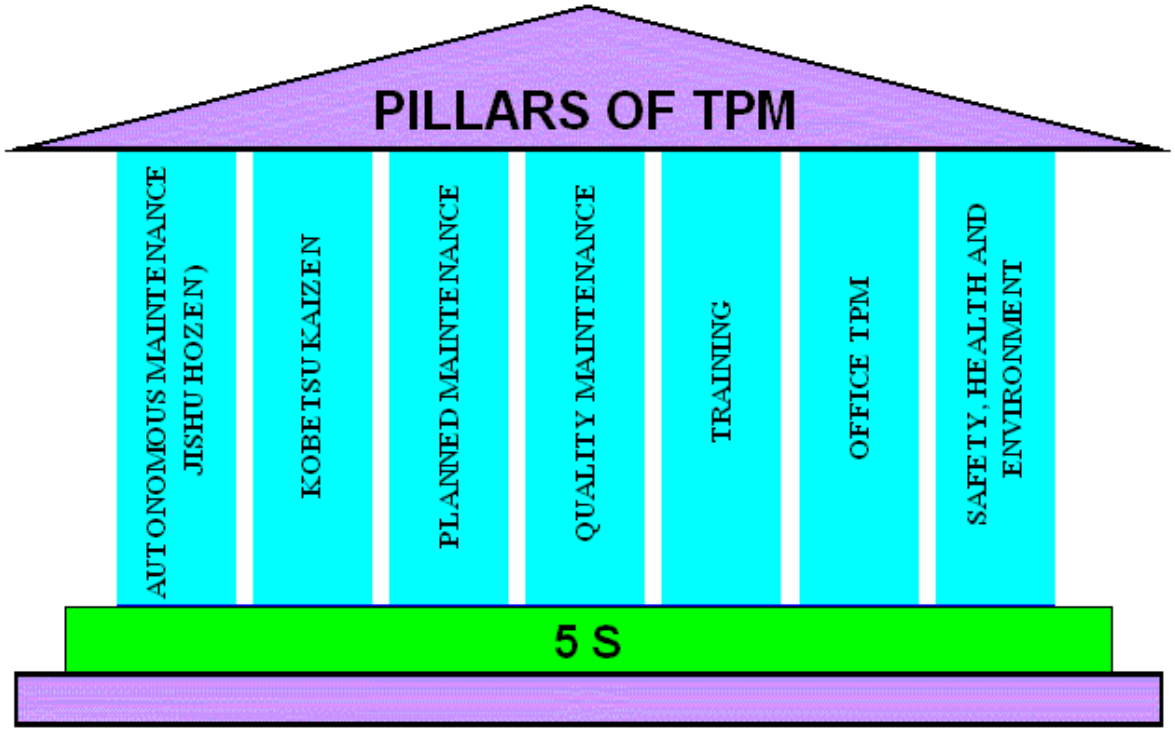
= **0.9780 = 97.80 %**

d. OEE = Availability X Performance X Quality

= 0.8881 X 0.8611 X 0.9780

= **0.7479 = 74.79%**

The 8 Pillars of TPM



PILLAR 1 - 5S

TPM starts with 5S. Problems cannot be clearly seen when the work place is disorganized. Cleaning and organizing the workplace helps the team to uncover problems. Making problems visible is the first step of improvement.

PILLAR 2 - Autonomous maintenance (JISHU HOZEN)

This pillar is geared towards developing operators to be able to take care of small maintenance tasks, thus freeing up the skilled maintenance people to spend time on more value added activity and technical repairs. The operators are responsible for upkeep of their equipment to prevent it from deteriorating.

PILLAR 3 - KAIZEN

"Kai" means change, and "Zen" means good (for the better). Basically kaizen is for small improvements, but carried out on a continual basis and involve all people in the organization. Kaizen is opposite to big spectacular innovations. Kaizen requires no or little investment. The

principle behind is that "a very large number of small improvements are more TPM effective in an organizational environment than a few improvements of large value.

This pillar is aimed at reducing losses in the workplace that affect our efficiencies. By using a detailed and thorough procedure we eliminate losses in a systematic method using various Kaizen tools. These activities are not limited to production areas and can be implemented in administrative areas as well.

The Six Big Loses

Down Time

1. Breakdowns due to equipment failure.
2. Setup and adjustment (e.g. exchange of dies in injection molding machines, etc.)

Speed Losses

1. Idling and minor stoppages (abnormal operation of sensor, etc.).
2. Reduced speed (discrepancies between designed and actual speed of equipment)

Defects

1. Defects in process and rework (scrap and quality defects requiring repair)
2. Reduced yield between machine startup and stable production.

Classification of losses:

Aspect	**Sporadic Loss**	**Chronic Loss**
Causation	Causes for this failure can be easily traced. Cause-effect relationship is simple to trace.	This loss cannot be easily identified and solved. Even if various counter measures are applied
Remedy	Easy to establish a remedial measure	These types of losses are caused because of hidden defects in machine, equipment and methods.
Impact / Loss	A single loss can be costly	A single cause is rare - a combination of causes trends to be a rule
Frequency of occurrence	The frequency of occurrence is low and occasional.	The frequency of loss is more.
Corrective action	Usually the line personnel in the production can attend to this problem.	Specialists in process engineering, quality assurance and maintenance people are required.

PILLAR 4 - PLANNED MAINTENANCE

It is aimed to have trouble free machines and equipment's producing defect free products for total customer satisfaction. This breaks maintenance down into 4 "families" or groups which were defined earlier.

1. Preventive Maintenance
2. Breakdown Maintenance
3. Corrective Maintenance
4. Maintenance Prevention

With Planned Maintenance we evolve our efforts from a reactive to a proactive method and use trained maintenance staff to help train the operators to better maintain their equipment.

Target:

1. Zero equipment failure and break down.
2. Improve reliability and maintainability by 50 %
3. Reduce maintenance cost by 20 %
4. Ensure availability of spares all the time.

PILLAR 5 - QUALITY MAINTENANCE (QM)

It is aimed towards customer delight through highest quality through defect free manufacturing. Focus is on eliminating non-conformances in a systematic manner, much like Focused Improvement. We gain understanding of what parts of the equipment affect product quality and begin to eliminate current quality concerns, then move to potential quality concerns. Transition is from reactive to proactive (Quality Control to Quality Assurance).

QM activities are to set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products. The condition is checked and measure in time series to very that measure values are within standard values to prevent defects. The transition of measured values is watched to predict possibilities of defects occurring and to take counter measures beforehand.

Target:

1. Achieve and sustain customer complaints at zero
2. Reduce in-process defects by 50 %
3. Reduce cost of quality by 50 %.

PILLAR 6 - TRAINING:

It is aimed to have multi-skilled revitalized employees whose morale is high and who has eager to come to work and perform all required functions effectively and independently.

Education is given to operators to upgrade their skill. It is not sufficient know only "Know-How" by they should also learn "Know-why". By experience they gain, "Know-How" to overcome a problem what to be done. This they do without knowing the root cause of the problem and why they are doing so. Hence it become necessary to train them on knowing "Know-why". The employees should be trained to achieve the four phases of skill. The goal is to create a factory full of experts. The different phases of skills are';

Phase 1: Do not know.

Phase 2: Know the theory but cannot do.

Phase 3: Can do but cannot teach

Phase 4: Can do and also teach.

PILLAR 7 - OFFICE TPM

Office TPM should be started after activating four other pillars of TPM (JH, KK, QM, PM). Office TPM must be followed to improve productivity, efficiency in the administrative functions and identify and eliminate losses. This includes analyzing processes and procedures towards increased office automation.

Office TPM and its Benefits:

1. Involvement of all people in support functions for focusing on better plant performance
2. Better utilized work area
3. Reduce repetitive work
4. Reduced inventory levels in all parts of the supply chain
5. Reduced administrative costs
6. Reduced inventory carrying cost
7. Reduction in number of files
8. Reduction of overhead costs (to include cost of non-production/non capital equipment)
9. Productivity of people in support functions
10. Reduction in breakdown of office equipment
11. Reduction of customer complaints due to logistics
12. Reduction in expenses due to emergency dispatches/purchases
13. Reduced manpower
14. Clean and pleasant work environment.

PILLAR 8 - SAFETY, HEALTH AND ENVIRONMENT

Target:

1. Zero accident,
2. Zero health damage
3. Zero fires.

In this area focus is on to create a safe workplace and a surrounding area that is not damaged by our process or procedures. This pillar will play an active role in each of the other pillars on a regular basis.

To create awareness among employees various competitions like safety slogans, Quiz, Drama, Posters, etc. related to safety can be organized at regular intervals.

Self-Check 2	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. What is Total Productive Maintenance (TPM)? (3pts)
2. What are the disadvantages of breakdown maintenance (4pts)
3. What are the advantages of preventive maintenance over breakdown maintenance? (3pts)
4. What are the aims of each pillars of TPM? (8 Points)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____
   _____
   _____
2. _____
   _____
3. _____
   _____
   _____
4. _____
   _____
   _____

Information Sheet-3	Preventing occurrence of Muda/ waste

3.1. Methods for waste prevention

We have discussed how you discover waste and what to do to remove it; but it doesn't end there. Unfortunately, problems always crop up, and we prevent them from becoming sources of waste we will be right back where we started in no time at all. That is one reason why one of the very first things mentioned about discovering waste adopting the right attitude. If everyone is paying attention to keeping waste from taking hold, then you have a good chance of sustaining production flow. There are four important methods you can use for maintaining a waste-free production environment:

- Standardization
- Visual controls
- Auditory controls
- 5W and 1H Sheet

Standardization

The primary purpose of standardization is to create and sustain a waste-free process. Standardization means establishing standard procedures for every operation so that anyone can understand and use them – and everyone does. There are many aspects to standardization. Standards must be created, documented, well-communicated, adhered to, and regularly re-assessed.

Standards are required for:

- Machines
- Operations
- Defining normal and abnormal conditions
- Clerical procedures
- Procurement

Visual and Auditory Controls

One way waste enters into operations is when standards are not improved to meet changing conditions. Even standardization fails to sustain waste-free production if not systematically updated to take advantage of new materials, new technology, and worker improvement ideas. If the slightest defect occurs, the standard must be reconsidered.

The factory is a living thing and must constantly be adjusted to stay responsive to changes in the environment. Responsiveness must be systematic so that problems are addressed without losing the solid foundation of the waste-removing methods already established.
The best way to do this is through visual and auditory controls.

Red-tagging – You probably did this at the beginning of your improvement activities when you implemented 5S. If not, do it now: put a red tag on everything in the factory that is not necessary to the current operations of the production process. After everyone has had time to notice red-tagged items and claim any that are needed in their area, remove the remaining red-tagged items from the environment. Management can decide what to do with them: they can be sold, thrown out, or moved to a location where they are needed. Always keep the production floor free of any thing that is not directly part of the production process.

Signboards- The purpose of workstations and the names of the workers who operate them should be displayed at every processing point. Signboards can also identify equipment and processes so that everyone knows what things are and what they are used for. Standard quantities should be included on supply bins or carts. The products produced on each line or in each cell can be displayed, and so on.

Outlining- Boarders around tools and equipment, big and small, help people find and return things. Outlining can also create patterns of work-flow by using the floor to indicate where and where not to place things, where to walk, safety zones and danger zones. Outlining to indicate goods to be processed or parts that have been processed becomes a signal to material handlers for replenishing or for delivery to the next process.

Andons- Different colored lights can report the status and needs of a system and signal when defects or abnormal conditions occur so that problems can be solved immediately.

Kanban- These little signs accompany work-in-process. They are the flexible production instructions or work orders that trigger materials supply and production in a pull system, the hallmark of lean manufacturing.

Pitch and Inspection Buzzers- These indicate when operations get out of sync with demand or when defects are around. They keep awareness focused on solving problems and keep waste from taking root.

The 5W and 1H Sheet

The 5W and 1H (five “whys” and one “how”) is a powerful method and one that never stops being wasteful in sustaining a waste-free production environment. The 5W and 1H sheet is a tool that will help you systematically apply this method.

Figure 1 shows one sheet filled out. (Use the side columns when multiple questions or answers arise at any step of solving a single problem).

Figure 2 shows an example of an improvement idea that resulted from the use of the 5W1H Sheet in figure 1.

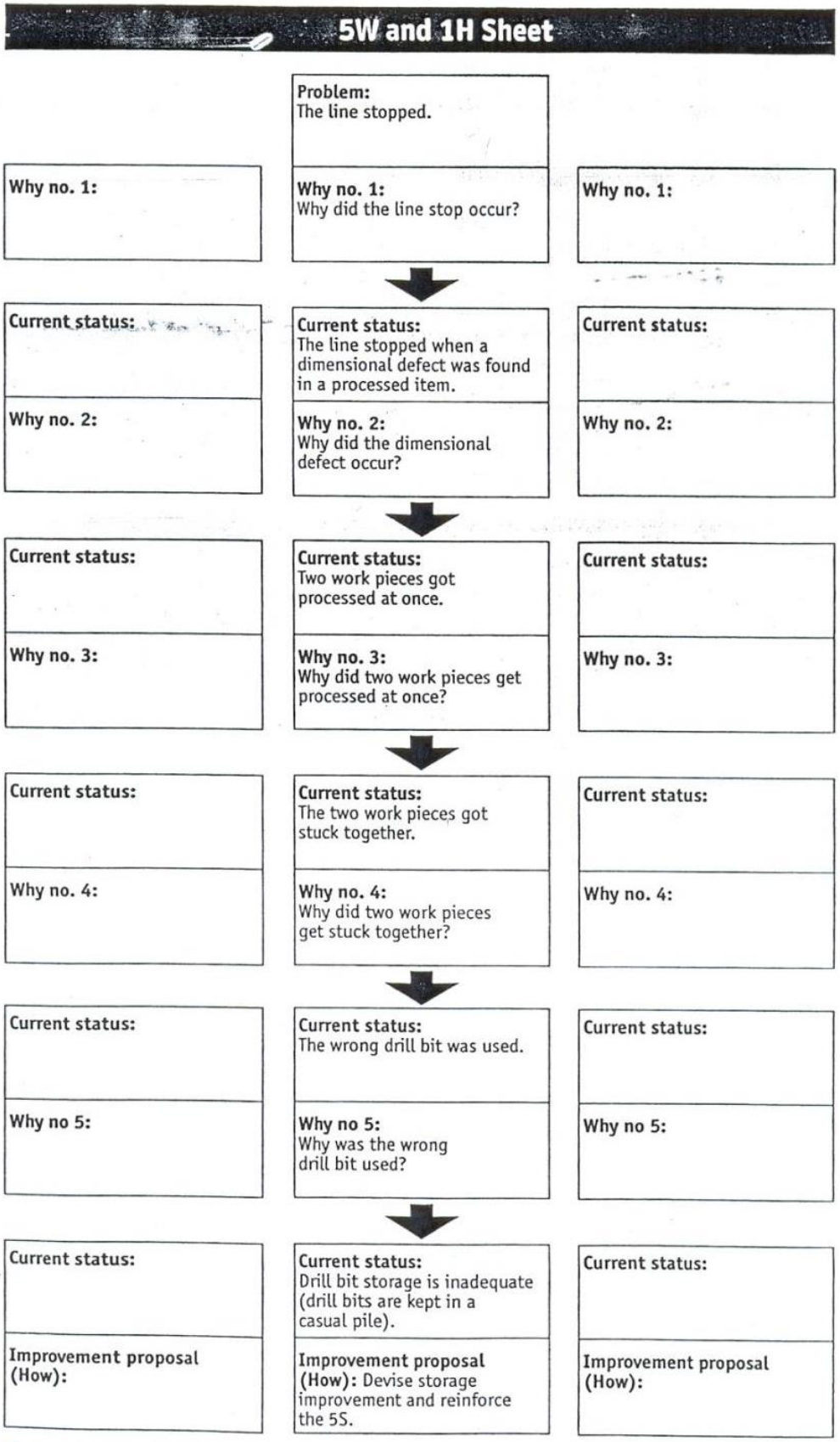


Figure1 showing 5W and 1H Sheet

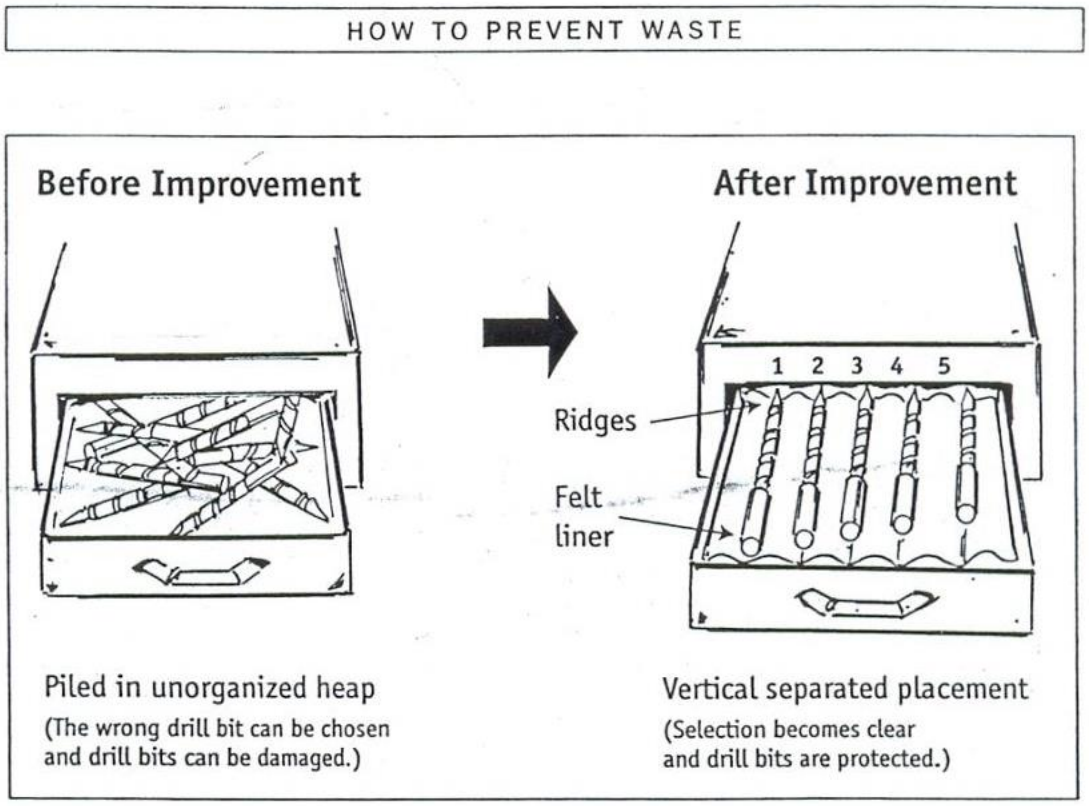


Figure2 showing Improvement in Drill Bit Storage

Five Key Concepts for Asking "Why" and "How"

Following these principles suggested by Hiroyuki Hirano when you are asking the 5"whys" and 1"how":

1. Look with the eyes of a child- All improvement begins with the first why. Never cease looking and never cease asking that first why. As you practice this, the result will follow.

2. Remember three essentials for fact finding- (1) Go to where the problem occurred.(2) See the problem first-hand. (3) Confirm the facts based on your own observations.

3. Be a walker and an observer- Supervisors and managers must continually work through the factory to see that standards are being followed and to practice seeing waste. Operators need to continually examine their own operations to stay alert for new problems and new ideas for solving them that may come to mind as they do their jobs.

4. Break down fixed thinking- If you ask "why" and "how" often enough you will eventually run out of "known" answers. At this point you may reach internal mental resistance to the discovery of what you don't know. Get in the habit of asking why and how beyond this point of fixed thinking. That is when you will make the big discoveries about waste and how to solve it.

5. Do it now- Don't wait. Put your ideas into practice immediately!

Self-Check -3	Written Test

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

1. What are the four methods for maintaining a waste free production environment? (4pts)
2. Mention the best way waste removing through visual and auditory controls (4pts)
3. Discuss five key concepts for asking why and how (5pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____
   _____
   _____
   _____
2. _____
   _____
3. _____
   _____

Information Sheet-4	Creating waste-free workplace

3.1. Waste Segregation

Segregation of all waste streams by type or category will avoid potentially undesirable combined effects and will facilitate the reuse, recycling, recovery and/or disposal of the various wastes. All waste categories will be evaluated and the principle of the following four R's applied:

- **Reduction Initiatives**: Reducing the raw material consumption is the first step to reduce waste generation. To practice this principle all processes and material used will be evaluated on the basis of possible reduction in raw material usage;
- **Reuse Initiatives**: Reuse of the material in other applications and /or by other parties is routinely examined by using the waste materials exchange;
- **Recycling Initiatives**: Recycling is the next option considered for the successful management of the waste streams;
- **Recovery Initiatives**: Recovery of usable material or energy as a by-product is a part of the four R's of the waste minimization process. For example, redistributing waste heat from generators to heat buildings is a process of recovery of energy from waste; and
- **Disposal**: Disposal is the final option when the four R's are no longer applicable or practical.

Recyclable

Waste consists mostly of metal containers, glass products, scrap metal, used equipment and machinery. Quantities of these materials shipped off site for recycling will be recorded. Handling of recycled waste will include:

1) Used Equipment – will be returned to vendor or given to a salvage contractor
2) Scrap Metal Recycling – will be stockpiled at the waste transit station until a sufficient quantity is available for a scrap metal recycling contractor to pick up
3) Metal and plastic containers (bind and drums) will be cleaned and reused for storage of waste chemical products, lubricants or oils
4) Used tires will be sent to the tire supplier for recycling and disposal

BURNING

only clean wood waste and stumps from grubbing and clearing will be disposed of at the burn pile. A control burn, under the supervision of Prodigy's environmental coordinator will be

made whenever sufficient combustible waste is accumulated and weather conditions are favorable.

3.2. 5W + 1H sheet

Kaizen (Japanese for “improvement”) focuses on continuous improvement in all the processes involved in business and management. It is the Japanese method of business management that the West has adopted. The 5Ws are What, Why, Where, When and Who. This is the basis of the Kaizen philosophy. 5W + 1H are basically a method used to conduct investigations and research on problems that occur in the production process.

The 5 W and 1 H of Kaizen

Who?	What?	Where?
1. Who does it? 2. Who is doing it? 3. Who should be doing it? 4. Who else can do it? 5. Who else should do it? 6. Who is doing 3-Mus?	1. What to do? 2. What is being done? 3. What should be done? 4. What else can be done? 5. What else should be done? 6. What 3-Mus are being done?	1. Where to do it? 2. Where is it done? 3. Where should it be done? 4. Where else can it be done? 5. Where else should it be done? 6. Where are 3-Mus being done?
When?	**Why?**	**How?**
1. When to do it? 2. When is it done? 3. When should it be done? 4. What other time can it be done? 5. What other time should it be done? 6. Are there any time 3-Mus?	1. Why does he do it? 2. Why do it? 3. Why do it there? 4. Why do it then? 5. Why do it that way? 6. Are there 3-Mus in the way of thinking?	1. How to do it? 2. How is it done? 3. How should it be done? 4. Can this method be used in other areas? 5. Is there any other way to do it? 6. Are there any 3-Mus in the method?

What

- Considering what the problem is and what should be done about it are ways of using this “W.”
- Another way is to find what is good about certain processes and build on those good attributes

Why

- Finding out why something happens is the focus of this “W.”
- Explanations are required to establish why something occurred.

- It could be a good or bad thing but there is a need to know why; if it's good, it can be used again, and if it's bad, it can be changed or nixed altogether

When

- When did it happen or when will it happen?
- Establishing time frames is an important part of business.
- If there is something wrong with timing, then this step addresses the situation.

Where

- Where will it or did it take place?
- Was it a good location, and if it was not, has a lesson been learned so that location will not be used again?
- It could be that the location is not a good one for a particular project but perfect for another; this can all be established during the improvement process.

Who

- Who was involved, and finding out if they were the right people for the job, is another part of the process.
- Changing personnel and making sure the right people are in the right roles, teams and departments is a vital part of the Kaizen program. Note: Some authors add a sixth question, "**HOW**," to the list

How

- Each question should have a factual answer - facts necessary to include for a report to be considered complete.

5W1H is shorthand for "Who, What, When, Where, Why, and How." It is used both in **problem solving** and in project planning.

This set of questions is sometimes referred to as the Kipling Method, due to a poem that appeared in Rudyard Kipling's 1902 "Just So Stories."

I keep six honest serving-men

(They taught me all I knew); their names are What and Why and When and How and Where and Who.

Problem Solving

When using 5W1H for problem solving, if you address each of the W's and the H, you will have a better understanding of the issue. Consider how you might ask these questions if you noticed that your car started getting poor gas mileage.

- Who noticed the problem? Who drives the car?
- What changed? (New gas station, maintenance issues on the car, etc.) What was the magnitude of the change?
- When did the gas mileage get worse? When was it noticed?
- Where has the car been driving? (New route, different environment, etc.)
- Why did any changes occur? (Explain why different gas was being used, or why the route changed, or why there was a new driver)
- How was the problem noticed? How did the conditions that led to the change happen?

3.3. Ways of reducing waste in the workplace

We all know that reducing waste is an important part of conserving our planet's resources and protecting it for many years to come. Fortunately, many of us are conscious of our impact and make efforts to reduce waste at home by recycling, returning bottles, using ceramic dishes over paper plates, and so on. But what about reducing waste in the workplace? Companies may not put time, money, or energy into workplace waste reduction if they believe it's too inconvenient to establish a program, or that it's trivial because it doesn't bring the company money. However, while reducing waste may not generate revenue in the traditional sense, it will ultimately save your business money. Even if your company isn't ready to establish a dedicated team to help take green

measures, there are simple ways to reduce waste that are easy to implement, help the environment, and save you money in the long run:

1. Go (nearly) paperless

While recycling is helpful, the biggest impact comes from using less paper in the first place. With programs like Google Docs that allows you to write, edit, and collaborate for free online, and Drop box, a free service that makes it easy to sync and share files, it's easier than ever to eliminate the amount of paper you use in the workplace. Consider adding a "think before you print" message to the bottom of your emails as a friendly reminder to coworkers.

2. Keep a paper recycling bin within arm's reach

People recycle when it's convenient. At ISCG, every trashcan has a small recycle bin attached so that it's visible and doesn't take any extra effort. Make it easy for employees to recycle by meeting them where they already are (at their desks) with a bin.

3. Print smarter

Sometimes printing is necessary. Save up to 50 percent on paper costs by having employees set their defaults to print double-sided, and ask employees to use the "Print Selection" function, which encourages them to only print what they need and reduces wasted sheets of paper.

4. Provide real dishes and silverware

Instead of spending money on wasteful paper plates, harmful Styrofoam cups, and flimsy plastic utensils, invest in real dishes and silverware for your office café. You'll save on the cost of purchasing and disposing these items over time, and real dishes are much nicer to use. Make everyone responsible for cleaning their own dishes, and if you can, spring for a dishwasher to make it even easier.

5. Get rid of the k-cup machine

Those millions of little plastic cups can't be recycled and go straight to the landfill. K-Cups may seem economical because you can make one cup of coffee at a time, but they are much more expensive than coffee beans. A pound of K-Cup coffee goes for roughly $50, while Starbucks is $12 per pound, and Dunkin is only $9 per pound. Invest in a machine that grinds the beans to make one cup at a time, and buy coffee beans in bulk to save money.

6. Buy in bulk

Coffee beans aren't the only thing you should buy in bulk for the office. Purchase items like sugar and creamer, snacks, cleaning supplies, and Kleenex in bulk instead of individually packaged to lower the cost per unit and reduce the amount of packaging you throw away.

7. Reuse binders and file folders

Provide label stickers so employees can write over and reuse binders and file folders instead of throwing them away after one use.

8. Create a recycling center

Make a small recycling center by providing bins to put returnable bottles, non-returnable bottles, and paper. At ISCG, we have these three bins and a trash bin hidden in two large pull-out drawers in the kitchen. Money from the bottle deposits is money in your company's pocket.

9. Provide filtered water

Install a filtered water tap or keep a large Brita pitcher in the fridge so employees can pour a glass of water instead of grabbing a disposable plastic water bottle. Your company will save money on bottled water, and landfills will be spared of more plastic.

10. Give employees a reusable water bottle

Surprise and delight employees with a reusable water bottle with your company's logo on it. There's a small cost associated, but ultimately you'll save on plastic water bottles, promote wellness, and get free advertising when they carry it outside the office.

Self-Check -4	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. What are the advantages of waste segregation? (3pts)
2. List 4R's principles in waste segregation (4pts)
3. Discuss each 5W and 1H (6pts)
4. List ways of reducing wastes in the work place (4pts)

Note: **Satisfactory rating - 17 points** **Unsatisfactory - below 17 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____

   _____

2. _____

   _____

3. _____

   _____

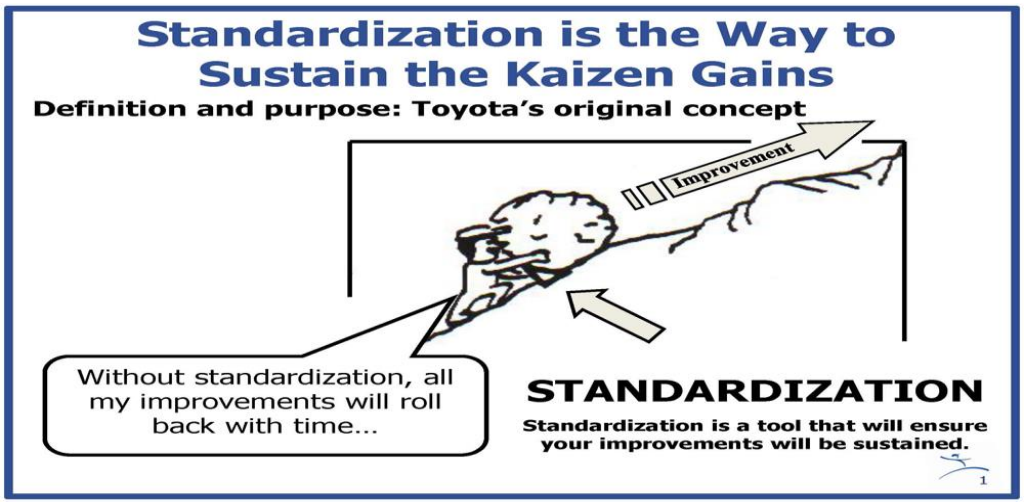
4. _____

   _____

Information Sheet-5	**Doing the completing of required operation with standard procedures**

5.1. Completion of required operation

A Standard Operating Procedure (SOP) is a set of written instructions that document a routine or repetitive activity followed by an organization. The development and use of SOPs are an integral part of a successful quality system as it provides individuals with the information to perform a job properly, and facilitates consistency in the quality and integrity of a product or end-result. The term “SOP” may not always be appropriate and terms such as protocols, instructions, worksheets, and laboratory operating procedures may also be used. For this document “SOP” will be used. SOPs describe both technical and fundamental programmatic operational elements of an organization that would be managed under a work plan. Standardized work is one of the most powerful but least used lean tools. By documenting the current best practice, standardized work forms the baseline for kaizen or continuous improvement. As the standard is improved, the new standard becomes the baseline for further improvements, and so on. Improving standardized work is a never-ending process.



Completion is the process of making a well ready for production (or injection) after drilling operations. This principally involves preparing the bottom of the hole to the required specifications, running in the production tubing and its associated down hole tools as well as perforating and stimulating as required. Sometimes, the process of running in and cementing the casing is also included. After a well has been drilled, should the drilling fluids be

removed, the well would eventually close in upon itself. Casing ensures that this will not happen while also protecting the well stream from outside incumbents, like water or sand.

Basically, standardized work consists of three elements:

- Take time, which is the rate at which products must be made in a process to meet customer demand.
- The precise work sequence in which an operator performs tasks within take time.
- The standard inventory, including units in machines, required to keep the process operating smoothly.

Establishing standardized work relies on collecting and recording data on a few forms. These forms are used by engineers and front-line supervisors to design the process and by operators to make improvements in their own jobs. In this workshop, you'll learn how to use these forms and why it will be difficult to make your lean implementations "stick" without standardized work.

5.2. Benefits of standard procedures

The benefits of standardized work include documentation of the current process for all shifts, reductions in variability, easier training of new operators, reductions in injuries and strain, and a baseline for improvement activities. Standardizing the work adds discipline to the culture, an element that is frequently neglected but essential for lean to take root. Standardized work is also a learning tool that supports audits, promotes problem solving, and involves team members in developing poka-yokes. The development and use of SOPs minimizes variation and promotes quality through consistent implementation of a process or procedure within the organization, even if there are temporary or permanent personnel changes.

SOPs can indicate compliance with organizational and governmental requirements and can be used as a part of a personnel training program, since they should provide detailed work instructions. It minimizes opportunities for miscommunication and can address safety concerns. When historical data are being evaluated for current use, SOPs can also be valuable for reconstructing project activities when no other references are available. In addition, SOPs are frequently used as checklists by inspectors when auditing procedures. Ultimately, the benefits of a valid SOP are reduced work effort, along with improved comparability, credibility, and legal defensibility.

3.4. Organizing the SOP Writing Effort

Developing a complete set of SOPs for a business can be a time consuming process. But a little time spent in the beginning to organize the effort can help reduce frustration with the process and make the effort more efficient and effective. Using the following five steps will aid in your organizing efforts.

1. Identify the key areas of concern for your operation where SOPs might be useful. For example, feeding, animal moving and handling, manure handling, equipment cleaning and sanitation, vaccination, bedding, biosecurity, animal health, new animal arrival, etc.
2. Using the list from step one, identify the top one or two priority areas for attention. In which areas are more controls desired or required? In which areas will economic returns or impact on the operation be greatest? Which areas are likely to yield some good successes early in the process so you can build momentum and excitement for the effort?
3. Focusing on the selected top priority areas from step two, identify all the processes, functions or operations that occur within each of these areas.
4. Group together and combine or subdivide further (which ever makes sense for your operation) all the important processes, functions or operations within each area. Then prioritize them for SOP development.
5. Identify the best individual to lead the development effort for each SOP and assign a development team of employees, managers, agribusiness representatives, consultants and anyone else who can bring relevant expertise to the effort.

Self-Check -5	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. Define SOP (3pts)
2. List benefits of standard procedures (5pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____
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   _____
   _____
2. _____
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   _____

Information Sheet-6	Facilitating updating of standard procedures

6.1. Updating standard procedures

The standardized work applies to the normal work of others and serves as the basis for continuous improvement. This may apply in a manufacturing, office, logistics, or other service environment along any part of the value stream. It applies to a person at whatever organizational level they are employed who facilitates this in others. The standardized work procedures may apply to every step of the job or may be procedures which allow discretion in the application. Standard operating procedures are written, step-by-step instructions that describe how to perform a routine activity. Employees should complete them in the exact same way every time so that the business can remain consistent.

The person will typically be a team leader or other person who works with, leads, facilitates and assists others. They will liaise and communicate with these others as required by the job and the standard procedures.

Organizations need to develop a comprehensive system to ensure that all policies, procedures and training programs are continually reviewed and updated, in practice as well as in writing. Making such a review part of supervisor job descriptions, and making time for it on the calendar help ensure that your organization keeps the information current and functional.

Standard operating procedures help maintain safety and efficiency for work place such as:

- Production/operations
- Sales and customer service
- Employee training
- Legal
- Financial

A standing operating procedure should never be difficult to read or vaguely worded. It should be brief, easy to understand and contain actions steps that are simple follow. A good standard operating procedure should clearly outline the steps and inform the employee of any safety concerns. The standing operating procedures should be the basis for training any new employees. They should also be updated every year to ensure they stay relevant to the current needs of the organization.

Objectives/purposes of standard operation procedures

- **They save time and money**

When the same task is completed in many different ways, it will always take longer to complete. Having a standard operating procedure in place streamlines the process so employees can accomplish more in less time.

- **They provide consistency**

Having a standard operating procedure in place ensures that regardless of who is working, business processes are being completed the correct way.

- **They improve communication**

Standard operating procedures make your employees' jobs easier because no longer do they have to guess as to how they should be performing their jobs. And they don't have to try to rack their brains to remember what you told them when they were first hired.

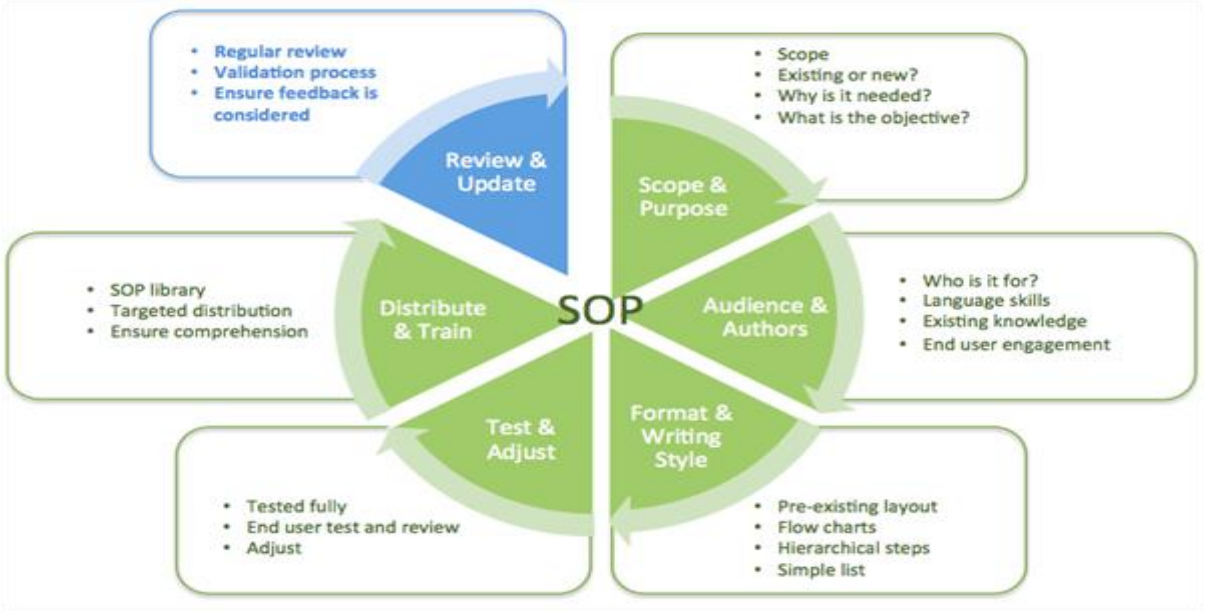
- **They allow you to hold your employees accountable**

How can you evaluate your employees if you don't have written standards in place? Without standard operating procedures, employee evaluations become a matter of personal opinion, which is hardly fair to your employees.

- **They create a safer work environment**

When employees perform the same tasks in completely different ways, it is not only inefficient it is actually a liability for your business. Standard operating procedures ensure that employees perform their job functions in a safe and consistent manner.

6.2. SOP review process



Some of the considerations for an effective SOP Review Process

1. **Self-Regulating** – Depending on the SOP, it may make sense to achieve this review and update by making it part of the SOP itself. By that I mean a process that includes steps or checks against the relevant environmental considerations.
   E.g. A check and update step at the start of the process, or having variable elements in the SOP that are referenced and looked at the point when the SOP is executed.
2. **Expiry Dates and Reminders** - There may be value in setting expiry dates on your SOP documents to ensure they are no longer distributed when they are expired or until a review is completed.
3. **Ownership** – Each SOP or set of SOPs has to have a clear defined owner who is responsible for whatever the agreed review and update approach is. Clear ownership has to be maintained for this over time, ensuring responsibility is shifted as people move around the organization. As well as ownership of the SOP, in most circumstances there would need to be some ownership of the influencing factors for this SOP
4. **Managing Influencing Factors** - These are the things that have an impact on your SOP, they usually fall into one of the environmental elements mentioned above. E.g. Regulatory. There needs to be a level of management against each of the Influencing Factors for your SOP, with a person, team or process being responsible for keeping up on changes. Identifying each of your influencing factors and understanding how the SOP owner will be made aware of these is key to success in your SOP Review Process

Self-Check-6	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. What are the advantages of Standard operation procedure (3pts)
2. List purposes of SOP (5pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____

_____

_____

2. _____

_____

Information Sheet-7	Ensuring capability of work team

7.1. Reinforce relationships and working together

A group of employees that work semi autonomously on recurring task, work teams are most useful where job content changes frequently and employees with limited skills and a specific set of duties are unable to cope. In the long run, there's only one way of absolutely making sure that your employees want to work together: form bonds between them. It enhances communication, problem solving and conflict management. Organizing a team building activity helps a great deal in this, as said before. A high-performance work team refers to a group of goal-focused individuals with specialized expertise and complementary skills that collaborate innovate and produce consistently superior results. The group relentlessly pursues performance excellence through shared goals, shared leadership, collaboration, open communication, clear role expectations and group operating rules, early conflict resolution, and a strong sense of accountability and trust among its members.

Work teams are the backbone of contemporary work life. Executive teams run corporations. Project teams create new products and services. Matrix teams help develop everything from pharmaceuticals to the delivery of services in consulting firms and charitable agencies. Marketing and sales teams deliver products and services to customers. High-performance work teams are essential to the way most organizations organize and carry out their work, resulting in superior performance, which translates into a significant competitive advantage. A team is a group of people who work together to accomplish something beyond their individual self-interests; however, not all groups are teams. A simple but effective description of what is meant by "a team" comes from Jon R. Katzenbach and Douglas K. Smith's book, *The Wisdom of Teams: Creating the High-Performance Organization*: "A team is a small number of people with complementary skills who are committed in a common purpose, performance goals, and approach for which they hold themselves mutually accountable.

What distinguishes high-performance teams from other groups is that a team is more than a collection of people simply following orders. To function effectively, a high-performance team also needs:

- A deep sense of purpose and commitment to the team's members and to the mission.
- Relatively more ambitious performance goals than average teams.

- Mutual accountability and a clear understanding of members' responsibilities to the team and individual obligations.
- A diverse range of expertise that complements other team members' abilities.
- Interdependence and trust between members.

High-performance work teams have an advantage over the work of individuals because each member can offer new ideas, talent and viewpoints. In addition, high-performance work teams predictably execute strategy, meet goals and need little management oversight because they are empowered and responsible for their functional activity and accountable for performance. Compensation and incentives are usually tied to the achievement of team and individual goals, respectively, with a heavier emphasis on collective team performance. Because superior team performance is so highly valued, these teams do not tolerate marginal and underperforming individual contributors.

7.2. Characteristics of High-Performance Work Teams

Although there is no simple measure of performance effectiveness for groups, and no team is identical, there seems to be a shared understanding of what makes an effective group work. High-performance work teams are generally composed of a combination of purpose and goals, talent, skills, performance ethics, incentives and motivation, efficacy, leadership, conflict, communication, power and empowerment, and norms and standards.

Common Types of High-Performance Work Teams

Though they vary in duration, purpose and ultimate goals, organizations commonly establish five types of teams to achieve work goals

Work teams

Work teams are continuing units responsible for producing goods or providing services. Their membership is typically stable, usually full time and well-defined. Work teams are found in both manufacturing and service settings and are traditionally directed by supervisors who make most of the decisions about what is done, how it is done and who does it. Self-managing teams involving employees making decisions that were formerly made by supervisors are gaining favor.

Fig 1. Work teams

Parallel teams

Parallel teams pull together people from different work units or jobs to perform functions the organization is not equipped to perform well. They exist in parallel with the formal organizational structure, have limited authority and can only make recommendations. Parallel teams are used for problem-solving and improvement-oriented activities (e.g., quality improvement teams, employee involvement groups, quality circles or task forces).

Parallel

Top Down Bottom Up	Parallel	Hypothesis Driven
▪ Define a vision ▪ One team working top-down (BCD) ▪ One team working bottom-up (DCB) ▪ Merge when they meet	▪ Define a vision ▪ Parallel teams working on phase BCD on different parts ▪ Merge when they meet in E	▪ Define a hypothesis ▪ Parallel teams working on phase BCD ▪ Merge when they meet in E
Use different competencies	Use different competencies	Fast delivery
Re-work during merge	Re-work during merge	Wrong hypothesis

Project teams

Project teams are typically time-limited and produce a one-time output (e.g., a new product or service, information system or plant). Project-team tasks are not repetitive and involve considerable application of knowledge, judgment and expertise. As a result, membership is usually diverse, drawing from different disciplines and functional units, so specialized expertise can be applied to the project.

Fig 2. Project teams

Management teams

Management teams coordinate and provide direction to their subunits and are responsible for the overall performance of a business unit. The management team's authority stems from the hierarchal rank of its members. At the top of the organization, the executive management team establishes strategic direction and manages the company's performance by applying its collective expertise and sharing responsibility for the overall success.

Fig 3. Management teams

Virtual teams

A virtual team is a group of individuals who work together in pursuit of common goals across time, space and organizational boundaries. They are linked electronically by webs of communication technology (e.g., the Internet, Skype, WebEx, internal networks). Members of a virtual team coordinate their work predominantly with electronic information and communication technologies to accomplish specific organizational tasks and may never meet face to face. Virtual teams allow companies to obtain the best talent possible for a specific project without geographical restrictions. They are also generally viewed as more efficient in expenditures of time and related travel costs.

Fig 4. Virtual teams

7.3. Team purpose, goals and roles

High-performing teams are synergistic social entities that work toward the achievement of a common goal or goals—short term and long term. They often exemplify a total commitment to the work and to each other. Team members do better work when their roles are clear: They know how to do their jobs and why they are doing them. Each member must understand and support the meaning and value of the team's mission and vision. Clarifying the purpose and tying it to each person's role and responsibilities enhances team potential, as does the inclusion of "stretch" goals that increase the challenge necessary to motivate team members.

7.4. Talent, skills and work ethic

High-performance teams begin by recruiting and retaining their best talent while quickly helping low-performing members find other places to work. Morale typically increases as performance increases. After selecting for talent, it is critical to ensure that the team members possess complementary skills (e.g., technical, problem-solving, decision-making and interpersonal skills). Team members must exhibit a sustained commitment to performance excellence, exercise candor and mutual respect, and hold themselves and their organizations accountable at both the individual and team levels.

7.5. Incentives, motivation and efficacy

Both monetary and nonmonetary systems that encourage high performance have a positive impact on tactical implementation of the team's goals. Over the long term, intrinsic motivators such as personal satisfaction at work and working on interesting projects provide the greatest impact on performance. In addition, a belief in one's self and abilities encourages people to take more strategic risks to achieve team goals.

7.6. Leadership

High-performing leaders generally accompany high-performance work teams. Essential leadership qualities include the ability to a) keep the purpose, goals and approach relevant and meaningful; b) build commitment and confidence; c) ensure that team members constantly enhance their skills; d) manage relationships from the outside with a focus on the removal of obstacles that might hinder group performance; e) provide opportunities for others without seeking credit; and f) get in the trenches and do the real work required. There is widespread agreement that effective team leaders focus on purpose, goals, relationships and an unwavering commitment to results that benefit the organization and each individual.

7.7. Conflict and communication

Conflict management is an essential part of becoming a high-performance team. Open communication in such teams means a focus on coaching instead of on directing and a focus on the ability to immediately address issues openly and candidly. The key to team performance is open lines of communication at all times to provide motivation, maintain interest and promote cooperation.

Power and empowerment

Empowered work teams increase ownership, provide an opportunity to develop new skills, boost interest in the project and facilitate decision-making. Researchers refer to the ideal situation as being "loose-tight," such that specific decision-making boundaries are constructed with enough room for individuals to make empowered choices.

Norms and standards

Like rules that govern group behavior, norms can be helpful in improving team development and performance. Norms for high-performance teams include open lines of communication, early resolution of conflict, regular evaluation of both individual and team performance, high levels of respect among members, a cohesive and supportive team environment, a strong work ethic that focuses on results, and shared recognition of team successes. The key is that high-performing teams actually discuss and agree to their operating rules—standards that each team member agrees to uphold and for which they hold each other accountable.

7.8. Stages of Team Development

Dr. Bruce Tuckman, an early psychology researcher focused on group dynamics, developed a four-phase model of team development that included forming, storming, norming and performing. Refinement by other researchers has resulted in a well-known team

development process that provides a useful framework for leaders and team members seeking to understand the nature of group dynamics and their evolution.

The four typically recognized stages of the process include:

1. **Forming.** Individuals are trying to get to know each other and the organization and have not formed a commitment to the team. In consult with HR, project leaders provide direction and outline expectations. In addition, HR might use DISC or Myers-Briggs assessments and then facilitate a discussion about the results to help the group understand each other's differences and operating styles.
2. **Storming.** In this typically rocky stage, team members may challenge the leader and each other. The leader coaches members on how to manage conflict and focus on goals and may ask the HR team to help facilitate related training.
3. **Norming.** After individuals have worked through conflicts, the team begins to develop. People begin to appreciate their differences and start to work together. The leader begins to serve as a facilitator, offering encouragement and guidance. HR serves as a continuing support and can facilitate discussions or offer training as needed.
4. **Performing.** At this stage, the team is fully functional, and members are able to manage their relationships and work toward shared goals. Team members feel accepted and communicate openly with the leader. The leader focuses on delegating responsibilities and must identify when the team is moving into a different stage.

7.9. Common Barriers Faced by High-Performance Work Teams

Given the importance of team-based work in today's economy, experts have focused on using evidence-based organizational research to pinpoint the defining attributes of high-performance teams.

Despite varying approaches to describing high-performance teams, some common characteristics seem to be strong indicators of a team that is not functioning at its peak or that needs intervention:

- **Nonparticipating leadership-**Team members fail to use a democratic leadership style that involves and engages team members.
- **Poor decision-making-** Team members make decisions too quickly without a blend of rational and intuitive decision-making methods**.**
- **Infrequent communication-** Lines of communication are closed and infrequent.

- **Diversity not valued-** Team members do not value the diversity of experience and backgrounds of their fellow team members, resulting in a lack of diverse viewpoints and less successful decision-making and solutions.
- **Lack of mutual trust-** Team members does not fully trust each other or the team as an entity.
- **Inability to manage conflict.-** Not dealing with conflict openly and transparently and allowing grudges to build up can destroy team morale.
- **Lack of goal clarity-** Team members are unsure about their roles and the ultimate team goals, resulting in a lack of commitment and engagement.
- **Poorly defined roles and responsibilities-** Team members are not clear about what they must do (and what they must not do) to demonstrate their commitment to the team and to support team success.
- **Relationship issues-** The bonds between the team members are weak, which affects their efficiency and effectiveness.
- **Negative atmosphere-** An overall team culture that is not open, transparent, positive and future-focused results in a failure to perform at high levels.

Communication

Communication within high-performing teams requires the free flow of information, a shared agreement that no topic is off-limits, and frequent and respectful interactions among team members and other individuals in the organization. The HR team can work with team members to provide communication skills training to help members stay in close contact with each other through transparent transactions.

Conflict resolution

- One of the central differences between an average team and a high-performance work team is the capability to handle conflict in a constructive way. Any conflicts that surface must be depersonalized and dealt with early, either between individuals or among the collective team. Instead of viewing conflict as a negative, a high-performance team views it as strength of the collective group. Diverse views help improve thinking, learning and overall performance.
- Task conflicts can actually improve team performance if managed collaboratively. Such conflict fosters a deeper understanding of task issues and an exchange of information that facilitates problem-solving, decision-making and generating ideas.

- Conflict arises from differences, and when individuals come together in teams, their differences in power, values and attitudes contribute to the creation of conflict. To avoid the negative consequences that can result from frequent disagreements, most methods of resolving conflict stress the importance of dealing with disputes quickly and openly. Conflict is not necessarily destructive; when managed properly, conflict can result in significant benefits for a team

Collaboration

Collaboration is the basis for bringing together the knowledge, experience and skills of multiple team members to contribute to the development of a new service or product more effectively than individual team members could. It involves a commitment to a shared goal and an interdependence that comes from understanding that what is accomplished together is greater than what can be accomplished individually.

Team member training

To maximize the individual contributions of employees to a team, HR must provide advance training on effective teams, the typical stages of team dynamics, role expectations, conflict resolution, communication and similar issues. This training can help team members better understand issues that may occur and how they can best respond to those inevitable problems.

Self-Check -7	Written Test

Instructions: Perform the following tasks. Write your answers in the answer sheet provided:

1. Mention advantages of work teams (4pts)
2. List types of high performance work teams (5pts)
3. List four stages of team development (4pts)
4. List common barriers faced high performance work team (5pts)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

1. _____
   _____
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