

# MACHINING

## Level - III

# Learning Guide 17

**Unit of Competence: Prevent and Eliminate MUDA**

**Module Title: Preventing and Eliminating MUDA**

**LG Code: IND MAC3 17 0217**

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<b>Instruction Sheet</b>	<b>Learning Guide #1</b>
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This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

1. Prepare for work.
2. Identify MUDA.
3. Eliminate wastes/MUDA
4. Prevent occurrence of wastes/MUDA

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:**

- Identify Safety equipment and tools
- **Tools and techniques are used to draw and analyze current situation of the work place.**
- **Wastes/MUDA are identified and measured based on relevant procedures.**
- **Necessary attitude and the ten basic principles for improvement are adopted to eliminate waste/MUDA.**
- **wastes/MUDA are prevented by using visual and auditory control methods.**

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 17.
3. Read the information written in the information “Sheet.
4. Accomplish the “Self-check test.
5. Do the “LAP test”.

## 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 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”.

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

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*undue stress may cause downtime, defects, delays, and even disasters. Muri refers to unevenness in production volume.*

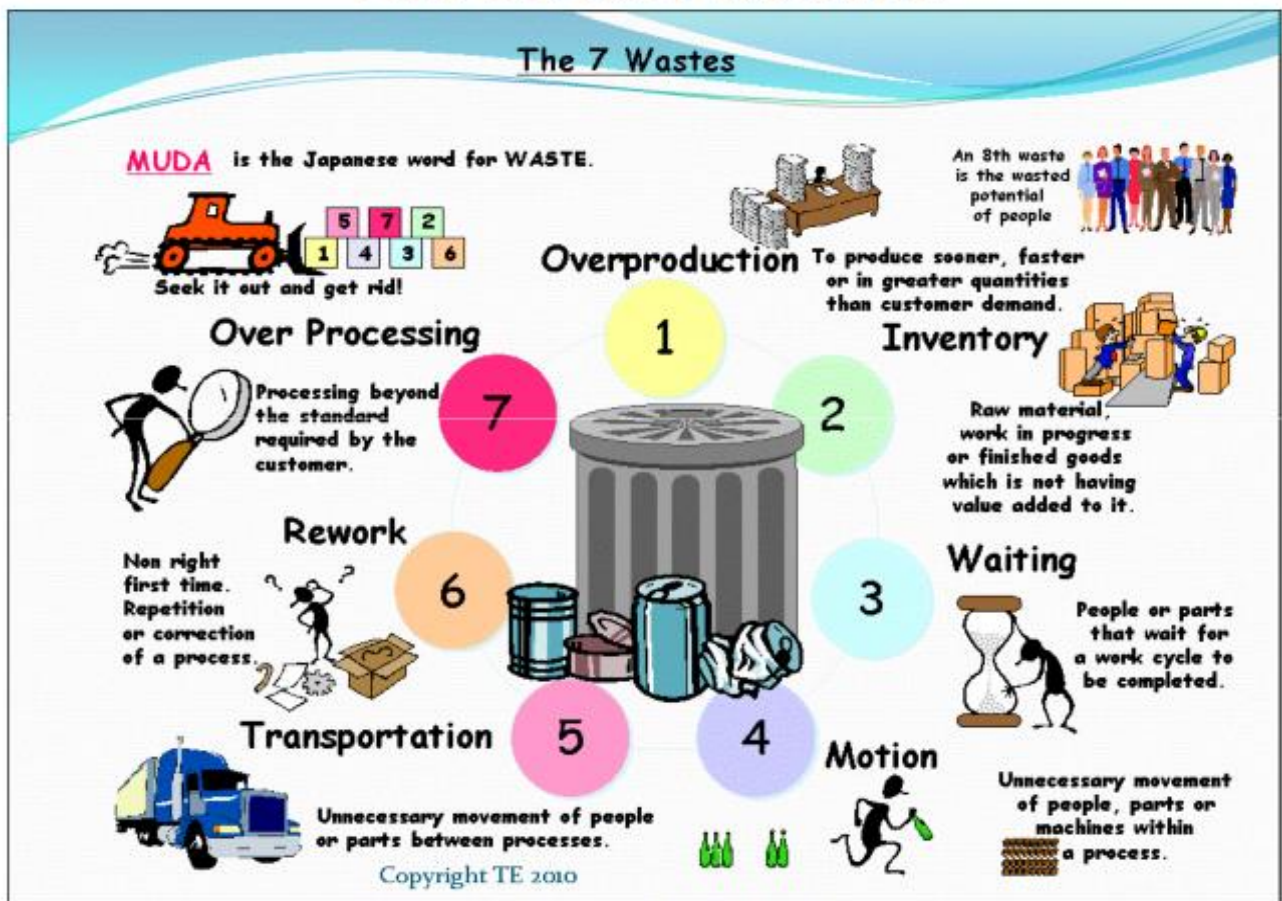
The wild fluctuations due to extreme highs (peaks) and lows (valleys) in production scheduling cause periods of overload and long idle time. One way to reduce muri is to implement heijunka or production leveling. In a way, mura and muri also cause wastes but in a particular way. Muda, mura, and muri cause inefficiencies and high costs in any operation.

***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

# The seven wastes



## ➤ 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 build up 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

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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.

*Producing more than your customer is requesting or before they request it*



➤ **Processing waste**

✓ Definition

- non-value added man processing
- non-value added machine processing

✓ Causes

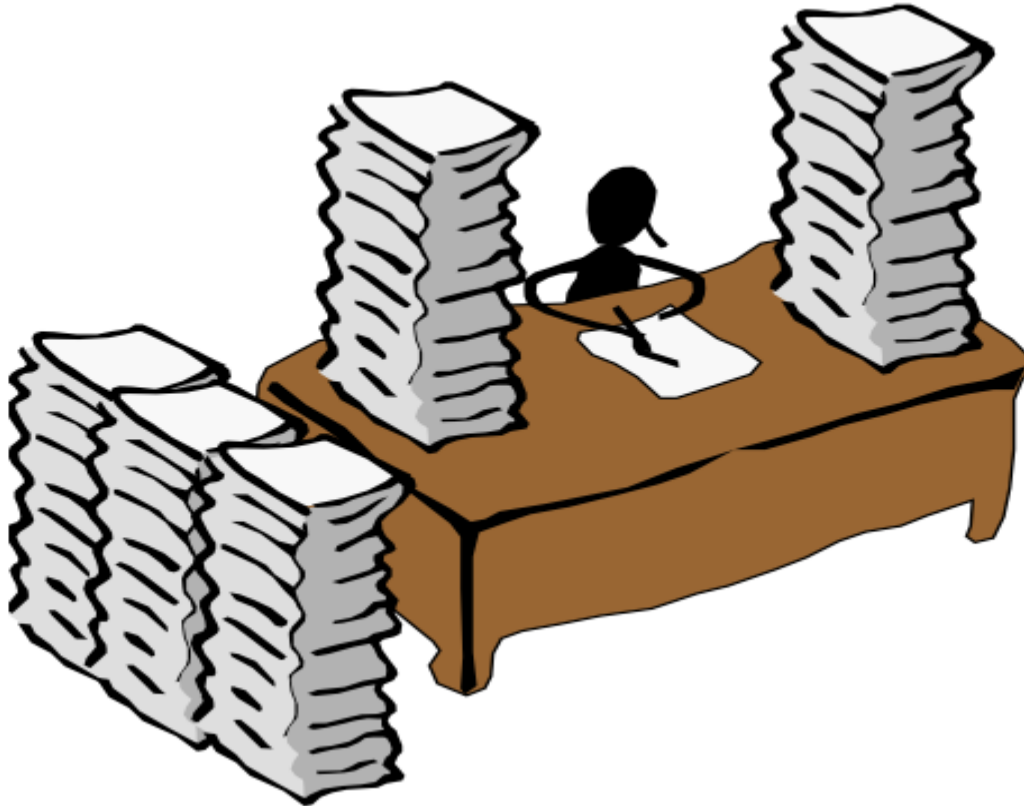
- unclear customer specifications
- frequent engineering changes
- excessive quality (refinements)
- inadequate value analysis/value engineering
- unclear work instructions

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

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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.

*Unnecessary manual work that does not contribute value to the product*



➤ **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

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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.

*Unnecessary conveyance of products, from one location to another, or handoff from one employee to another*



➤ **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

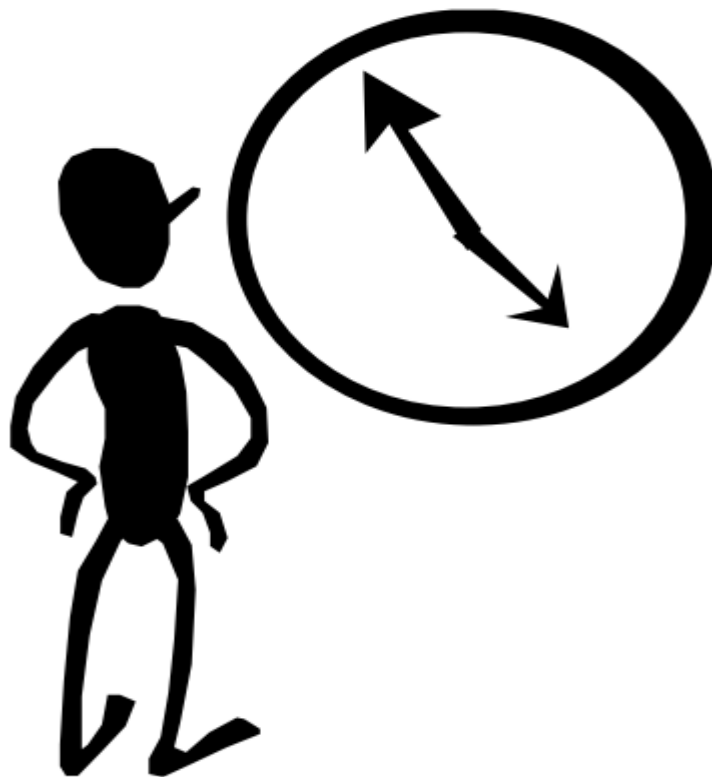
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- material shortage or delay
- manpower shortage or delay

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.

*Waiting done by customers or by employees*



➤ **Inventory Waste**

- ✓ Definition
  - excessive process (WIP) inventories
  - excessive raw material inventories and supplies
    - ✓ Causes
      - over-production
      - imbalanced line
      - big batch sizes
      - long lead times

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- 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 are 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.

***More materials or information than is required***



➤ **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

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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.

*Unnecessary physical or mental motion often associated with searching*



➤ **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

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- 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 and 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.

*A mistake which reaches the customer*



## WHY REDUCE WASTE?

$$\text{Price} = \text{Cost} + \text{Profit.}$$

Transformed to

$$\text{Price} - \text{Cost} = \text{Profit}$$

Decided by  
market

Very much  
function of  
cost

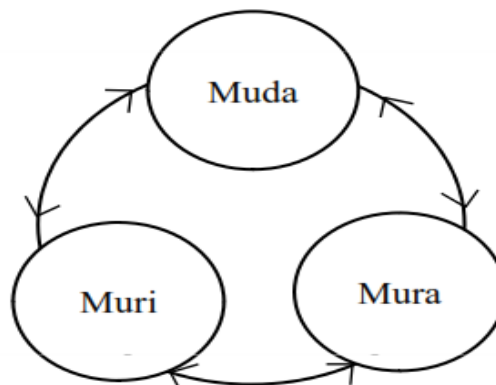
Wasteful  
activities in  
processes

### 3 M

**MURI** – **STRAIN**

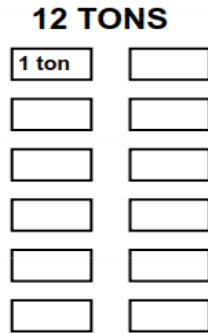
**MURA** – **INCONSISTENCY / IMBALANCE**

**MUDA** – **WASTE**



## What is Muda, Muri & Mura

- For example, suppose you need to transport 12 tons of material with a 4 ton capacity truck...



Capacity : 4 ton



## What is Muda, Muri & Mura



$$\times 2 = \text{MURI}$$



To make 2 trips, carrying 6 tons at a time is Muri (overburden)...

## What is Muda, Muri & Mura



**X 6 = MUDA**



Making 6 trips,  
carrying 2 tons at a  
time is Muda  
(waste)...

## What is Muda, Muri & Mura

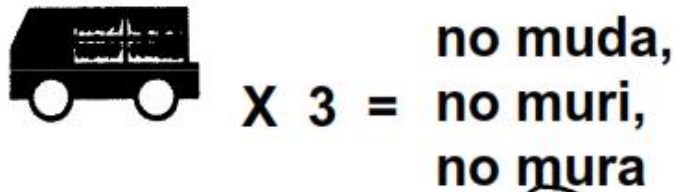


} = **MURA**



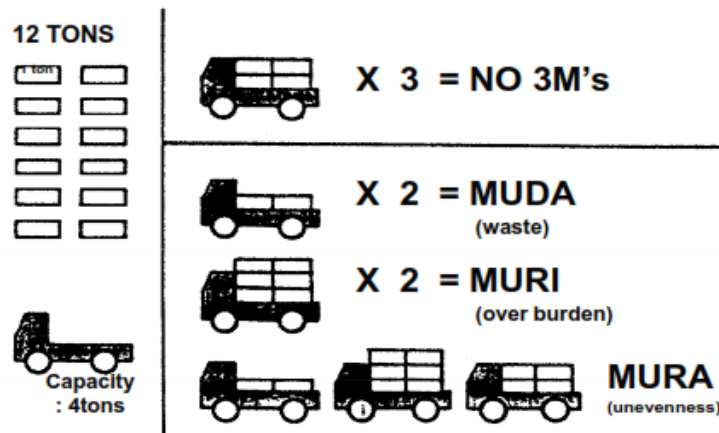
A mixture of the two is  
Mura (unevenness)

## What is Muda, Muri & Mura



3 trips, carrying 4 tons at a time, eliminates Muda, while at the same time no causing Muri.

## What is Muda, Muri & Mura



Achieving such a balance everywhere in the company is one of the primary aims of the Toyota production system. Elimination of the “3Ms” is always in the Toyota employee’s mind, as everyone tries to keep waste down without causing overburden.



# Elimination of MUDA (Waste)

What is MUDA ?

**Operation = Work + MUDA**

**Work = Increases value of production**

**MUDA = Increases cost of production**

