

Lean System Engineering

Chapter Three

Stability

By Rukiya Nuray

Stability

what is basic stability?

- In the simplest sense stability implies general **predictability and consistent** availability in terms of (the 4Ms.)
 - » **Man power**
 - » **Machine**
 - » **Material**
 - » **Method**

- How do you know if you have enough stability in operations to proceed with flow? The answer depends upon your ability to meet a few key requirements:
 - Do you have enough machine uptime to produce customer demand?
 - Do you have enough material on hand every day to meet your production needs?
 - Do you have enough trained employees available to handle the current processes?
 - Do you have work methods, such as basic work instructions, defined or standards in place?
- If the answer is emphatically “no” to any of these questions, stop and fix the problem before proceeding.

1. Manpower

- Basic stability starts with a **well trained workforce**. Fortunately employees tend to know their jobs very well or we would all be in serious trouble
- The **three specific job training components for production supervisors :**
 1. **Job instruction,**
 2. **Job methods and**
 3. **Job relations.**

1. Manpower cont..

- **Job instruction (JI)** taught supervisors **how to plan for the correct resources** they would need in production, **how to break down jobs for instruction**, and **how to teach people safely, correctly, and conscientiously**.
- **Job methods (JM)** taught supervisors **how to analyze jobs and make simple improvements** within their realms of control.
- **Job relations (JR)** taught supervisors to **treat people as individuals and solve basic human-related problems** in production rather than to ignore them.

2. Machines

- You do not need equipment with perfect uptime, but you must know your customer demand, the capacity of your process, and the actual average output.
- If you have theoretical capacity as well as demonstrated capacity to meet customer demand then there is no problem.
- It is only when you have no demonstrated capacity to meet demand that you have a basic machine stability problem.
- For example, if customer demand is 700 units per shift and your actual output is only 500 units despite having the capacity for 1000, then you need more availability.

3. Materials

- In general the goal of lean is to **reduce waste and shorten the timeline** from when an order is received until the time it is produced. Normally this requires the **reduction of inventory** in the value stream.
- If you suffer from **basic instability**, however, you might need to **increase inventory in the short term** in some places or in some instances. The reason is because with some processes you can flow production **one by one or in very small amounts**.

Two pieces of advice on this topic.

- **First, not all inventories are waste.** Only inventory **beyond what is needed** to run the process is waste.
- **Second,** inventory often exists as a **symptom of a problem in the process**.

Solving the problem earns you the **right to reduce the inventory**.

4. Method

- Finally, achieving basic stability requires having **standard methods for manufacturing.**
- The key point here is the definition of a standard.
- The normal definition is that a standard is a **rule or way to do things.**
- The definition of a **standard** in Toyota is slightly different. A standard is a **“rule or a basis for comparison.”**
- A standard is nothing more than a **tool to measure how we are doing something and refer to when we want to make a change.**
- The standards are what we use to **measure and compare our changes so that we know if the new way is better or not.**

Lean System Standards

Three fundamental lean questions and answers about standard

1. What is a standard?

- A standard is a clear image of a **desired condition**.

2. Why are standards so important in the Lean system?

- Standards **make abnormalities** immediately obvious so that **corrective action** can be taken.

3. What makes an effective standard?

- A good standard is **simple, clear, and visual**.

Work place organization philosophy

- First impression is very important
- Cost of pure work place organization means waste
- Two segments of work place organization
 1. Visual management
 2. 5s

Visual Management

- *The Visual Management* is designed to create a visual workplace environment that is
 - » Self-explaining
 - » Self-ordering, and
 - » Self-improving.
- In a visual workplace, the out-of-standard situation is immediately obvious and employees can easily correct it.

First Impressions

"You never get a second chance to create a first impression."

First Impression: Condition of Work Area

- What does the workplace tell the customer and associates?
- Items to consider:
 - Openness of work area
 - Color coordination
 - Straight lines (desks, benches, equipment, walls, power drops)
 - Product displays
 - Performance metrics
 - Condition of walls, floors, equipment
 - Visual controls

Poor Workplace Organization Means Waste

- Unneeded inventory incurs extra inventory-related expenses and obsolescence due to design changes, limited shelf life, etc.
- Extra manpower is needed to manage the growing inventory
- Extra time spent looking for equipment, parts, components, etc.
- Quality defects result from unneeded in-process inventory and machine breakdowns
- Unneeded equipment poses a daily obstacle to production activities
- The presence of unneeded items makes designing factory/office layouts more difficult

Work Place Organization: Visual Management

- Create an environment in which anyone can walk into a workplace and visually know the current situation:
 - Visually understand:
 - ◆ workplace organization
 - ◆ the work process
 - ◆ when there is an abnormality
 - ◆ if they are ahead, behind or on schedule
 - Without opening a book or without turning on a computer
 - Without opening a file drawer
 - Without talking to anyone



visual management triangle

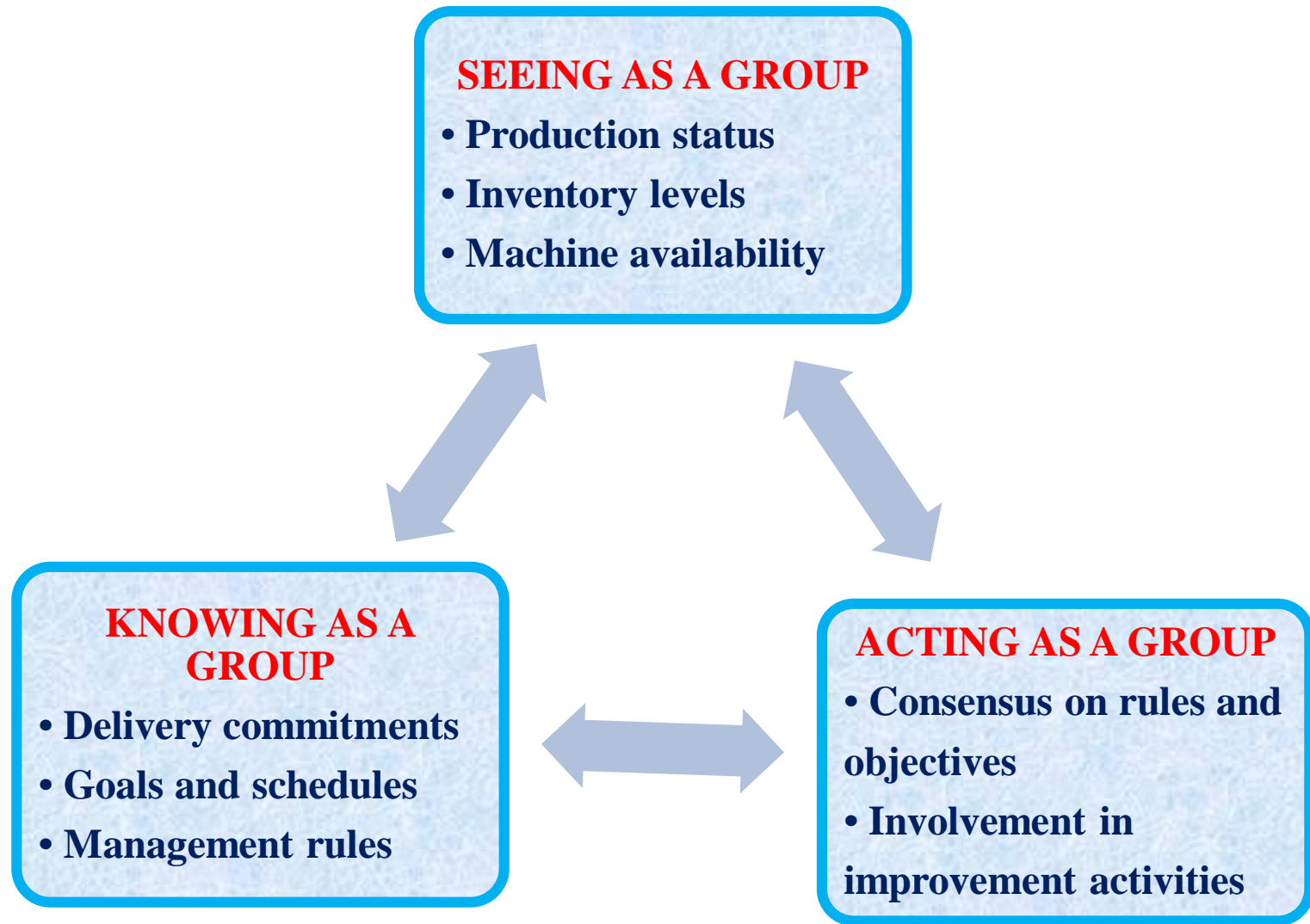
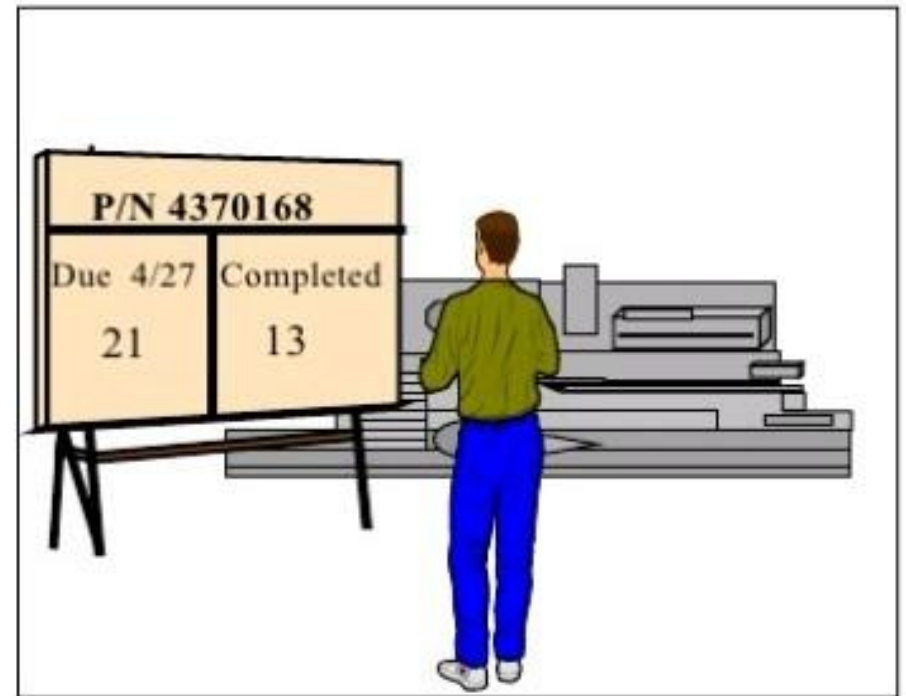


Figure 3.1 The visual management triangle.

Two Workplaces, Two Ways of Communicating



HIDDEN WORKPLACE



VISUAL WORKPLACE

Visual Management: Major Benefits

- Controls inventory levels
- Controls lot sizes
- Improves lead time in a Pull System
- Promotes One Piece Flow
- Reduces space by better organization / utilization
- Reduces energy (manual or mechanical)
- Promotes quality

Visual Controls vs. Visual Displays

Visual Display

- Displays history
- Gives people information management wants them to know
- Displays status
- Drives maintaining the status quo
- Can be interesting to look at

Visual Control

- Provides current, up to date information
- Gives people information they need to know to be successful
- Displays abnormalities to anyone clearly
- Drives improvement
- Can alert, prevent, and provide fail-safe processes

Idea Behind 5S

In order to achieve high levels of quality, safety, and productivity, workers must have a conducive working environment.

What is the purpose of 5S?

Immediately make problems visible

5S Fundamentals

WHAT IS 5S?

- It is the name of a workplace organization method that uses a list of five Japanese words:

SEIRI, SEITON, SEISO, SEIKETSU, and SHITSUKE

- It is a structured program to systematically achieve total organization, cleanliness, and standardization in the workplace.

Why 5S?

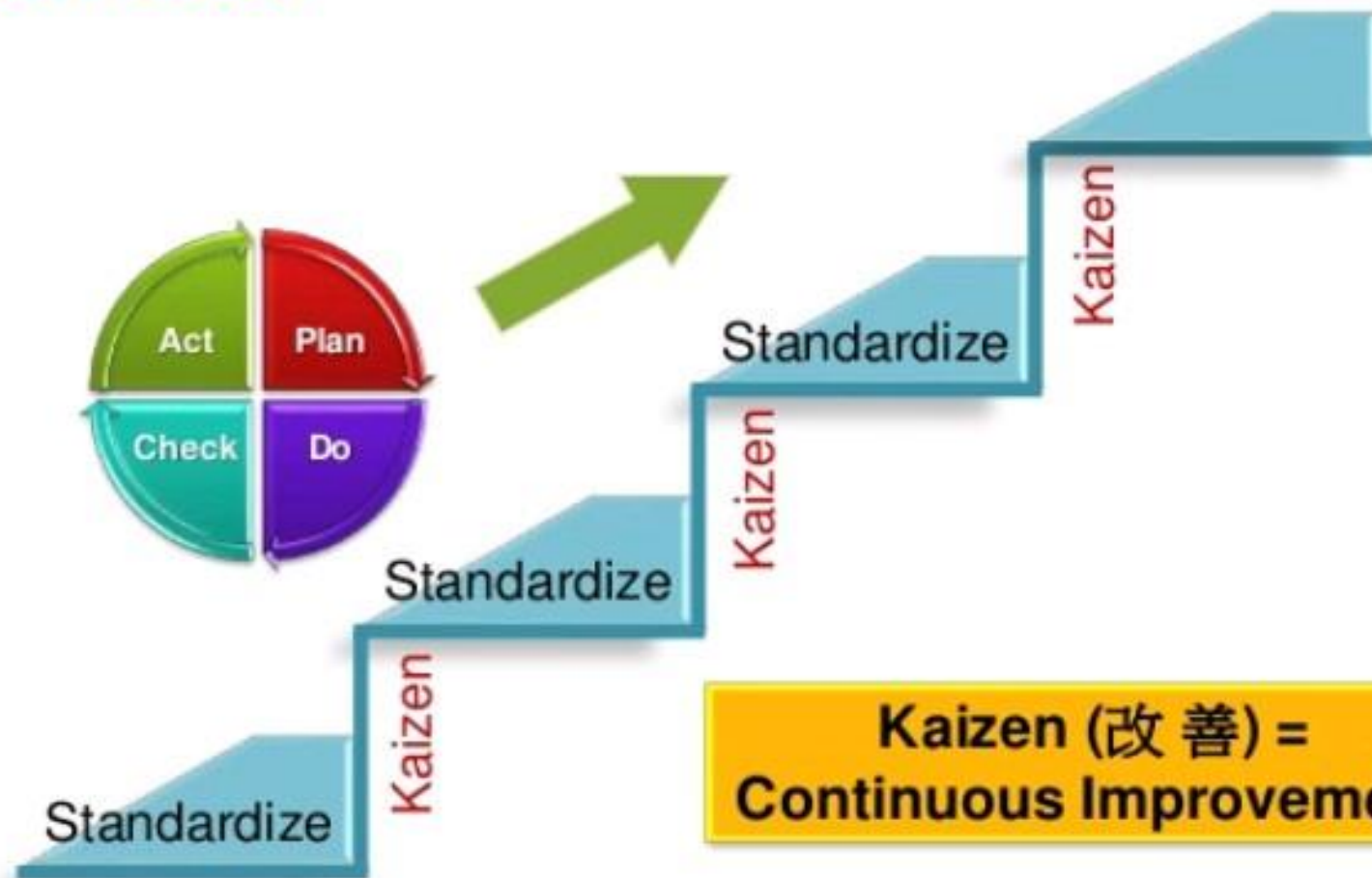
5S will teach us how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order.

“A place for everything and everything in its place.”

5s principle

	Principles	General Description
1S	Sort	Remove what is not needed and keep what is needed
2S	Set in Order	Arrange essential items in order for easy access
3S	Shine	Keep things clean and tidy; no trash or dirt in the workplace
4S	Standardize	Establish standards and guidelines to maintain a clean workplace
5S	Sustain	Make 5S a habit and teach others to adhere to established standards

5S Establishes a Baseline for Kaizen Activities



RED TAG STRATEGY

DIVIDE ITEMS INTO
Three CATEGORIES:



ATTACH TO ALL
UNNECESSARY ITEMS



NECESSARY	UNNECESSARY
<p>1. Identify the problem. What is the problem? What are the symptoms? What are the causes? What are the consequences?</p> <p>2. Identify the stakeholders. Who are the people affected by the problem? Who has a stake in the problem? Who are the decision makers?</p> <p>3. Identify the goals. What do you want to achieve? What are the objectives? What are the outcomes?</p> <p>4. Identify the options. What are the possible solutions? What are the alternatives? What are the choices?</p> <p>5. Identify the risks. What are the potential dangers? What are the possible negative consequences? What are the possible losses?</p> <p>6. Identify the resources. What do you need to solve the problem? What are the available assets? What are the available skills?</p> <p>7. Identify the constraints. What are the limitations? What are the restrictions? What are the boundaries?</p> <p>8. Identify the opportunities. What are the possibilities? What are the potential benefits? What are the potential gains?</p> <p>9. Identify the threats. What are the dangers? What are the potential negative consequences? What are the potential losses?</p> <p>10. Identify the solutions. What are the possible answers? What are the possible resolutions? What are the possible remedies?</p>	<p>1. Identify the problem. What is the problem? What are the symptoms? What are the causes? What are the consequences?</p> <p>2. Identify the stakeholders. Who are the people affected by the problem? Who has a stake in the problem? Who are the decision makers?</p> <p>3. Identify the goals. What do you want to achieve? What are the objectives? What are the outcomes?</p> <p>4. Identify the options. What are the possible solutions? What are the alternatives? What are the choices?</p> <p>5. Identify the risks. What are the potential dangers? What are the possible negative consequences? What are the possible losses?</p> <p>6. Identify the resources. What do you need to solve the problem? What are the available assets? What are the available skills?</p> <p>7. Identify the constraints. What are the limitations? What are the restrictions? What are the boundaries?</p> <p>8. Identify the opportunities. What are the possibilities? What are the potential benefits? What are the potential gains?</p> <p>9. Identify the threats. What are the dangers? What are the potential negative consequences? What are the potential losses?</p> <p>10. Identify the solutions. What are the possible answers? What are the possible resolutions? What are the possible remedies?</p>

SORT

CATEGORIZE NECESSARY ITEMS:

- * RARELY USED
* OCCASIONALLY USED
* FREQUENTLY USED



DISCARD
UNNECESSARY
ITEMS



1S : Sort



- Principle
 - Stratification management
 - Dealing with the causes
- Meaning
 - Distinguish between the necessary and unnecessary
 - Get rid of what you do not need
 - “When in doubt, move it out”

1S : Sort

Degree of Need	Frequency of Use	Storage Method
Low	<ul style="list-style-type: none">• Things you have not used in the past year• Things you have used once in the last 6-12 months	<ul style="list-style-type: none">• Throw them out• Store at a distance
Medium	<ul style="list-style-type: none">• Things you have only used between 1-6 months	<ul style="list-style-type: none">• Store in a central place in the workplace
High	<ul style="list-style-type: none">• Things used once a week• Things used daily• Things used hourly	<ul style="list-style-type: none">• Store near the work site or carry on the person

Red Tagging

- Define what you need to meet your production objectives and clear out everything else.
- The key S1 tool is red tagging.
- The red tag is a simple tag containing the following information:
 - Item classification
 - Item ID and quantity
 - Reason for red tagging
 - Work section
 - Date

Red-Tagging

- The 3 Questions

- Is this item needed?
- If it is needed, is it needed in this quantity?
- If it is needed, does it need to be located here?

- Holding Areas

- A “safety net” between questioning whether something is needed and getting rid of it
- Items held for a set time (30 days)

Sort

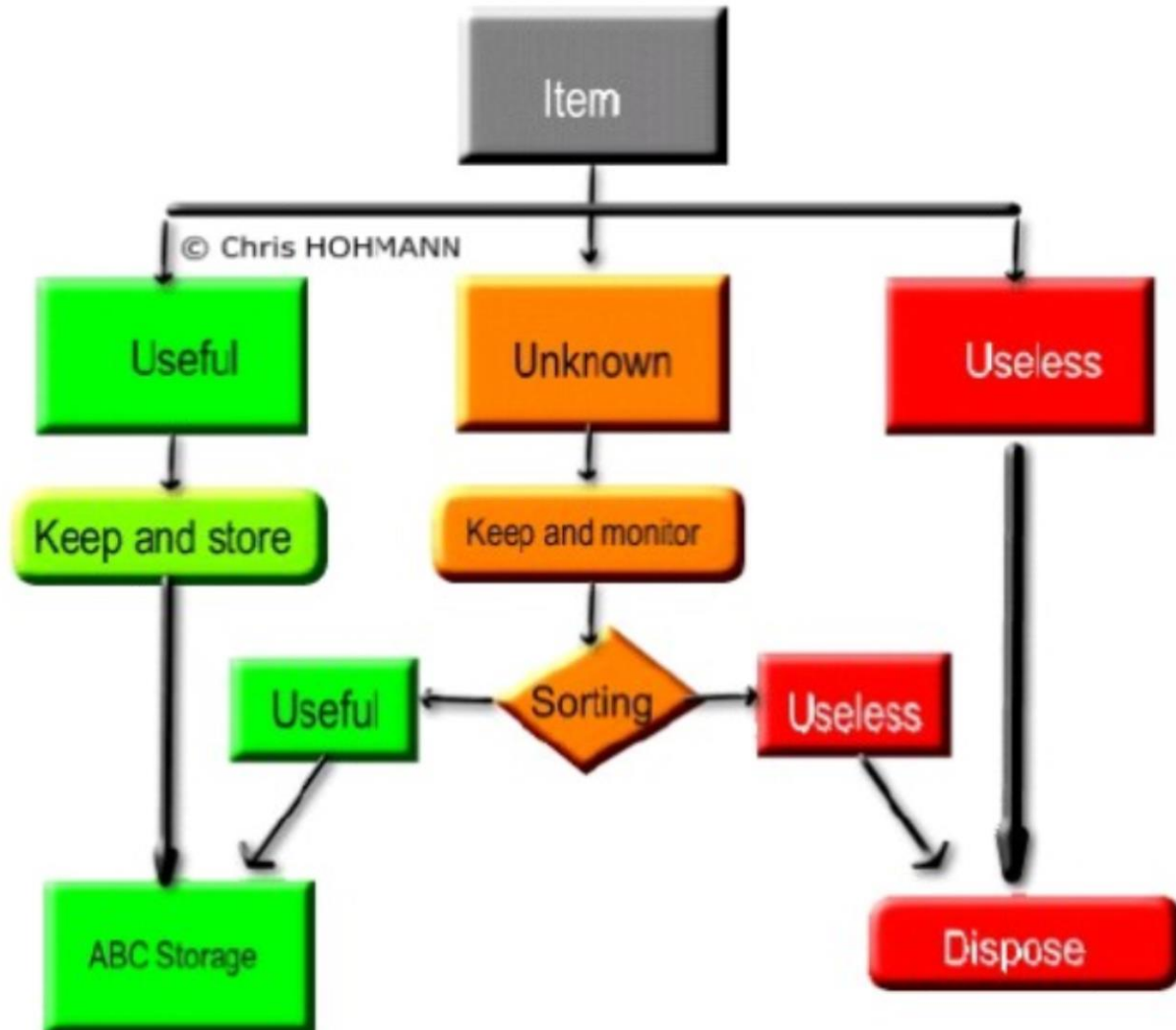


Check Item

Action

- Any unused / unneeded items
 - Discard, throw away (Red Tag and Segregate)
- Items almost never used
 - (Yellow Tag) Evaluate over time.
- Items for which no immediate use is planned, but which must be stored on the chance they will be needed later
 - Keep in work area (Green Tag)
 - Use white squares to mark location, or store on tool board or another centralized storage unit
- Items used frequently

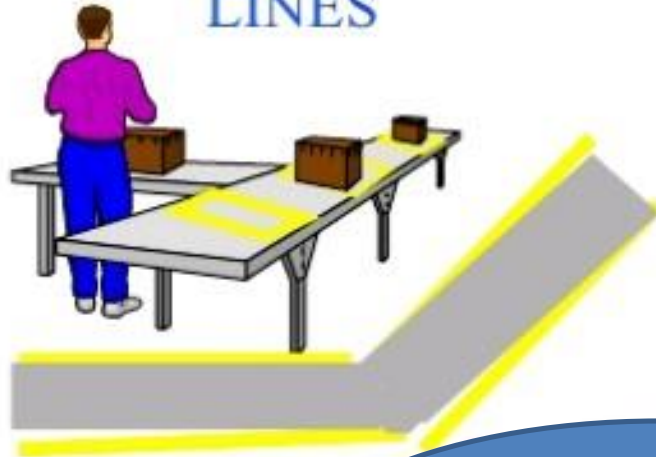
Red Tagging



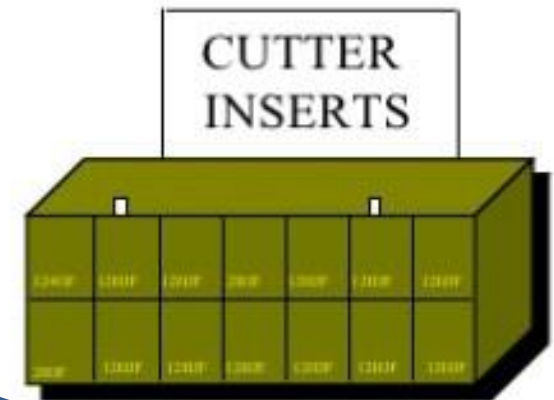
RED TAG

Category	1. Raw material 2. In-process stock 3. Semi-finished goods 4. Finished goods 5. Equipment		6. Dies and jigs 7. Tools and supplies 8. Measuring devices 9. Documents 10. Other	
Item name and number				
Quantity	Units	\$ Value		
Reason	1. Not needed 2. Defective 3. Not needed soon 4. Scrap material 5. Use unknown 6. Other			
Disposal by:	Department/Business Unit/Product Center			
Disposal method:	1. Discard 2. Return 3. Move to red-tag storage site 4. Move to separate storage site 5. Other			Disposal complete (signature)
Posting date:		Disposal date:		

IDENTIFICATION LINES



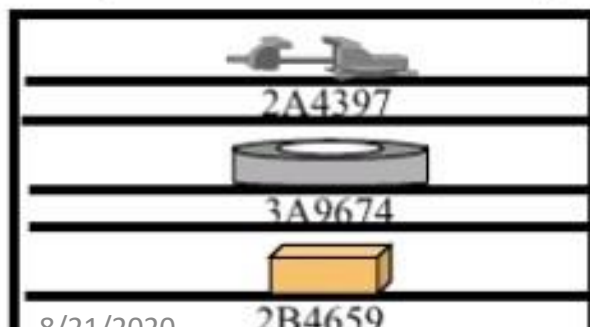
DETERMINE LOCATION FOR NEEDED ITEMS



2s set in order

VISUAL LOCATIONS

PW2000 FIXTURES



POINT OF USE STORAGE



2S : Set In Order



- Principle
 - Functional storage
 - Search elimination
- Meaning
 - Arrange essential items in order for easy access
 - A place for everything
 - Everything in its place after use

2S : Set In Order - Examples



3S : Shine

- Principle
 - Cleaning as inspection
 - Degrees of cleanliness
- Meaning
 - Eliminate the sources of dirt and filth
 - Cleaning as a form of inspection
 - Clean everything, inside out
 - Shine check sheet



3-Step Approach to Cleaning

Macro



Individual



Micro

Common areas, walls, ceilings, lights, storage areas, toilets, “junk yards”, shelves, filing cabinets, etc.

Individual workstations, chairs, drawers, computers, cabinets, shelves, etc. Clear away things underneath your table!

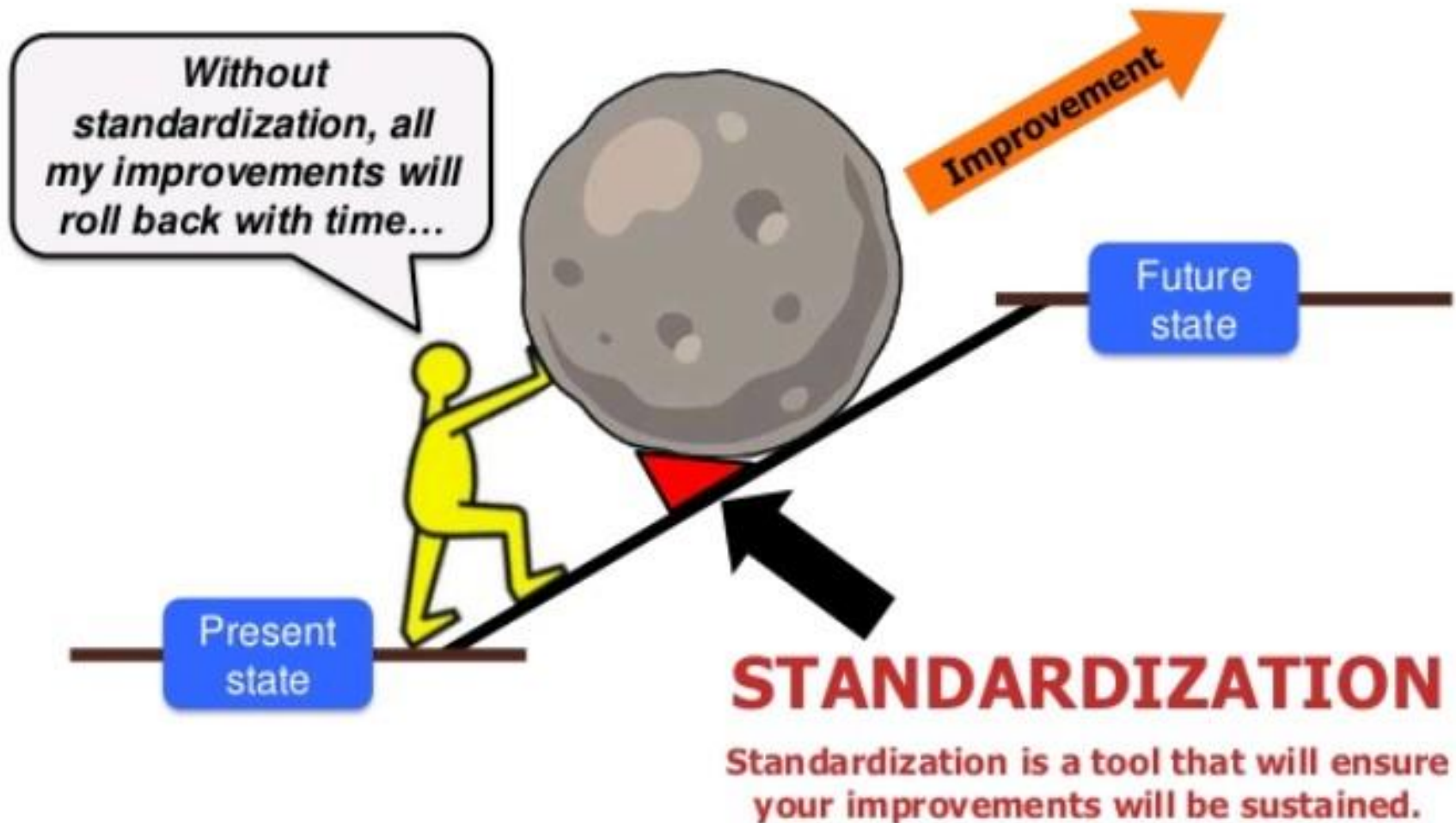
Measuring instruments, e.g. micrometer, gauges, vernier calipers, contact surfaces, etc.

4S : Standardize



- Principle
 - 5S standardization
 - Visual management
- Meaning
 - Establish guidelines
 - Make standards and guidelines visual
 - Make standards so that any abnormality becomes visible
 - Use visibility tools

Standardization is the Way to Sustain the Gains



Foundations of Standardized Work



5S : Sustain

- Principle
 - Habit formation
 - Disciplined workplace
- Meaning
 - Training
 - 'Before' and 'after' photos
 - Daily 5S five-minute activities
 - Self-discipline



How to Sustain 5S?

- Get management commitment
- Get everyone involved
- Get authorization from management for 5S activities
- Promote 5S in the organization
- Do it all the way
- *Gemba* walk by CEO
- Conduct monthly review by 5S committee
- Use 5S as a platform to launch other continuous improvement programs/initiatives

Where Are We Now?

- ◆ In a *third-rate* workplace, Associates leave trash and no one stops to pick it up.
- ◆ In a *second-rate* workplace, Associates leave trash but others pick it up.
- ◆ In a *first-rate* workplace, no one leaves trash but Associates would pick it up if they saw it.

This is World Class!

Total Productive Maintenance

- “The performance standard is zero breakdowns.”

Seiichi Nakajima

- **5S** naturally leads to total productive maintenance (TPM), which is the key to **machine stability and effectiveness**.
- TPM assigns basic maintenance work such as **inspection, cleaning, lubricating, and tightening to production team members**.
- This frees up maintenance team members for **predictive maintenance, equipment improvement and overhauls, training, and other high-value activities**

- TPM represents a profound shift from the ***“I OPERATE; YOU FIX” MINDSET, TO “WE ARE ALL RESPONSIBLE FOR OUR EQUIPMENT, OUR PLANT, AND OUR FUTURE.”***
- Just as in safety, where the **target is zero accidents**, **the target of TPM is zero breakdowns.**

TPM = (Preventive + Predictive maintenance) + Total involvement

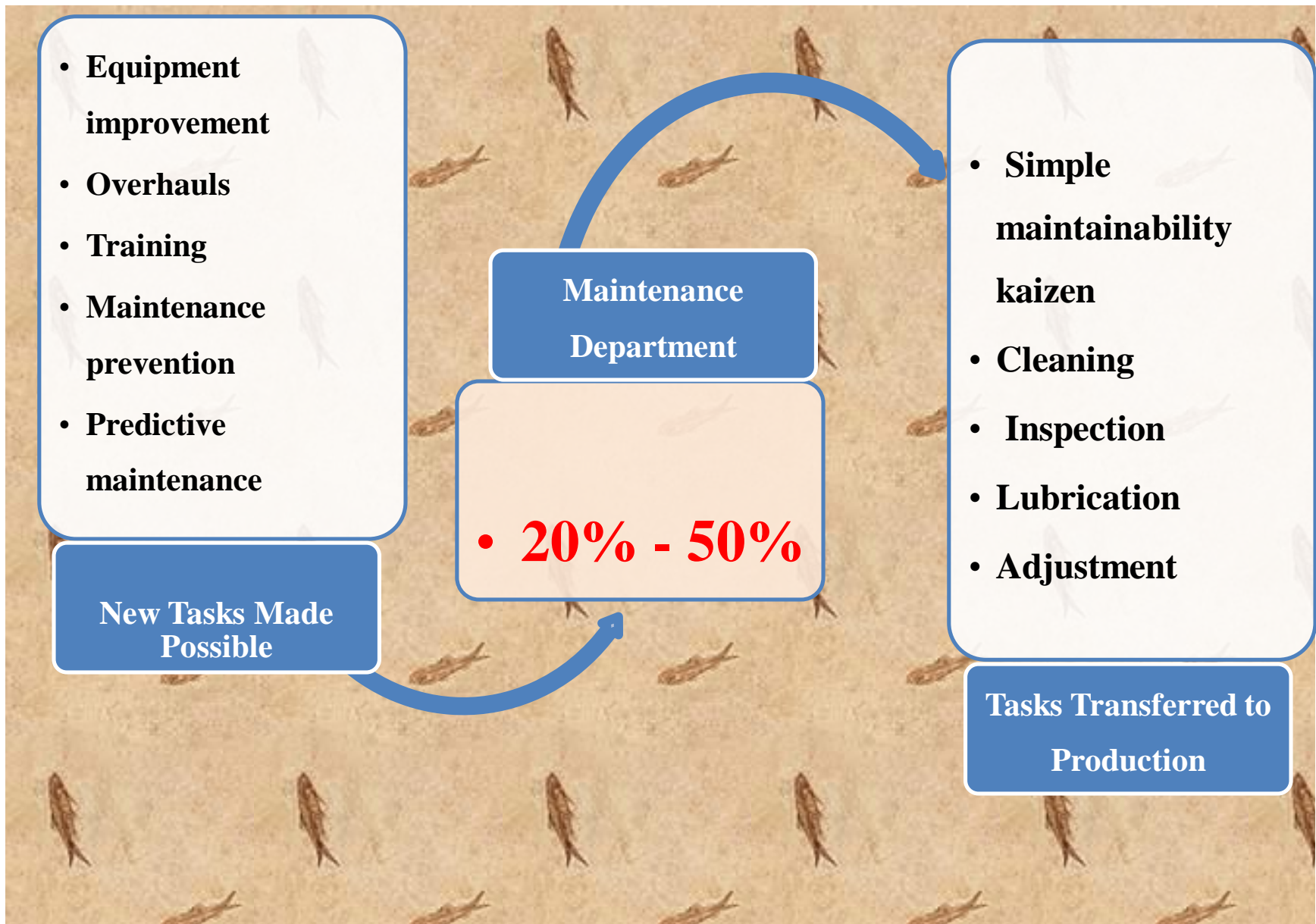


Figure 3.2 How TPM shifts maintenance tasks.

Six Big Losses

- TPM entails involving all team members to **eliminate the six big losses that downgrade machine effectiveness:**

- **Downtime**

1. Equipment breakdowns
2. Setup and adjustment delays

- **Speed or Hidden Losses**

3. Idling and minor stoppages (the machine is being run but no product is processed)
4. Reduced speed (the actual machine speed is less than the design speed)

- **Defects**

5. Process defects (e.g., scrap, defects that require repair)
6. Reduced yield (e.g., from machine startup to stable production)