Chapter 12
5S – Foundation for Improvements

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CONTENTS

12.1 5S IS TO REMOVE ORGANIZATIONAL SLACK

- *Muda* (in Japanese) is essentially the waste of manpower, outputs, money, space, time, information, etc.

- It is called *organizational slack* in American organization theory.

- It is more important when companies are struggling or during recessions.

12.1 5S IS TO REMOVE ORGANIZATIONAL SLACK

- The continuous implementation of smaller improvement activities is the principle behind *kaizen* (改善).
- Kaizen and 5S are used to diminish the slack hidden in plants.

- Seiri (arrangement, 整理)
- Seiton (tidiness, 整頓)
- Seiso (cleaning, 清掃)
- Seiketsu (cleanliness, 清潔)
- Shitsuke (training, 躾)

12.1 5S IS TO REMOVE ORGANIZATIONAL SLACK

- The components of 5S.

1. Seiri (arrangement)

- to clearly separate necessary things from unnecessary ones and abandon the latter

2. Seiton (tidiness)

- to neatly arrange and identify things for ease of use

12.1 5S IS TO REMOVE ORGANIZATIONAL SLACK

3. Seiso (cleaning)

- to always clean up; to maintain tidiness and cleanliness

4. Siketsu (cleanliness)

- to constantly maintain the 3S mentioned above

5. Shitsuke (training)

- to have workers make a habit of always conforming to rules

12.1 5S IS TO REMOVE ORGANIZATIONAL SLACK

- In a plant, *dirt* includes unnecessary work-in-process inventories, defective inventories, unnecessary jigs, tools, and measures, and so on.

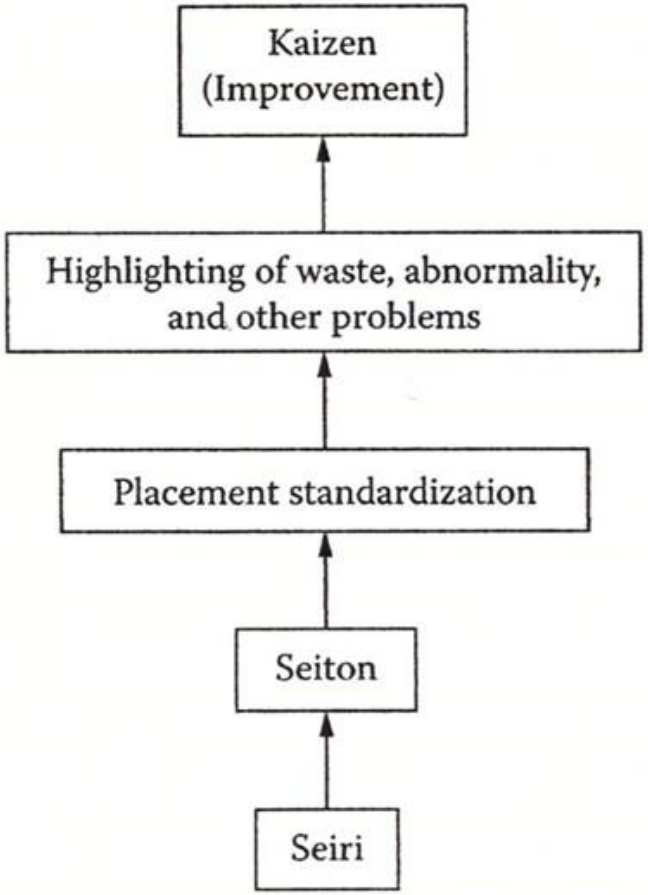
- 5S is the process of washing out all this dirt in order to be able to use the necessary things at the necessary time in the necessary quantity.

12.1 5S IS TO REMOVE ORGANIZATIONAL SLACK

- The following slack must be diminished.
  - Excessive setup time
  - Defective materials and products
  - Cluttered work areas
  - Missed delivery times
  - Unsafe conditions

12.2 VISUAL CONTROL

- To make Muda visible to every employee, Seiri (arrangement) and Seiton (tidiness) are the first two steps.



12.2 VISUAL CONTROL

- To recognize wasted items, materials are separated into necessary and unnecessary stacks.
- At Toyota, red labels are used to seal the wastes and expose them for what they are.
- Only necessary things will remain within the plant.

12.2 VISUAL CONTROL

- The red label technique consists of the following 6 steps.

Step 1. Establishment of a red label project

- the red label at each workplace
- the company-wide red label

12.2 VISUAL CONTROL

Step 2. Determination of objects to be sealed

- Inventories
  - materials, WIP, parts, and finished products
- Machinery
  - machines, facilities, tools, vehicles, and so on
- Space
  - floors, passages, shelves, and storages

12.2 VISUAL CONTROL

Step 3. Determination of labeling criteria

- Specific criterion must be developed to distinguish the necessary and unnecessary items.
- In general, the objects (e.g., materials and tools) that will not be used during the upcoming month is regarded as redundant.

12.2 VISUAL CONTROL

Step 4. Preparation of labels

Model	SZ-250P
Product name	door
Lot size	40
Quantity	1 pallet
Process	door welding
	Sep. 2/1990
Reasons	Dent

(The actual size is 5" × 5".)

Classification	1. Facilities 2. Jigs and tools 3. Measures 4. Materials 5. Parts	6. Works in-process 7. Half-finished products 8. Completed products	9. Sub-materials 10. Clerical supplies 11. Documents
Item name			
Number			
Quantity			
Reasons	unnecessary, defective		
Department			
Date			

FIGURE 12.2
Standard red labels.

12.2 VISUAL CONTROL

Step 5. Labeling

- The actual labeling should be done objectively.

Step 6. Evaluation of sealed items and recommended actions

- Defects
- Dead stock

} thrown out

- Staying items (excess inventories) → transferred to the red label storage
- Leftover materials → examined for usability

12.2 VISUAL CONTROL

- The results should be summarized in *a list of unnecessary inventories* and *a list of unnecessary facilities*.

- Each list should conclude with a recommendation for action and/or counter-measure.

12.2 VISUAL CONTROL

List of Unnecessary Inventories

Department Date _____

Item name	Code	Quantity	Unit cost	Cost	Disposal	Provision	References
Total amount of unnecessary inventories					Disposal value Others		
Countermeasures and improvement points							

List of Unnecessary Facilities

Department Date _____

Name of facility	Code	Quantity	Unit cost	Purchase cost	Purchase date	Accumulated depreciation cost	Book value	Located place	References
Total amount of unnecessary facilities									
Countermeasures and improvement points									

FIGURE 12.3
Lists of unnecessary inventories and facilities.

12.2 VISUAL CONTROL

- After Seiri (the red labeling elimination process), only necessary items are left.

- Seition (tidiness) is to distinctly show the position, name, and quantity of materials so that they can be easily recognized.

12.2 VISUAL CONTROL

- Indicator plates are used to facilitate ease of location and retrieval of needed materials and tools.

- Six steps are taken before indicator plates are attached to items.

12.2 VISUAL CONTROL

Step 1. Decide item placement

- Define the items that are used frequently and place them around the workers who use them.
- Items should be located at a height between a worker's shoulders and waist.

12.2 VISUAL CONTROL

Step 2. Prepare the container

- Containers such as boxes, cabinets, shelves, and pallets must be prepared.
- Try to avoid purchasing new containers.




12.2 VISUAL CONTROL

Step 3. Indicate the position for each item

- Indicator plates containing *place codes* are created and hung from the ceiling.
- The place code, including the *place address* and *spot address*, shows the location of the item.

12.2 VISUAL CONTROL

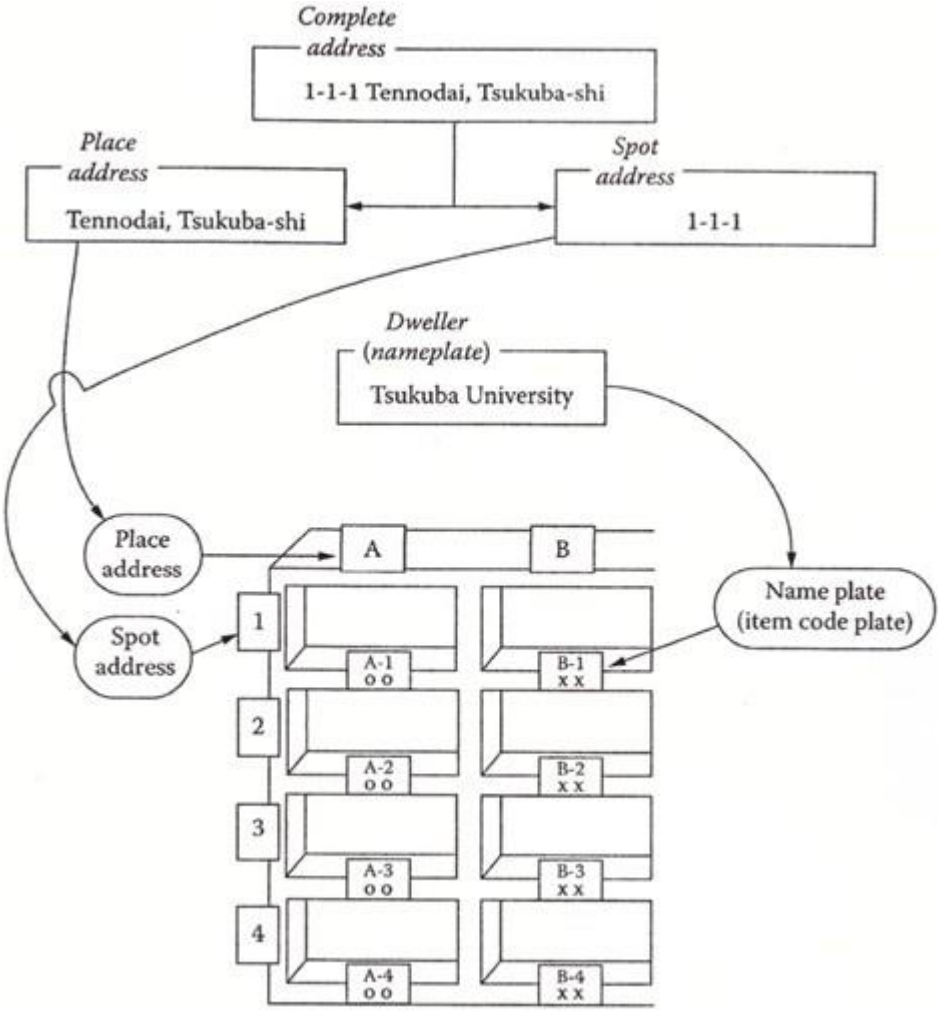


FIGURE 12.4
Place plate, spot plate, and item code plate.

12.2 VISUAL CONTROL

Step 4. Indicate the item code and its quantity

- Item codes and quantities are specified via an *item code tag* (on the item) and an *item code plate* (on the shelf the item occupies).

similar to the system in a parking lot

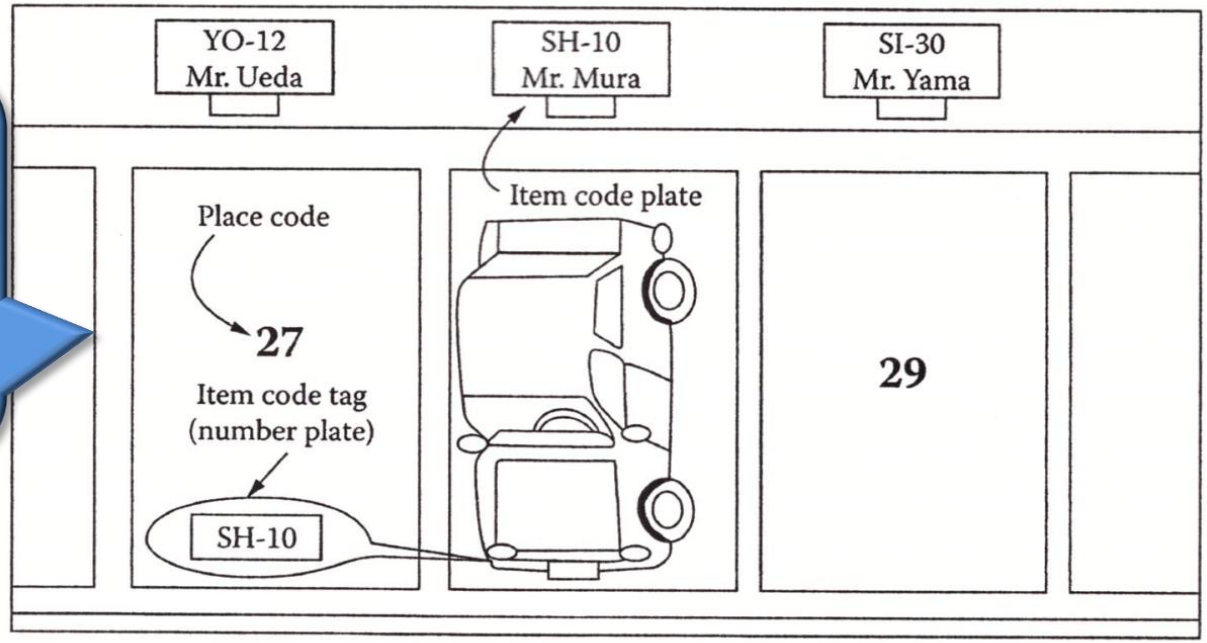


FIGURE 12.5
Item code plate and item code tag in a parking lot.

12.2 VISUAL CONTROL

- For the quantity indication, the maximum (lot size) and minimum (reorder point) quantities of inventories are specified.
- It is better to express the quantities visually.

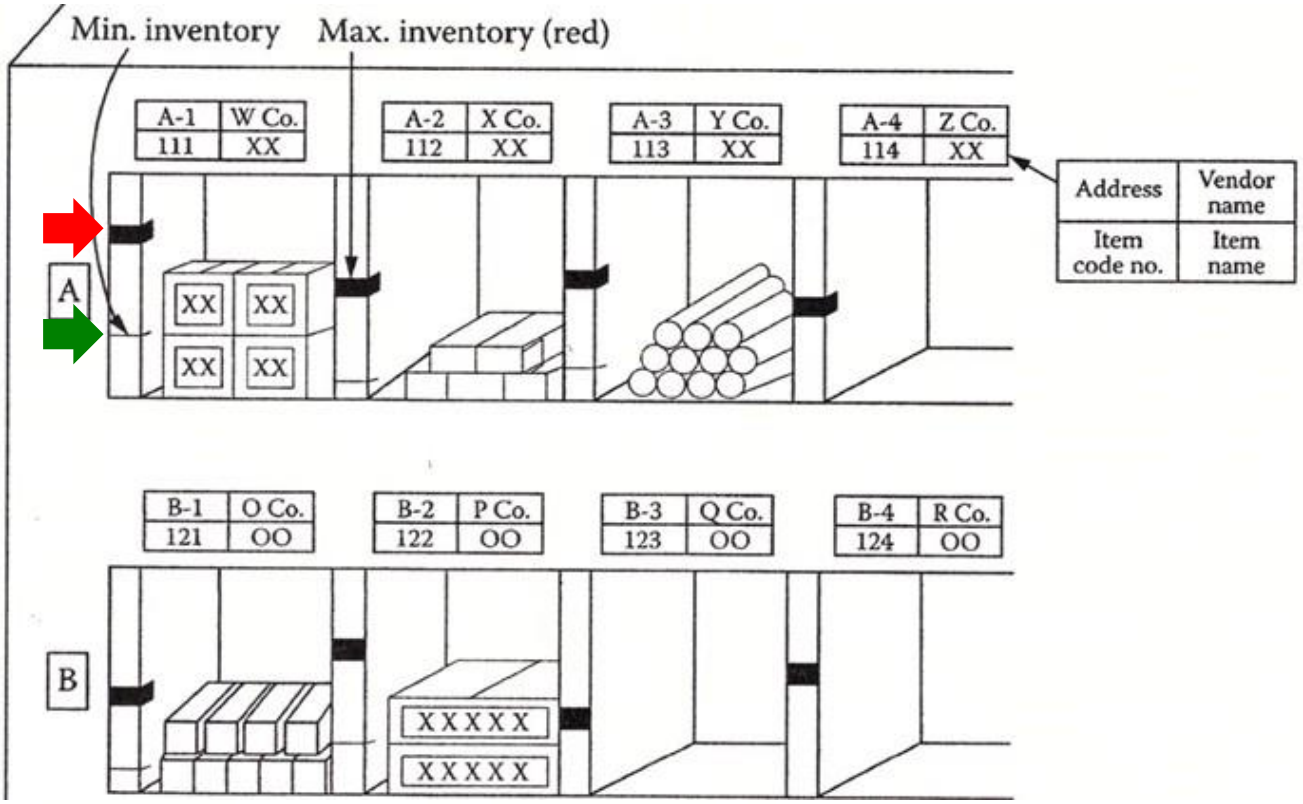


FIGURE 12.6
Indication of maximum and minimum quantities of inventories.

12.2 VISUAL CONTROL

Step 5. Make Seiton (tidiness) a habit

- Seiri and Seiton should be performed adequately.

1. Visual separation of necessary and unnecessary materials
2. Organization of frequently used stock at nearby places
3. Use of place code plates, item code plates, quantity indicator lines

12.3 PRACTICAL RULES FOR SEITON

- Seiri and Seiton are typically applied to WIP.

- To achieve improvements, the following problems should be perceived by everyone.
  - Excessive WIP inventories
  - Defective units
  - Inventories whose completion is held up by machine troubles at subsequent assembly stations

12.3 PRACTICAL RULES FOR SEITON

- Three rules of Seiton for WIP.

Rule 1. First-in, First-out (FIFO)

- Under the FIFO, items put in first can be taken out and used first.
- Under the Last-in, First-out (LIFO), items put in last are used first that could create a potential quality control problem.

12.3 PRACTICAL RULES FOR SEITON

FIFO is difficult in this case

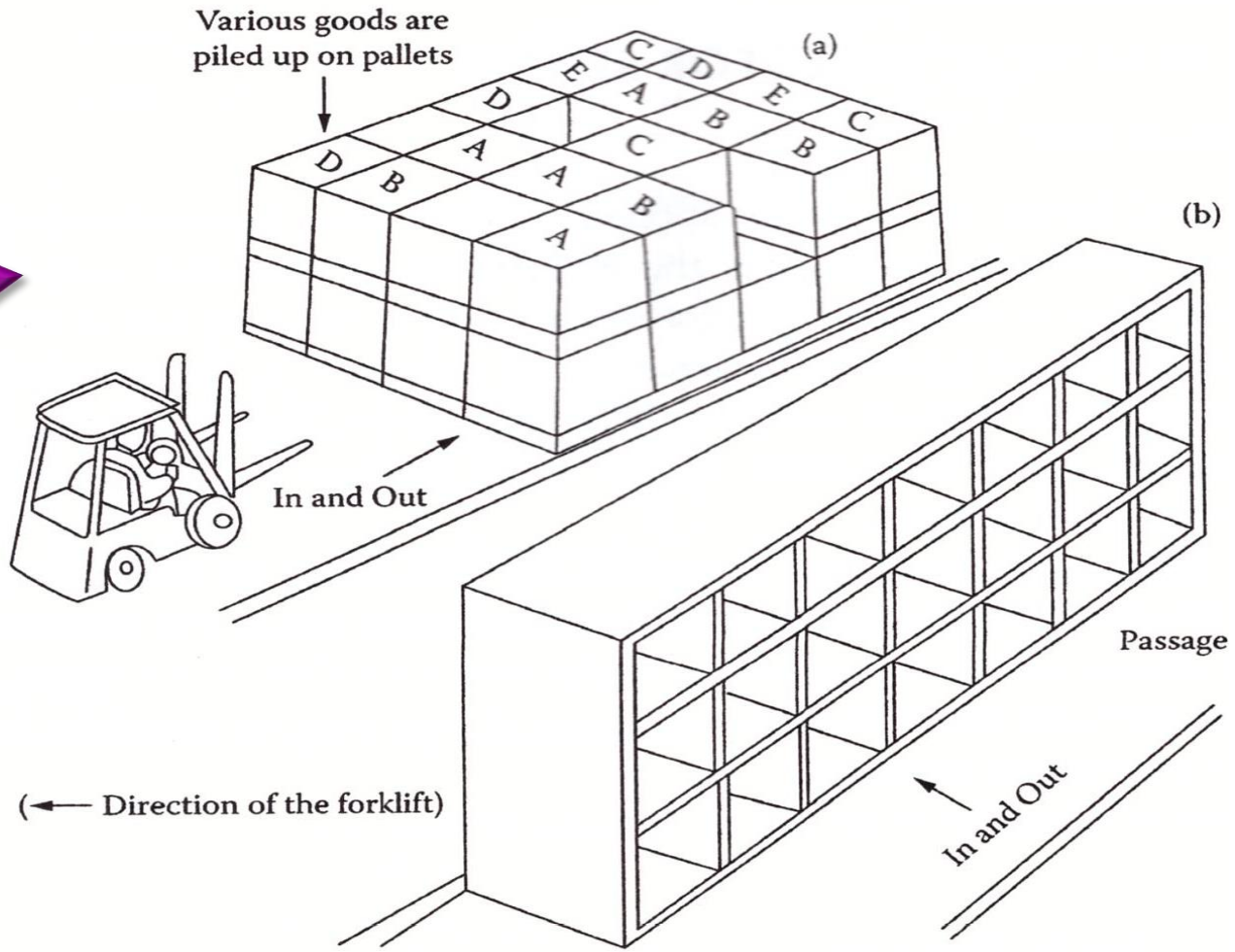


FIGURE 12.7
"First-In, First-Out" requires broad width and short depth.

12.3 PRACTICAL RULES FOR SEITON

Rule 2. Setup for easy handling

- Improvement in material handling is important for efficient plant operation.
- Using a *material handling index of liveliness* can help determine the best method of conveyance, i.e., pallet, cart, fork lift, and so on.

12.3 PRACTICAL RULES FOR SEITON

Classification	Index of liveliness	Number of required tasks	Variety of required tasks				Conditions
			Group	Raise	Lift up	Bring	
In bulk	0	4	O	O	O	O	Left in bulk directly on the floor or tables
Unified in a box or batch	1	3	--	O	O	O	Placed in a container or grouped in a bundle
In box with bolsters	2	2	--	--	O	O	Raised by pallets or skids
On a carriage	3	1	--	--	--	O	Set on carriages or something with castors
On the move	4	0	--	--	--	--	Moving by conveyor, chute, or carriages

FIGURE 12.8
Material-handling index of liveliness.

12.3 PRACTICAL RULES FOR SEITON

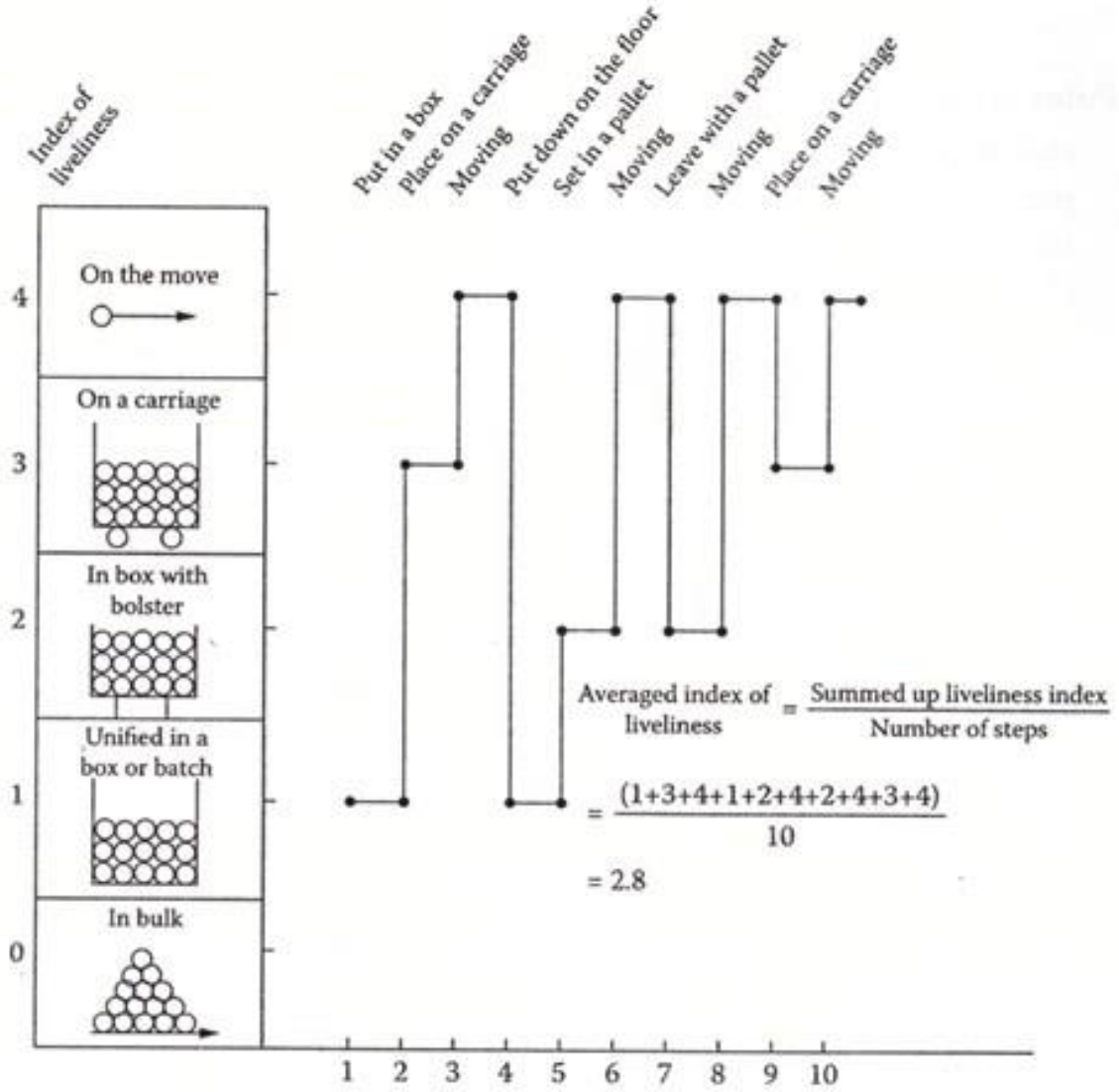


FIGURE 12.9
Averaged material-handling index of liveliness.

12.3 PRACTICAL RULES FOR SEITON

- If the averaged index is smaller than 0.5,
  - containers, pallets, and carts should be prepared;
  - do not put items directly on the floor.
- If the averaged index is smaller than 1.3,
  - use more pallets, carts, and forklifts.

12.3 PRACTICAL RULES FOR SEITON

Rule 3. Regard stock space as part of manufacturing line

- If the worker is in a job-shop situation, parts should be stored based on similarity of functions.
- If the worker is in a flow-shop situation, parts should be stored according to the production line.

12.3 PRACTICAL RULES FOR SEITON

- It is important to devise a way for workers to return the tools and jigs with ease after each use.

Point 1. Can tools and jigs be eliminated?

- Try to perform a function effectively by hand.

Point 2. Can the variety of tools and jigs be decreased?

- Try to consolidate the variety of operations into a smaller variety by standardizing at the design stage.

12.3 PRACTICAL RULES FOR SEITON

Point 3. Are tools positioned ergonomically?

- Avoid wasted motion and the possibility of injury to workers.

Point 4. Can workers easily identify storage for tools?

- Three methods. 

12.3 PRACTICAL RULES FOR SEITON

- Visual controls are extremely effective when used for control limits.

- A meter-zone indication is used to separate a danger zone from a normal zone.

- Fit marks are lines that are drawn on, for example, from the head of a bolt to a nut at the properly fastened position.

When the lines on the bolt and nut do not coincide with each other, the bolt is loose.

12.3 PRACTICAL RULES FOR SEITON

- Visual controls are extremely effective when used for control limits (continued).
  - To maintain a certain level or condition, a needle can be used to mark each control limit on every measure.
  - Spot marks and stop lines are used for marking the position of an item and for depicting the position to stop.
  - Separation lines divide passageways and workplace areas to guarantee the safety within a plant.

12.4 SEISO, SEIKETSU, AND SHITSUKE

- Seiso (cleaning)
  - to always clean up
  - to continually maintain tidiness
- Seiketsu (cleanliness)
  - to standardize cleanup activities
- Shitsuke (training)
  - to motivate workers to perform Seiso and Seiketsu activities

12.4 SEISO, SEIKETSU, AND SHITSUKE

- Can reveal the following conditions on the floors:
  - Rubbish
  - Water and oil leaks
  - Tire marks
  - Dust scattered by cutting materials
- Countermeasures against dirtiness must be taken at the source. (eg. Placard warning sudden starts)

12.4 SEISO, SEIKETSU, AND SHITSUKE

- Cutting instrument is one of the main sources of dirt in workplaces.

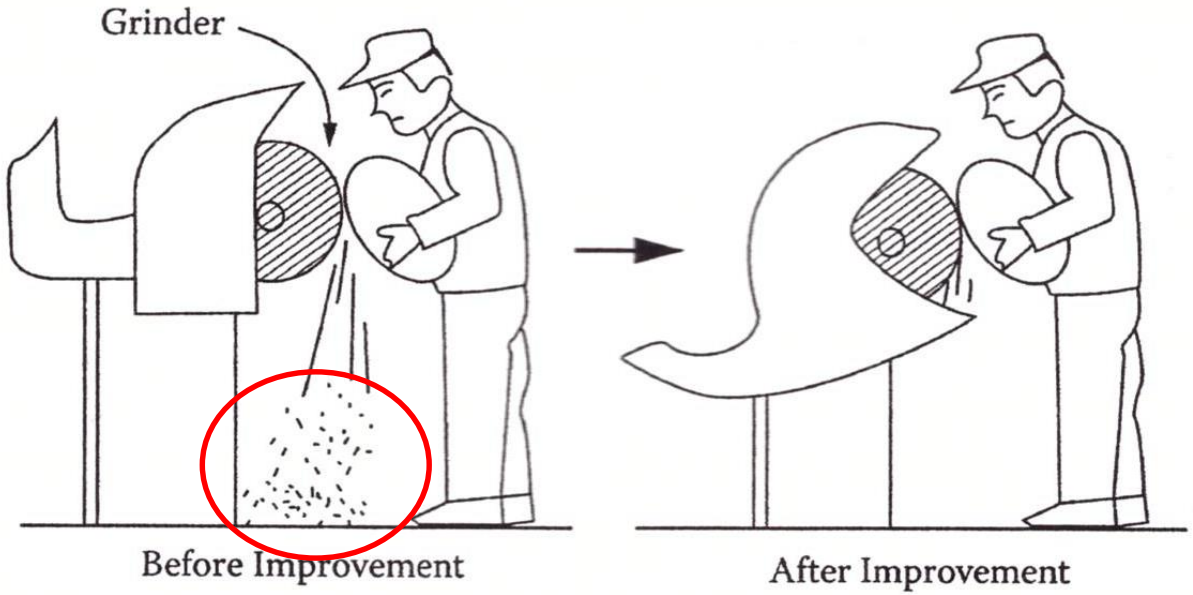


FIGURE 12.13
Use of dust collecting covers.

12.4 SEISO, SEIKETSU, AND SHITSUKE

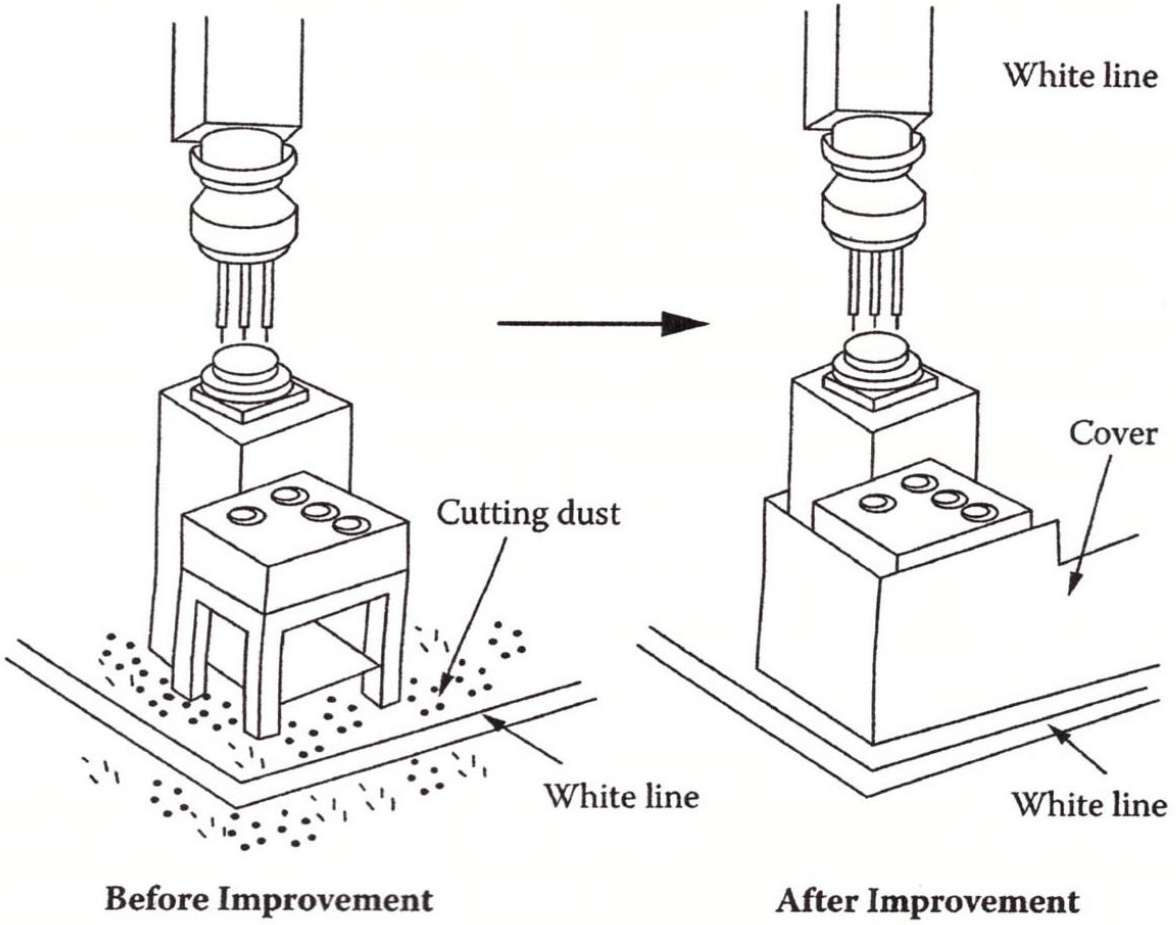
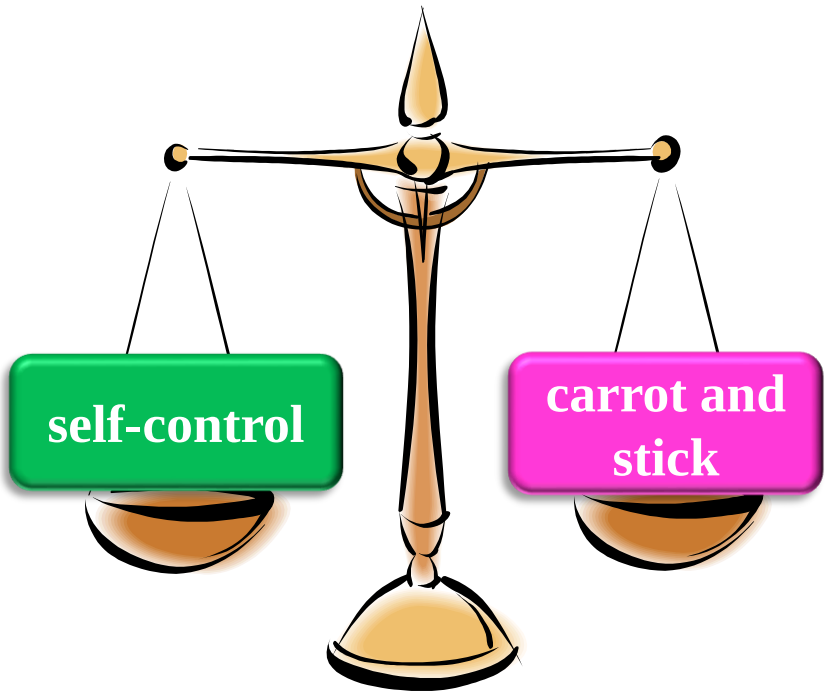


FIGURE 12.14
Cover around legs of machines and tables for rapid cleanup.

12.4 SEISO, SEIKETSU, AND SHITSUKE

- Shitsuke, motivating workers to perform the other 4 rules is the most difficult component of 5S.

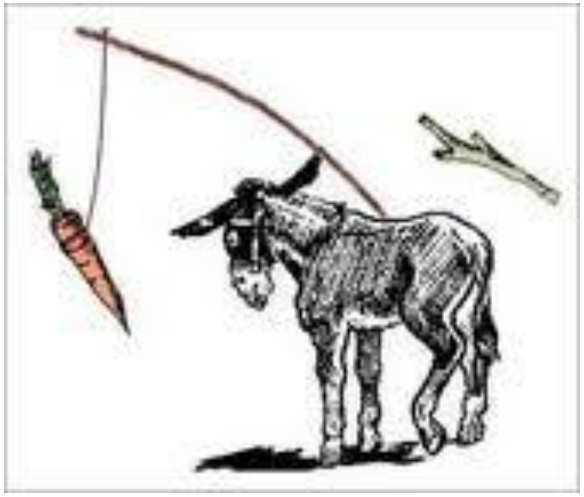
Japanese workers



Western workers

12.4 SEISO, SEIKETSU, AND SHITSUKE

- Carrot and Stick Approach (carrot or stick approach) is an idiom that refers to a policy of offering a combination of rewards and punishment to induce behavior.



- It is found that this policy did not work well for Japanese workers.

12.4 SEISO, SEIKETSU, AND SHITSUKE

- The notion of *self-control* was implemented at Toyota that emphasized the emotions of pride and shame of workers.

- The desire to improve oneself and a sense of rivalry were used to motivate workers to control themselves.

12.5 PROMOTION OF 5S SYSTEM

- Promoting 5S depends on top managers' decision.

- *Point photographing* is a strong motivational tool for 5S.
  - Take pictures of the same position of the workplace from the same direction before and after the application of 5S.
  - Comparison can make workers feel pride or shame.
  - A picture can be taken each time an improvement is made.

12.5 PROMOTION OF 5S SYSTEM

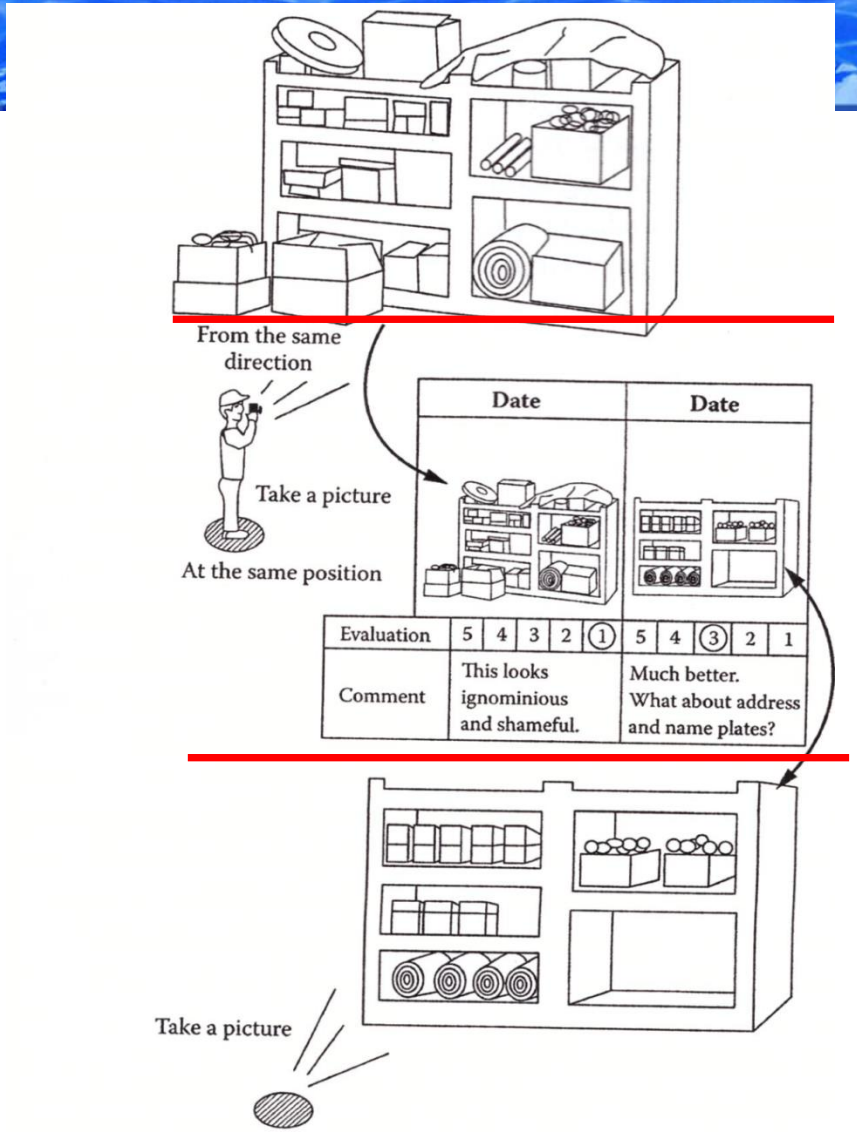


FIGURE 12.15
Point photography method.

12.3 PRACTICAL RULES FOR SEITON

Three methods

- The first method is to trace the outline of a tool or jig on the place where it is to be stored.

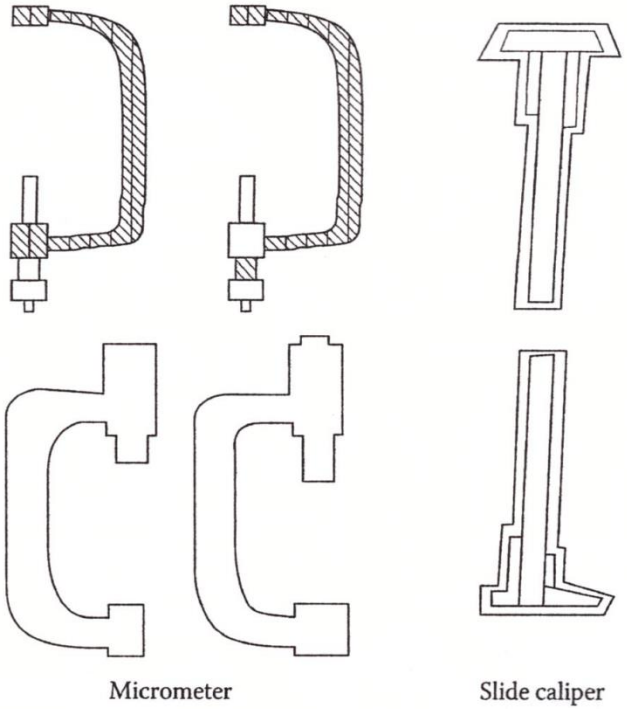


FIGURE 12.10
Tracing control.

12.3 PRACTICAL RULES FOR SEITON

Three methods

- The second method is to place tools into sacks rather than hung on a peg board in a specified location.
  - Called *blindfold returns*.
  - Allows workers to release the tool in an approximate position.

12.3 PRACTICAL RULES FOR SEITON

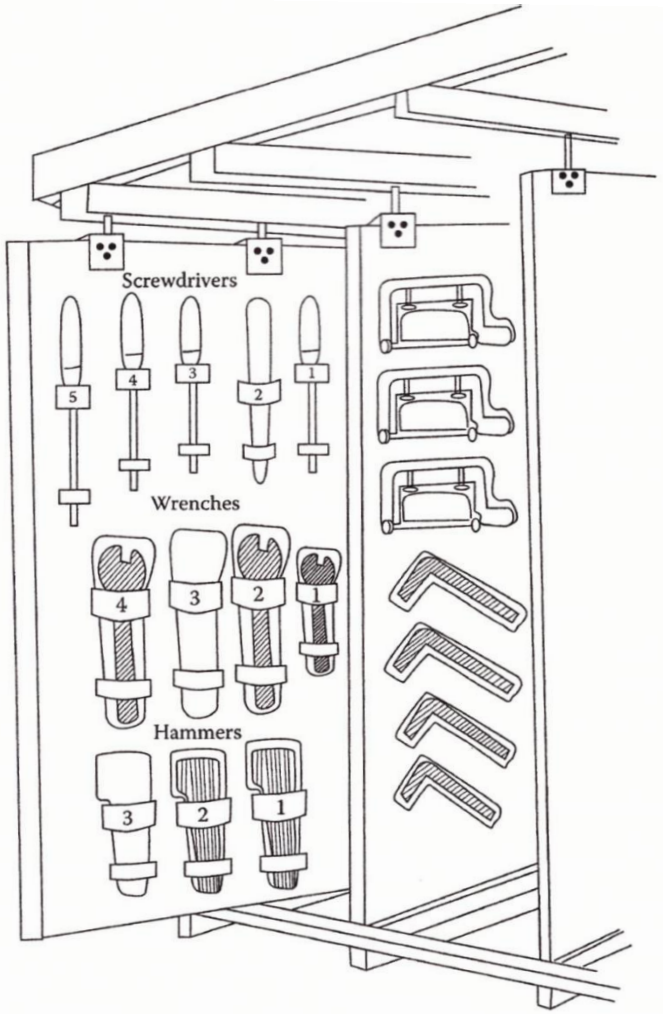


FIGURE 12.11
Blindfold return and a drawing cabinet exclusively for tools.

12.3 PRACTICAL RULES FOR SEITON

Three methods

- The third method is to suspend tools on cables hung from the ceiling.

- Allows workers to return tools immediately and unconsciously.

- Perhaps the most ideal method