

MECHANICS

LEVEL-III

Learning Guide-74

Unit of Competence: Prevent and Eliminate MUDA

Module Title: Prevent and Eliminate MUDA

Module Code: XXXXX

LG Code: XXXXX

TTLM Code: XXXXX

LO1: Prepare for work

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Instruction Sheet	Learning Guide #74
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This learning guide is developed to provide trainees the necessary information regarding the following **content coverage** and topics:

- Introducing Waste/MUDA
- Using work instructions.
- Reading and interpreting Job specification
- Observing OHS requirements
- Selecting appropriate material
- Safety equipment and tools

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

- Use work instructions.
- Read and interpret Job specification
- Observe OHS requirements
- Select appropriate material
- Safety equipment and tools

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 1 to 3.
3. Read the information written in the information “Sheet 1

Introduction

Muda is a Japanese word for waste. Though in practice, elimination of muda is very specific focusing you on several key opportunities to become more efficient and therefore reduce your costs or increase your opportunity to be productive (make more money).

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.

Every action, step or process in a business and in your life can be categorized in one **of three ways**. What you do, sell or obtain is either Value-Added, Incidental or Muda (Waste).

From a business' perspective, value-added is the stuff a customer is willing to pay for. Products or services that a customer needs or desires. On a personal level value-added are those actions, services or products that either bring you income or reduce your expense of time or money, all of which can lead to greater wealth.

Incidental activities are the actions that are not value-added but necessary. These actions are often considered as being necessary but do not directly add any value.

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.

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Wastes take the shape of an iceberg, the tip consists of the obvious wastes while the seen bulk under the water contain 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, manhours, 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 be 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”.**

The Three M's (Muda, Mura, Muri)

Aside from “muda” or wastes, the lean system also attacks and avoids “mura” or overload or overburden and “muri” or unevenness.

Mura refers more specifically to overloading an equipment, facility, or human resource beyond its capacity.

This undue stress may cause downtime, 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.

The Three M's

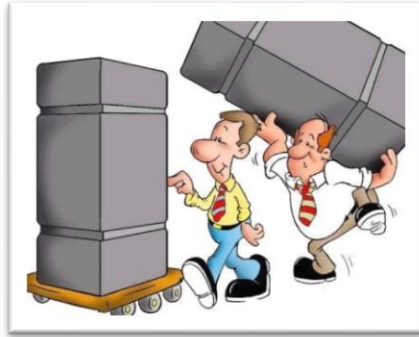
- Imbalance (inequality)(Mura)
- Excessive (too much)(Muri)
- Wasteful (Muda) Works

Productivity improvement does not mean hard work

Muda is:- Production factors that increase productivity and decrease cost, in other words, eliminating all unnecessary things.

Muri :-Mental and physical **overburden** on operators, and overburden on production machinery
We should not force hard work on Employees in the name of productivity improvement

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Mura: - Variation in work distribution, production capacity of machinery, and material specifications



The Three M's

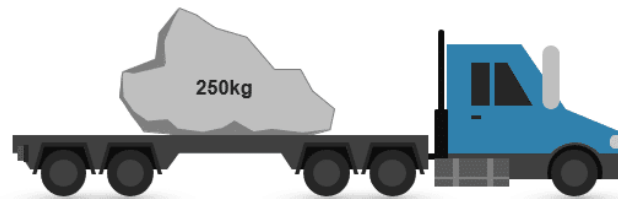
Mura (unevenness)

- It is having starts and stops, overutilization then underutilization
- Is a problem because it does not provide itself to quality, standardization of work, productivity, or continuous improvement.

Muda

This includes reducing waste and to create a process flow that can help eliminate the seven types of waste. Reducing waste also helps in eliminating waste through continuous improvement (Kaizen). The seven types of waste include; overproduction, waiting time, unnecessary transport, motion, defects, over or incorrect processing and extra inventory.

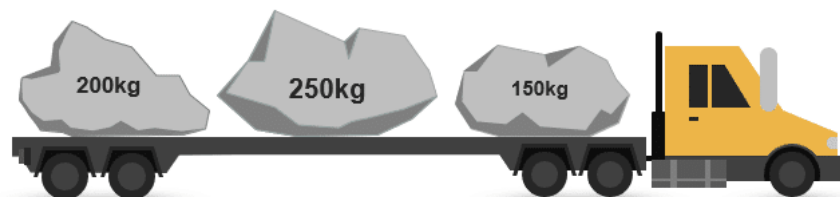
MUDA - Wastefulness



Mura

Mura implies unevenness; inconsistency, irregularity or inequality. Mura used in business/process improvement is countered through Just-In-Time systems. This enables the company to keep little or no inventory to avoid waste. In order to avoid Mura, there is a need to anticipate and cater for consumer demand, with consistent processes that can be simple enough to cater for demand and work in a regular flow.

MURA - Imbalance

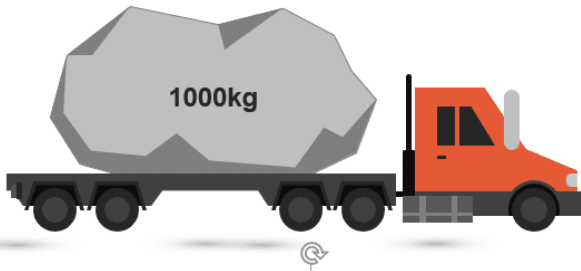


Muri

Muri means unreasonable, impossible or overburdening. By using standardized work, Muri can be avoided. Standard process allows each individual to know their work, it reduces costs and improves efficiency. A good example of this is specialization and division of labour which was introduced by Henry Ford in car manufacturing. As each assembly line worker had a specific task,

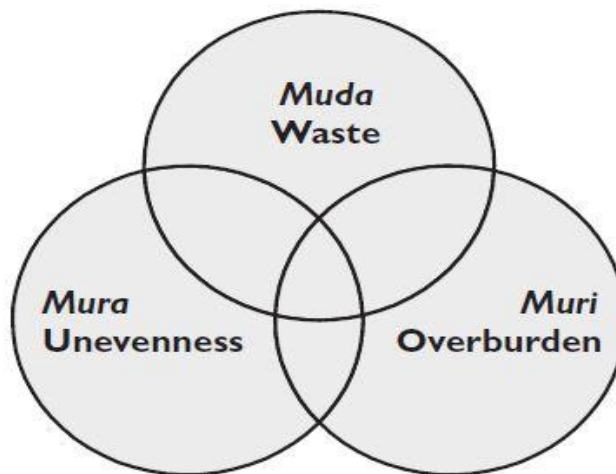
the production process was improved and so was output. For production to work smoothly, each station has to perform a standard task; since the next station is only equipped to work in a standard manner to perform their part of the manufacturing task.

MURI - Overload



Relationship between the 3 M's

- Usually Mura creates Muri which in turn lead to generation of Muda



- **Relationship between the 3 M's**

Example

- **At the end of the budget year** in most companies we see mura because they try to receive as **many orders** as possible to full fill the planed volume in the year. This causes sales to write too many orders towards the end of the period and production managers to go to fast in trying to fill them, leaving undone the routine tasks necessary to sustain long-term performance.

- This wave of orders causing equipment and employees to work too hard as the finish line approaches creates the overburden of muri. This in turn leads to downtime, mistakes the muda of waiting, correction , and conveyance.
- Therefore, mura creates muri that undercuts previous efforts to eliminate muda.
- Eliminating mura is fundamental to the complete elimination of muri and muda

The three categories of Operations

(1) Net Operation (value adding)

(2) Non-Value adding Operations

(3) “Muda” (Wasteful)

But what is value? **Definition of value**

- It is capability provided to the customer at the right time at an appropriate price.
- It is defined by the ultimate end customer

It is also product-specific

- **The three categories of Operations**

(1) Net Operation

Part of the operation that adds value to make parts and products, Examples, Milling, Turning, Grinding, Assembling and Welding

(2) Non-Value adding Operations

Operation that **adds no value** but **cannot be avoided**, Example Setting up, Inspecting, Picking up parts, Removing drill chips

(3) “Muda”

- is a Japanese word meaning **Wasteful Activity**
- is **anything unnecessary** in operation.
- **Can be eliminated** immediately
- Muda affects the **quality** of the product and also **delivery time**
- It increases **Production cos**

Value adding

- movements
- assembling
- molding
- spinning
- searching for tools
- cleaning
- mixing
- building

- milling etc

Non-value adding

- transporting materials
- over production waiting /idle time making defects etc

Muda” are activities which **use resources, time or cost** without adding value

Very Simple Drill

- **Operation** to staple two papers using a stapler **when work place is disorganized**
- **Materials and tools**
 - Two pieces of paper, Stapler , Staples

N0	Activities	Time	Type of Operation	Measure	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)	-	-

- 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?
- What if the job order was to produce a car?

Imagine the MUDA.

Common Causes of MUDA

- ✓ Layout & Location
- ✓ Long setup time
- ✓ Incapable processes
- ✓ Poor maintenance
- ✓ Poor work methods
- ✓ Lack of training
- ✓ Large lot production
- ✓ Inconsistent performance measures
- ✓ Ineffective production planning
- ✓ Lack of workplace organization
- ✓ Poor supply (quality/reliability)

Taichi Ohno of Toyota identified the *seven wastes* or **Mudas**, being the most common.

The Seven Wastes

- 1)“Muda” of Overproduction
- 2) “Muda” of Inventory
- 3) “Muda” of Waiting
- 4) “Muda” in Transporting
- 5) “Muda” of Defect-making
- 6) “Muda” of Motion
- 7) “Muda” in Processing

Cost Reduction by Elimination of muda

- 1)“Muda” of Overproduction

To produce things more than necessary in terms of type, time, and volume. It is called “**the worst kind of Muda**” since it hides all the other wastes.

“Muda” of Overproduction

[Cause]

- Excessive work force and facilities
- Big lot production
- Big and fast production machine
- Lack of customer focus

[Effect]

- Disturbance of flow
- Increase in inventory
- Outbreak (occurrence) of defects
- Advanced preparation of materials and parts
- Consumes resources
- Needless wear on machines

2) “Muda” of Inventory

The situation where items such as raw materials, parts, and finished goods are stagnant or which are not having value added to them. Some are located in the warehouses, and others are in-process inventory.

“Muda” of Inventory

[Cause]

- | | |
|---|--|
| <ul style="list-style-type: none"> ▪ Weak consciousness for inventory ▪ Bad facility layout ▪ Big lot production ▪ Bottle-neck processing stage | <ul style="list-style-type: none"> ▪ Advanced Production ▪ Speculative production ▪ Not leveled Production schedule ▪ Unreliable suppliers |
|---|--|

[Effect]

- | | |
|---|--|
| <ul style="list-style-type: none"> ▪ Lengthened delivery time ▪ Weak consciousness to control inventory ▪ Waste of space ▪ Needs for inspection, and transportation | <ul style="list-style-type: none"> ▪ Shelf life may expire ▪ It ties up cash ▪ Makes FIFO inventory management more difficult |
|---|--|

3) “Muda” of Waiting

This includes all kinds of waste of time such as workers or parts waiting: -for an upstream process to deliver,

- for a machine to finish processing,
- for incoming parts or materials,
- for process that has a long wait time

“Muda” of Waiting

[Cause]

- Bottle-neck processing stage
- Bad facility layout
- Big lot production
- Shortages & unreliable supply chain
- Lack of multi-skilling
- Ineffective production planning

[Effect]

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

4) “Muda” in Transporting

It is unnecessary movement of parts between processes caused by unnecessary transportation distance, temporary storage, and relocations or re-piling up.

“Muda” in Transporting

[Cause]

- Bad facility layout
- Big lot production
- Single-skilled workers
- Sedentary operation
- Low morale

[Effect]

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

5) “Muda” of Defect-Making

This includes defects, inspections for defects in-process, and claims, rescheduling, and resource loss.

“Muda” of Defect-Making

[Cause]

- Emphasizing on down-stream processes by inspection
- Poor in methods and standards for inspection

[Effect]

- Lack of standard operation
- Increase in material cost
- Increase in personnel & processes for inspection
- Increase in defects and claims
- Incur reworking costs

6) “Muda” of Motion

These are non-value adding movements or more than necessary movements of workers, equipment, and machines, such as looking for goods, bending, stretching, walking, lifting, and reaching etc.

Muda” of Motion

[Cause]

- Isolated operation
- No education or training
- No standard operating procedure
- Bad facility lay out

[Effect]

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

7) “Muda” in Processing

This consists of processing and operations primarily unnecessary. **It is processing beyond the standard required by the customer.**

“Muda” in Processing

[Cause]

- Lack of analysis of the contents of operation
- Improper tools and their use
- Insufficient standardization
- Attitude - 'Always done it like this'

[Effect]

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

MECHANICS

LEVEL-III

Learning Guide-75

Unit of Competence: Prevent and Eliminate MUDA

Module Title: Prevent and Eliminate MUDA

Module Code: XXXXX

LG Code: XXXXX

TTLM Code: XXXXX

LO2: Identify MUDA

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

- Preparing and implementing Plan of MUDA
- Causes and effects of MUDA
- Tools and techniques to draw & analyze current situation.
- Identifying and measuring waste/Muda
- Relevant procedures of identifying & measuring MUDA.
- Reporting Identified and measured wastes

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

- Prepare and implementing Plan of MUDA
- Identify Causes and effects of MUDA
- Identify Tools and techniques to draw & analyze current situation.
- Identify and measure waste/Muda
- Relevant procedures of identifying & measuring MUDA.
- Report Identified and measured wastes

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Identifying and measuring waste/Muda

The 7 forms of waste include;

Motion – Do you move unnecessarily during a process or activity. Ever make 3 trips back into the house for things you forgot before finally leaving?

Transportation – Do you move materials or supplies unnecessarily? This isn't about you moving this is about moving stuff. I've walked miles in the kitchen carrying ingredients back and forth; maybe better organization could cut down on how much we have to carry stuff?

Inventory – Having too much, or too little of supplies. Sticking with the kitchen theme, how much does it cost in time, energy and gas when you have to run out at the last minute for missing ingredient? On the other end buying too much of anything is a waste as well. I've still got dozens of pipe fittings I purchased 8 years ago (just in case!) during a kitchen renovation.

Over-processing – Doing more than really necessary. Scrubbing the same spot after it's already clean, repetitive mouse clicks because we don't know the computer's shortcut commands, or too much packaging peanuts and such for a non-fragile item are all examples of over-processing.

Rework – As the saying goes, "if you don't have time to do it right the first time, when will you have time to do it over." – John Wooden. Rework is just that, having to do anything a second time because it was unacceptable the first. Be it cleaning, repairing, filling out forms a second time we all experience the pain and frustration of rework.

Time – The most obvious to most of us, waiting for another person company or process before we can move forward is a huge waste. Waiting for the computer to finish processing a page, waiting at the doctor's office long past your appointed time, or waiting in line at the local grocery store costs us all. The more inefficient others are, the less efficient we can be.

Over Production – Producing too much, too soon, or too fast. Speaking of the kitchen how often are we throwing out the leftovers that were never eaten?

Originally there were only 7 forms of waste. Later in life, during an interview Taiichi Ohno stated that “he never said there were only 7 forms of waste.” The 7 just happened to be the most common his company faced, but are there more?

Talent and Ideas – Consultants that teach these philosophies are sometimes including the waste of talent and ideas as the 8th type of waste. In the heat of the moment, we get frustrated because of wasteful activities, we ponder that there must be a better way. By not taking action and changing our ways we are wasting our capabilities and opportunities.

Cash – A 9th form of waste appropriate to personal financial growth is just plain cash. How many times have you purchased a product or service but never used it? Have you ever bought food that was never eaten, clothes that were never worn or software that was never used?

By training yourself to see the muda you will find that it is easier to save a dollar than to make a dollar. It’s that recognition, which in part, prompted this blog.

There are probably other ways we can categorize waste that are not “official” according to Lean Management. Where else do we have waste in our lives? Please contribute if you can add to the list.

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