3

Understanding Japanese Manufacturing

Soft Skill Text for
Japan-India Institute for Manufacturing

METI
Ministry of Economy, Trade and Industry

Japan-India Institute for Manufacturing®

AOTS
The Association for Overseas Technical Cooperation and Sustainable Partnerships

Synopsis

This text material was prepared in 2025 for students enrolled in the Japanese Institute of Manufacturing (JIM), a corporate-run school in India entrusted by the Ministry of Economy, Trade and Industry of Japan [METI].

In this Chapter, the order of the sections is well organised so that the reader can move step by step from the basics of small productivity improvement activities (Kaizen) to company-wide production systems, which are the trend in many countries around the world. The final section also shows students reading this textbook how they can start their own careers in manufacturing.

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Features of Japanese manufacturing

Section 1 Features of Japanese manufacturing

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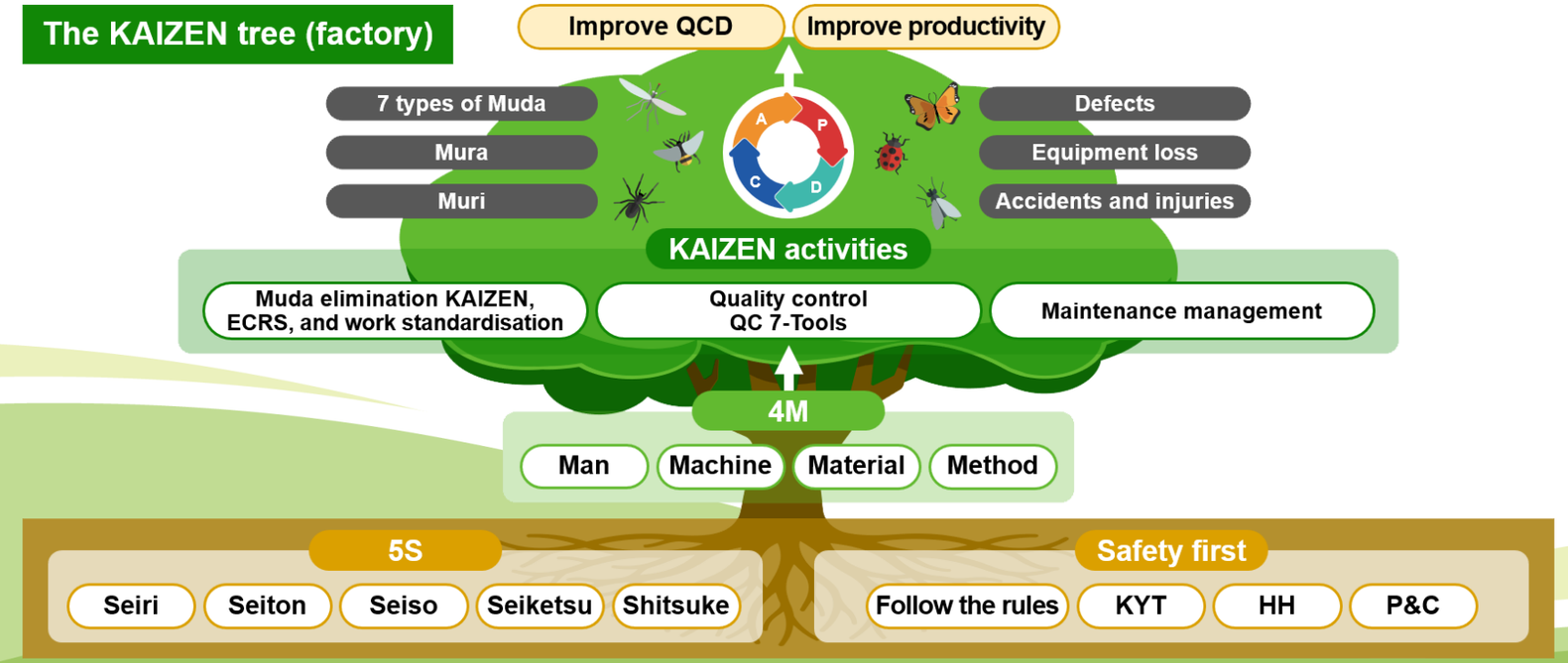
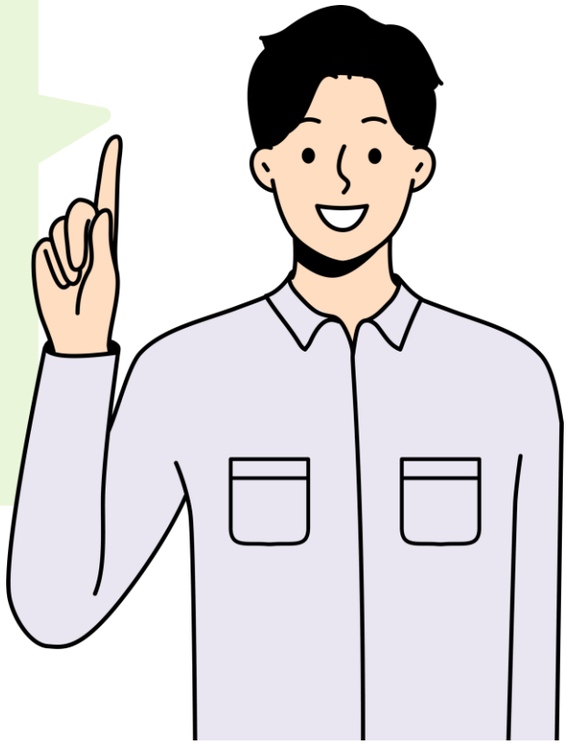
- **Problem solving through the Gemba-principle**
- **Continuous KAIZEN activities**
- **Manufacturing activities carried out by teams**



Key points of Section 1

Japanese manufacturing has various features.
The three typical characteristics are introduced here.

1. **Problem solving through the Gemba-principle**
2. **Continuous KAIZEN activities**
3. **Manufacturing activities carried out by teams**



Gemba-principle emphasise sites of production

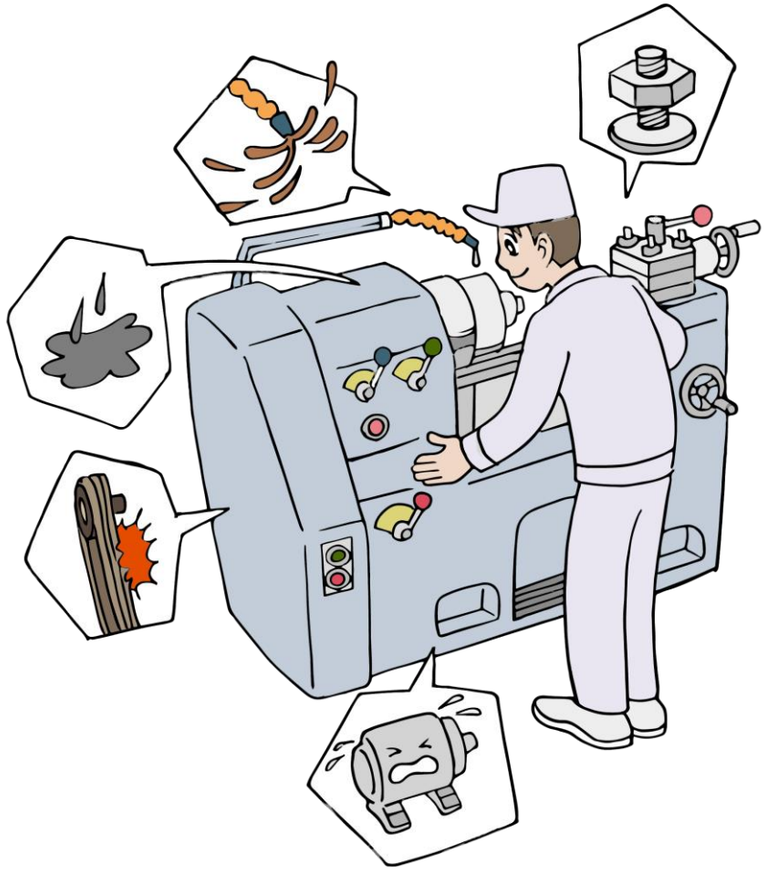
- Traditional Japanese way of manufacturing is based on the idea of problem-solving at the actual site, on the actual part and in the actual situation.
- When a problem occurs at the workplace, the people concerned get together and make their best efforts to solve it by finding the root cause by paying careful attention and giving their thorough consideration to the problem.
- There are certain differences between Japan and other countries in the manufacturing method and its philosophy.

Gemba-principle emphasise sites of production

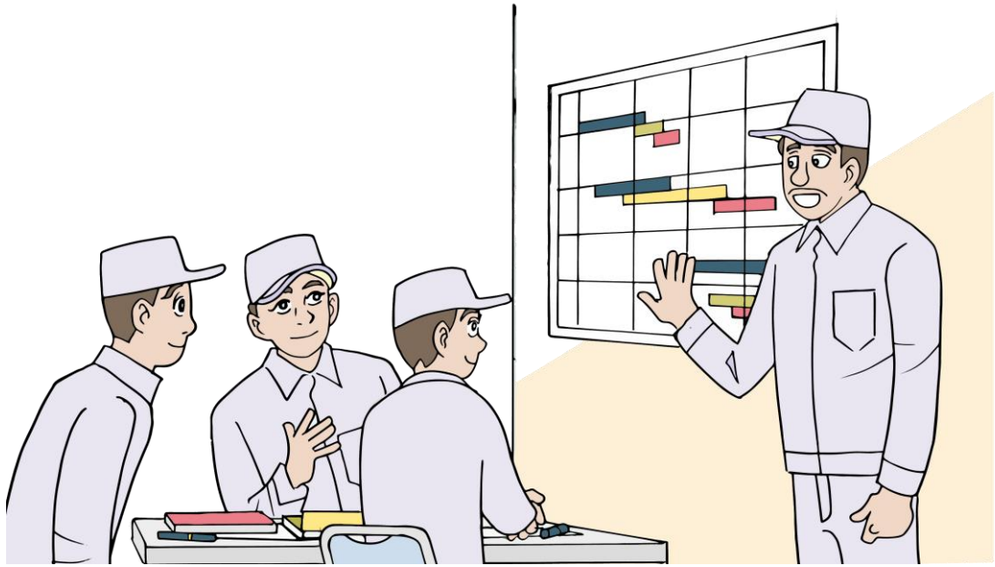
- Gemba is a Japanese word and means “the actual site.”
- Gemba-principle is based on the following ideas.

  - It is in Gemba that the production takes place and the actual values are added.
  - Operators are always observing Gemba carefully and are ready to find solutions immediately, whenever a problem occurs.

Gemba-principle emphasise sites of production



A problem occurs unexpectedly at a site



Workers at the site thoroughly consider the problem and cope with it by themselves

What is KAIZEN?

- KAIZEN means “continuous improvement”.

It means activities to enhance productivity while eliminating Muda continuously. Further elimination of Muda requires a new and better way of production because you can’t expect more when you just follow the same way as before.

KAIZEN is to improve things today so that they are better tomorrow and therefore it’s a never-ending challenge.

Outline of KAIZEN Activities

- KAIZEN activities are focused on the thorough elimination of Muda. 5S activities are the basis of KAIZEN.

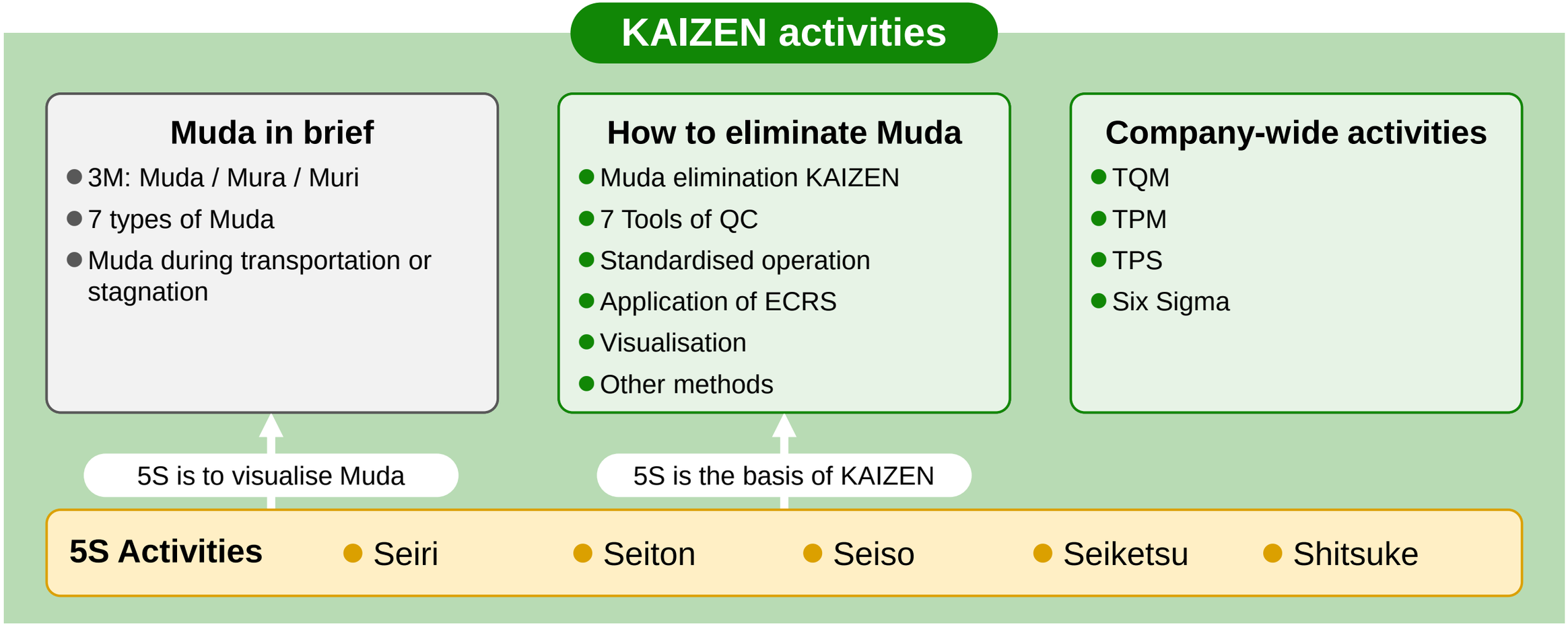


Image of KAIZEN Activities

KAIZEN activities can be visualised as follows:

The KAIZEN tree (factory)

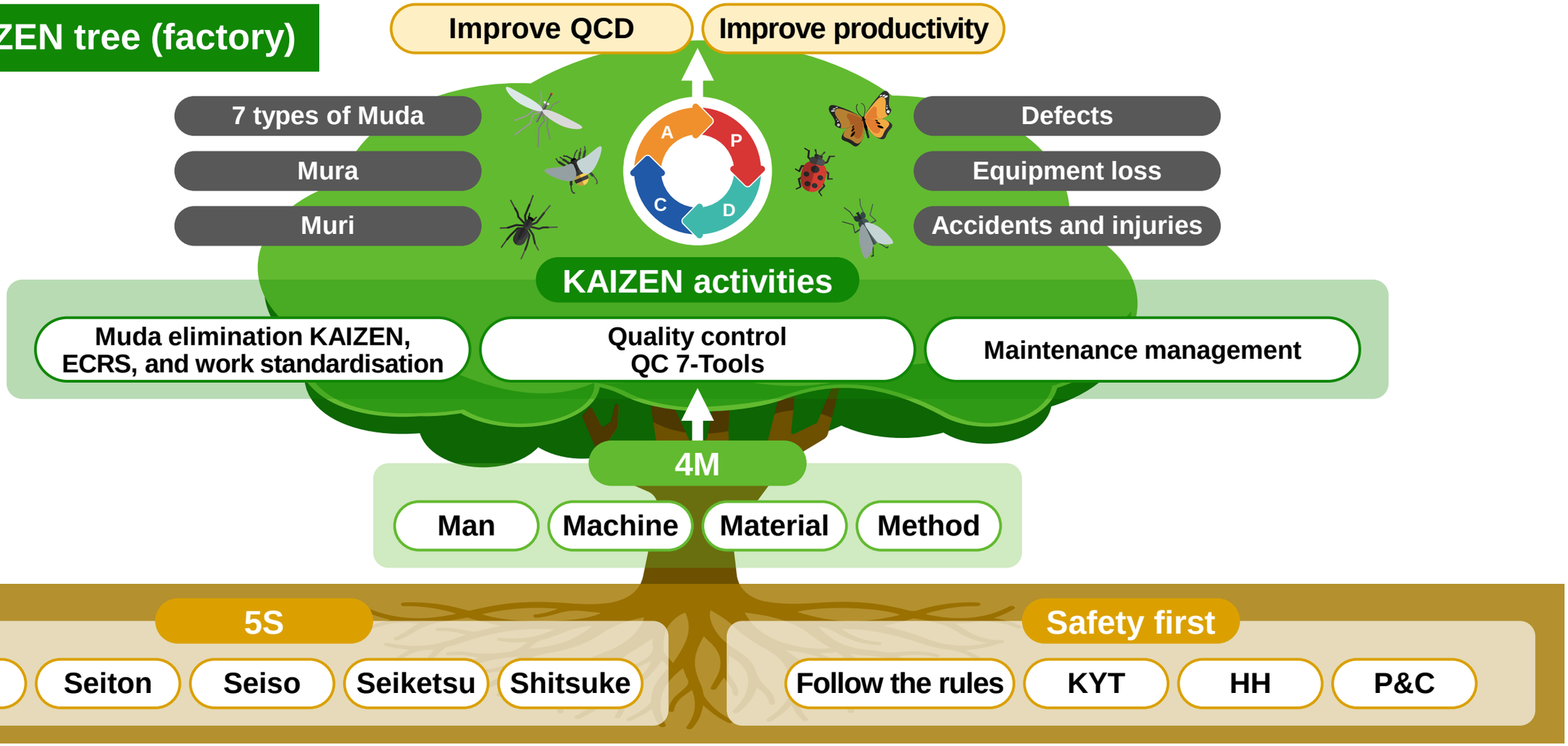


Image of KAIZEN

- A depiction of KAIZEN activities is as follows:

  - 5S activities and safety activities are the foundation (roots in the ground) of a production site.
  - The inputs for production activities are the 4M (Man, Machine, Material and Method).
  - Muda, Muri, Mura, equipment loss, defects, accidents, and injuries are hidden within the factory.
  - These problems can be eliminated through KAIZEN activities.
  - KAIZEN activities involve the PDCA cycle.
  - Due to KAIZEN, QCD and productivity can be improved.
  - As a result, factory profits increase.

Emphasis on team work

Japanese companies emphasise job execution by a team. The sense of togetherness and belonging in a team is usually very strong. Thus, working on a task together generates collective power leading to the competitiveness of Japanese companies.

Emphasis on team work

- At a production site, working together as a team is essential. Doing small group activities such as quality control circles, which are called QC circles, is encouraged in Japan.

“KAIZEN” is originally a Japanese word meaning improvement but nowadays in manufacturing site it is commonly used as an English word.

Emphasis on team work

- Good products come from good teams.

Problem solving
conducted by a team

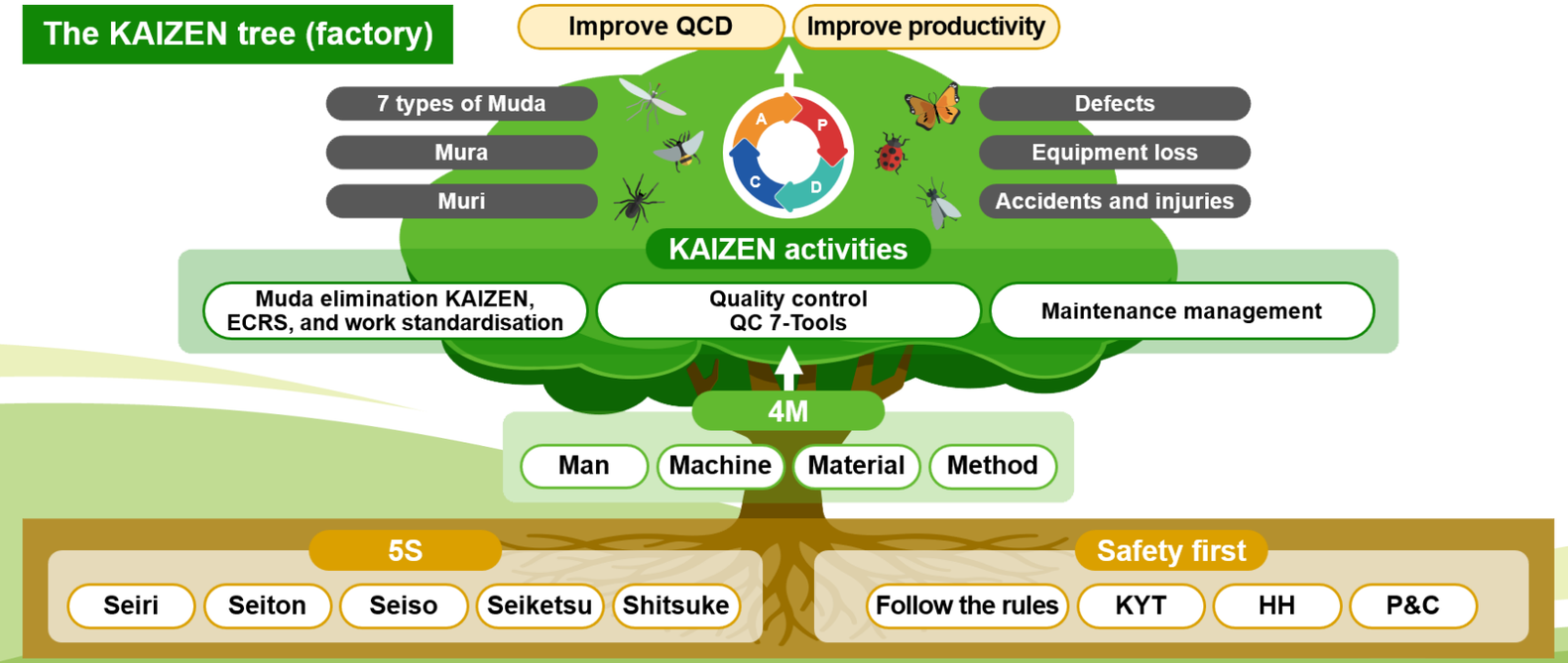
Section 2

Approach to safety

Section 2 Approach to safety

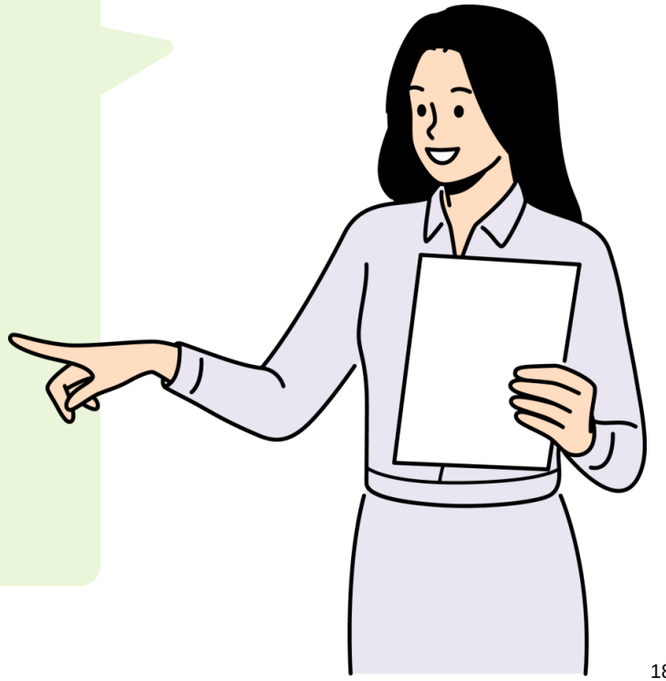
Contents

- **Safety first manufacturing**
- **Following the rules for proper production**
- **Five risks at the production site**
- **Activities to reduce risks**



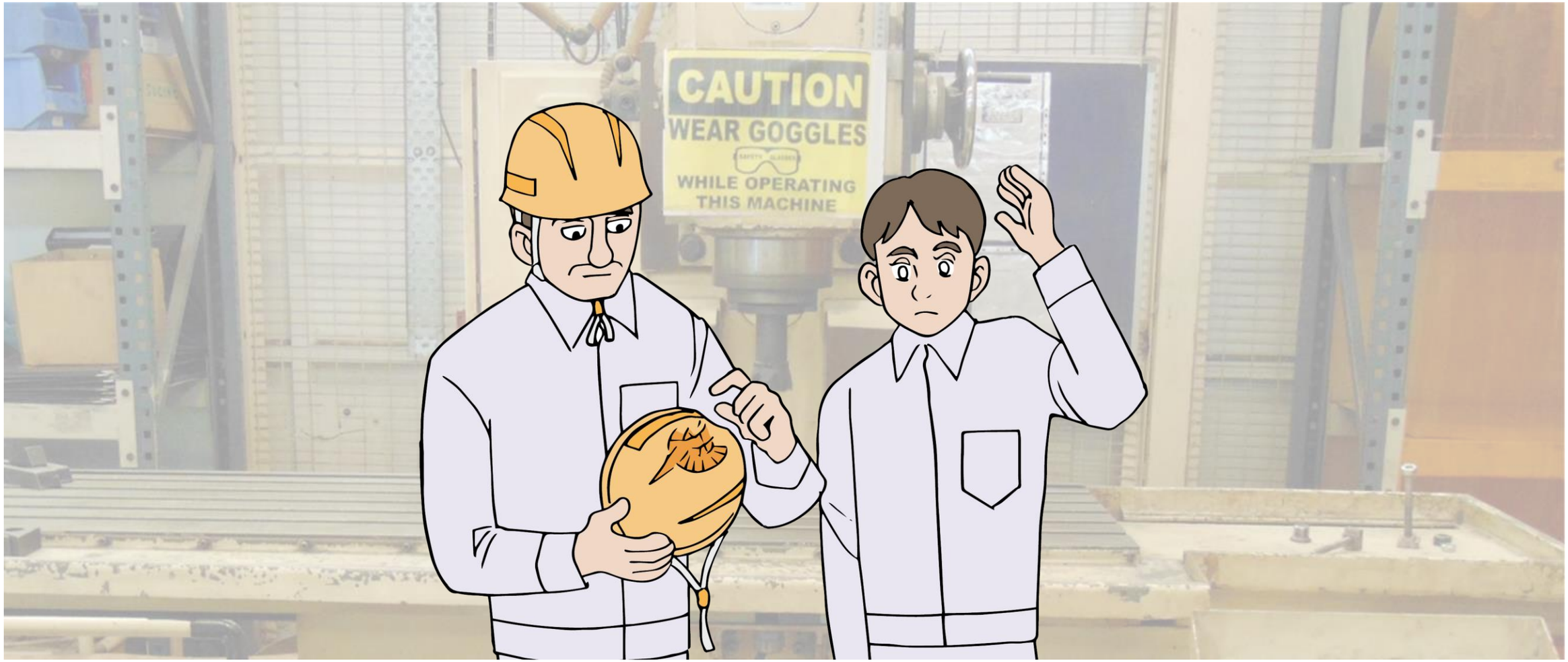
Key points of Section 2

- Safety takes priority over production and quality.
- Therefore, safety must be understood by everyone working at the factory.
- To maintain safety, it’s important to follow the rules, be aware of the risks that lurk in the factory, and reduce those risks.
- In this section, you will learn fundamental approaches to maintaining safety.



Your job starts with safety

- Efficient and high quality work is not feasible unless you are able to perform ‘safe work’.



Safety first

- Securing of safety should come with maximum priority
- Securing of safety is the essential condition for your life
- Respect for humanity should be a primary concern
- Basis of all work should be on the ‘Safety First’ principle

Accidents and hazards

- Big loss for the company and society

With production stopped, the company can’t manufacture and accept an order; The credibility of the company will be lost.

- Unhappy for you and your family

Your everyday life will be interrupted severely. You might be caught by a tragedy including death; Everyone will become unhappy.

For proper operation

- Follow operation rules

Work in compliance with the company’s regulations and rules.
Operations must be based on standardised work instructions and work standards.

- Follow safety rules

Follow your company’s own safety rules.
Comply with the state rules and regulations of safety in India.

For proper operation

Basic Rules in Factory

- Wear your uniform, cap, safety shoes and protective gear properly.
  (Uniform: no rolling up of sleeves, no turning up of trouser bottoms, no lifting up of hems, no turning up of collars)
- Don’t put your hands in your pockets while walking.
- Use the handrail when you go up and down stairs.
- Work with the proper license if it’s required.
- Cut off the power source without fail at the time of error, repair or inspection.
  (Electric / pneumatic / hydraulic source)
- Don’t stay under suspended things.
- Don’t get close to a running forklift.

For proper operation

Safety traffic

- Leave no materials and obstacles in passage ways.
- Maintain appropriate lighting.
- Keep passages free from being slippery and avoid stumbling.
- Display entrances/exits and emergency escape routes.
- No shortcuts. No going out of permitted routes.
- Follow staff instructions for certain operations such as crane work.
- Stop before crossing passages, entrances, and T-junctions and look left and right for safety.

For proper operation

Proper attitude towards work

- Keep regular sleeping and eating patterns.
- Don’t have irregular habits like staying up late at night.
- Don’t put your hands in your pockets during work.
- Exchange greetings.
- Be punctual.
- Practice Hou-Ren-Sou (Japanese compound word meaning reporting-communication-consultation).

Source: National Institute of Advanced Industrial Science and Technology (AIST)

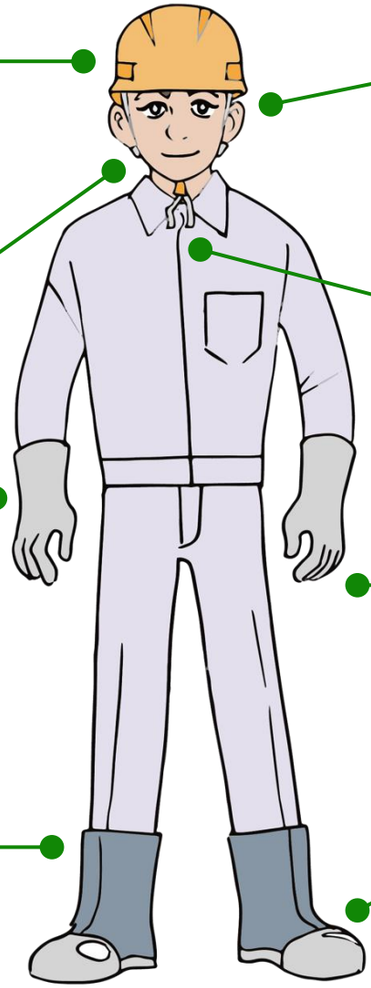
Work uniform and protective gear

Safety traffic

- Always wear a clean work uniform.
- Choose a work uniform that fits your body.
- Keep your clothes buttoned properly to avoid being caught in machinery.
- Wear clothes properly even in hot weather or while working in a hot place.
- Don’t put anything unnecessary for work in your uniform pockets.
- Don’t commute wearing your work uniform, because it might be contaminated by oil and/or harmful substances from the workplace.
- Observe rules about wearing protective gear without fail, if it’s required in the workplace.

Work uniform and protective gear

Always check your protective gear before work



Helmet

To protect your head
from the danger of falling or falling objects

Chin strap

To prevent your helmet
from coming off when you fall or stumble

Wrist cover

To protect your wrists
from being injured

Legging

To protect your ankles
from being injured

Eye protector

To protect your eyes
from flying objects

Buttons / zipper

To protect your chest
from backlash of steel and others

Gloves

To protect your hands
from being injured

Safety shoes

To protect your feet
from falling objects

Work uniform and protective gear

- Safety check points of your uniform/safety gears

- ☐ Are you wearing a protective hat and keeping the chin strap tight?
- ☐ Is it good protection for both falling objects and falling risks?
- ☐ Are you using a safety harness for working at a place 2m or higher above the ground?
- ☐ Are you wearing gear to protect your feet including safety shoes?
- ☐ Are you wearing clothes properly?
- ☐ Aren’t you wearing a towel around your neck?
- ☐ Are your sleeves kept tidy?
- ☐ Isn’t there any tear or ripping in your uniform?
- ☐ Are you using a safety harness hook with a diameter of less than 50mm? Is the rope shorter than 1.5 meters? Isn’t there any break or damage on the rope and harness?

Pay attention to Safety signs

- Prohibition marks: to prohibit any dangerous actions

Pay attention to Safety signs

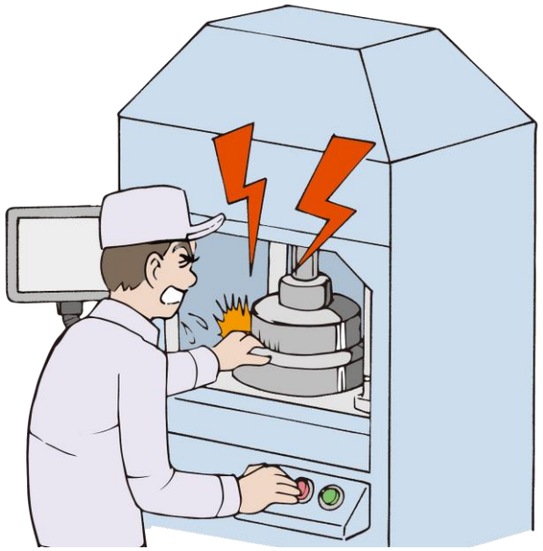
- Attention marks: Warning to dangerous things, places and conditions

Five types of risks in the workplace

1. Mechanical risk
2. Chemical risk
3. Electrical and heat risk
4. Risk in working conditions
5. Risk in own behaviour

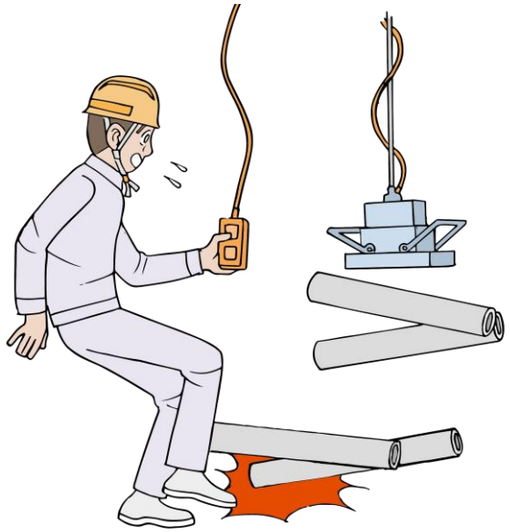
Mechanical risk

Case 1



Hand sandwiched
in press work

Case 2



Metal bar dropped
from hoist

Type of accident

Get caught in; Drawn in; Falling; Rolling down; Machine broken; Machine ruptures

Cause of risk

Stamping machine; Assembly robot; Machine tools; Transfer equipment; Crane; Boiler; High pressure tank, and more

Chemical risk

Case 3

Thinner poisoning during tank washing

Type of accident

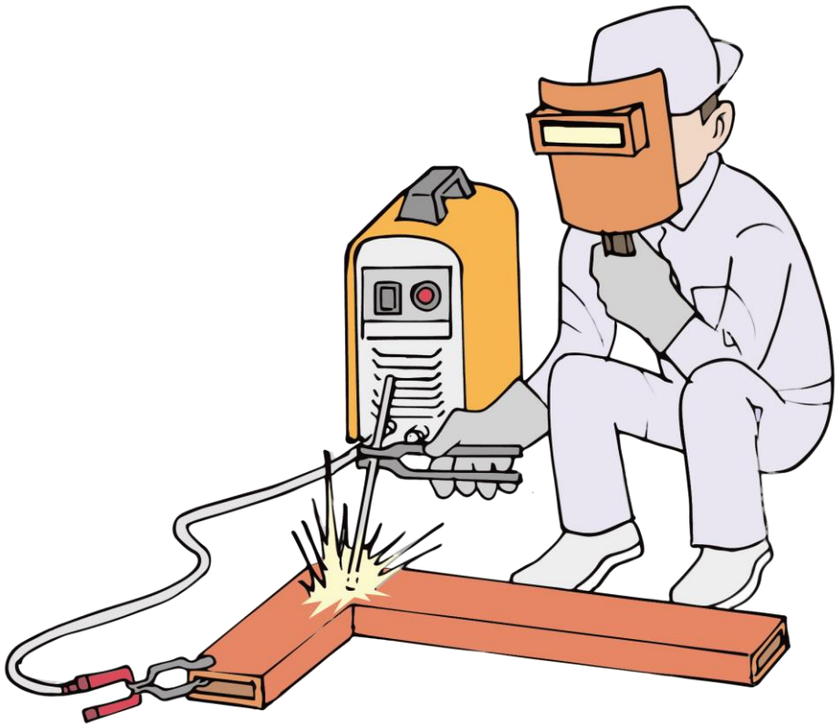
Damage by explosive; Inflammable / ignitable / combustible materials; Damage by corrosive liquid or poisonous material

Cause of risk

Explosive compound; Petrol; Kerosene; Hydrogen gas; Sulfuric acid; Hydrochloric acid, and more

Electrical and heat risk

Case 4



Dust spattering by arc

Type of accident

Electrification; Fire; Overheat; Electric leak; Burn injury; Eye injury

Cause of risk

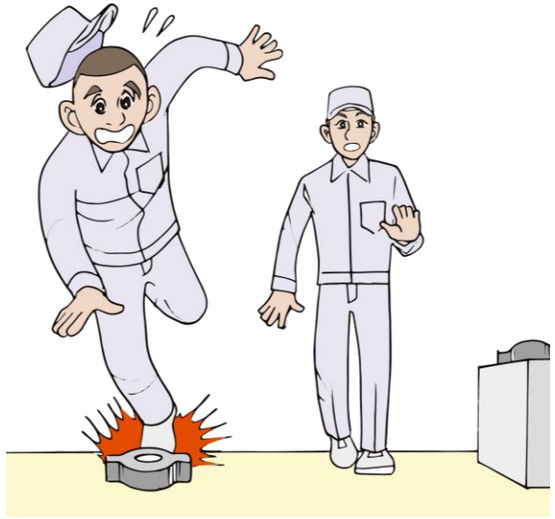
Electric appliance; Electric spark; Power wire failure; Heat generating equipment; Boiler, and more

Risk in working conditions

Case 5

Falling from
deck of a truck

Case 6



Stumbling by tripping over
a part left on the floor

Type of accident

Get caught in; Drawn in; Falling; Rolling down; Machine broken; Collision

Cause of risk

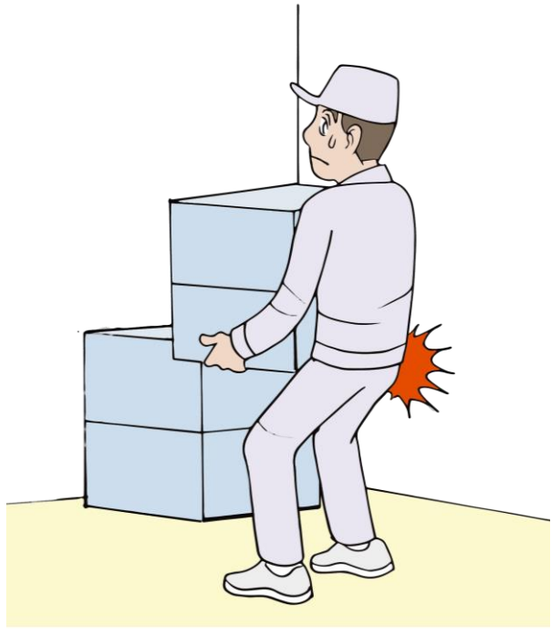
Construction; Civil engineering; Manufacturing; Transporting, and more

Risk in own behaviour

Case 7

Metal chips jump into eyes during deburring work with a handheld grinder

Case 8



Lower back pain by lifting heavy object

Type of accident

Accidents caused by carelessness and improper behaviour including all of these cases exemplified in previous slides.

Cause of risk

Risky personal behaviour triggers the accidents explained here.

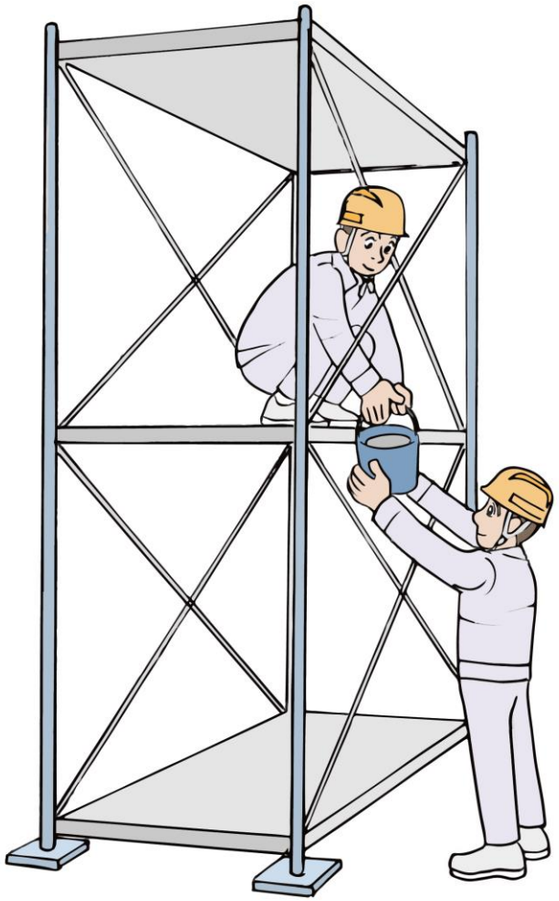
Activities to reduce risks

- There are activities to keep the workplace safe and prevent accidents and disasters from occurring. Two specific hazard prevention activities are introduced below.

  - Activity to predict risks and take necessary actions
  - Activity to eliminate human errors that may cause a hazardous situation

Activities to reduce risks

Case 1



Q

You are passing a bucket filled with sand to another operator on scaffolding.
What risk (accident) may happen next?

Predict risks

What sorts of risks can you imagine in this situation? Falling? Dropping? Stumbling? Crashing? Explain the reason why you think that way.

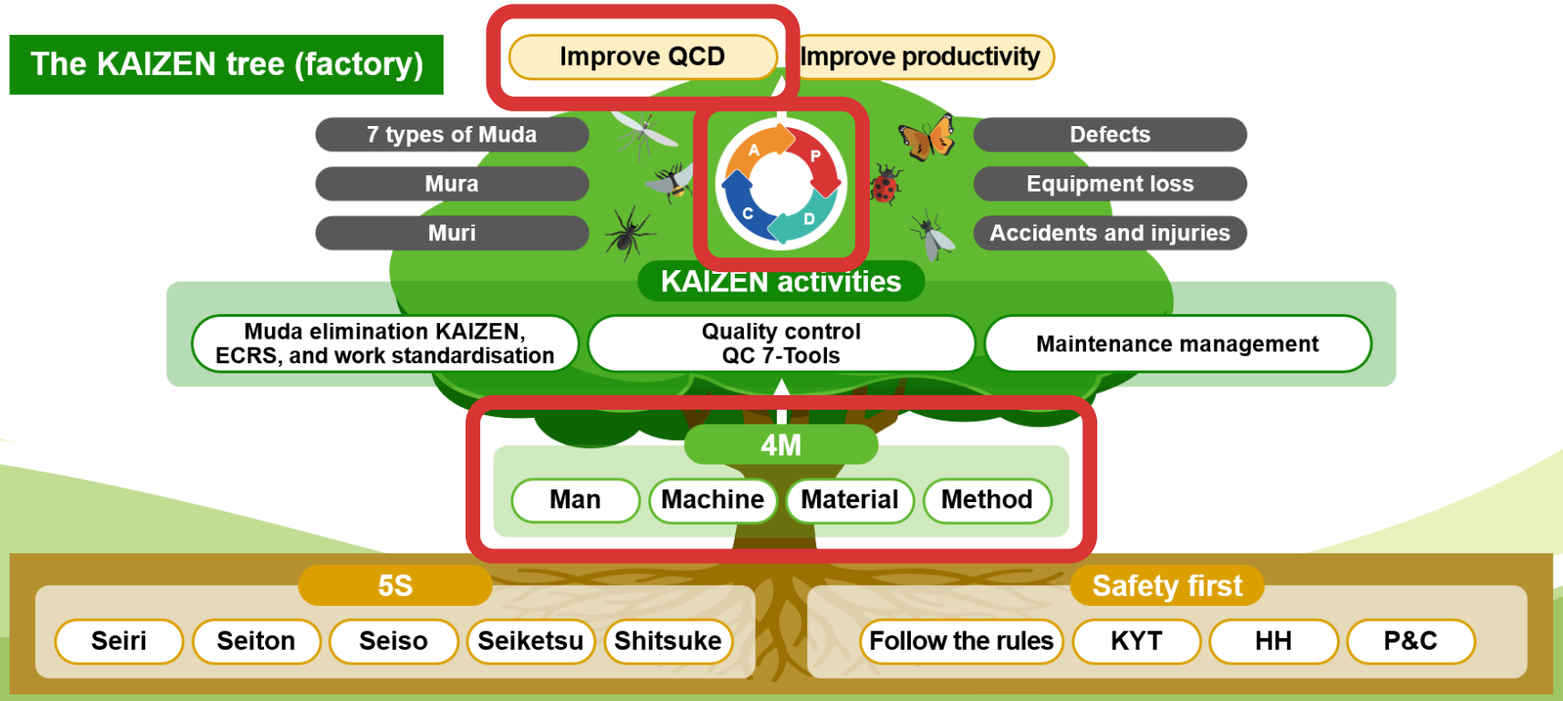
Section 3

Basic structure of manufacturing

Section 3 Basic structure of manufacturing

Contents

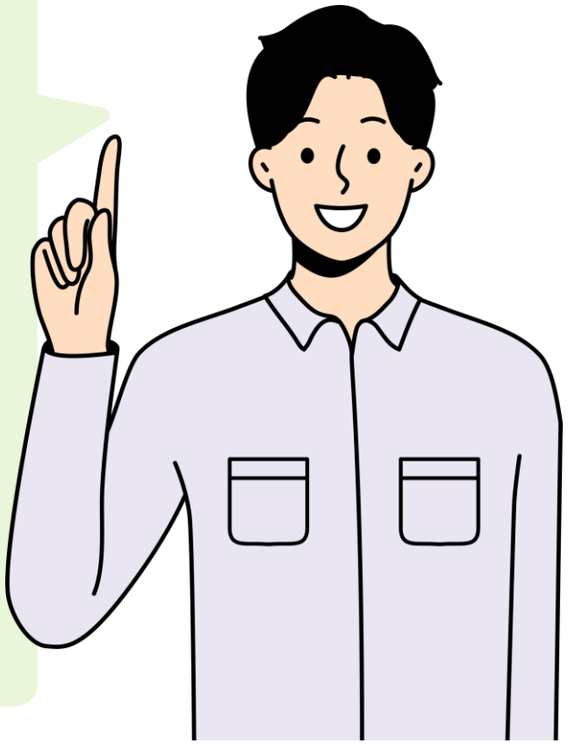
- **The four elements of production: 4M**
- **Production output: QCD**
- **PDCA cycle for Kaizen**
- **The relationship between 4M,**
- **PDCA, and QCD**



Key points of Section 3

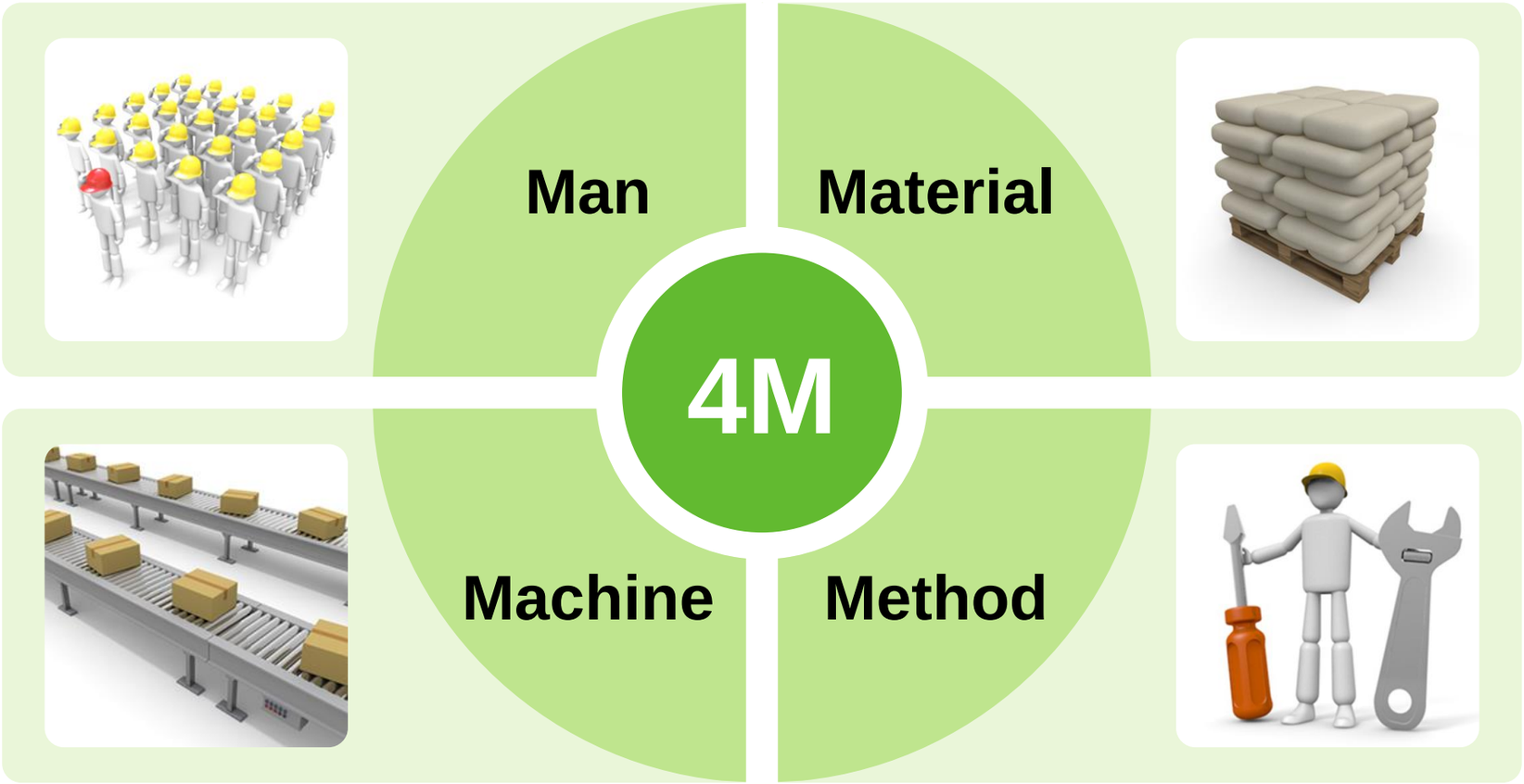
- First, understand the meaning of the terms 4M, QCD, and PDCA cycle.
- The 4M are the inputs for production, and by running the PDCA cycle at the production site, KAIZEN will progress at the manufacturing site, achieving a high QCD for the products that are output.
- In this section, please understand the relationship between the 4M, QCD, and the PDCA cycle.

*If you want to know specific examples of KAIZEN and productivity improvements, see Section 5 onwards



What is 4M?

- The meaning of 4M is as follows:
- 4M is called the ‘four elements of manufacturing.’



The 4Ms are essential input factors for production

M1: Man

- Operators
- Foreman / Leader
- Technical staff
- Supervisor

Safe and efficient actions!

M2: Machine

- Machinery
- Jigs and tools
- Transport equipment
- Maintenance tools
- Utilities

Pursue zero breakdowns and trouble!

M3: Material

- Raw materials
- Purchased parts
- Subcontract parts
- Auxiliary materials

Never allow defectives to mix

M4: Method

- Production methods (processing methods, manufacturing methods, etc.)
- Production conditions and operation methods
- Work methods and procedures

Standardise work and increase productivity

What is QCD?

- QCD is the most important indicator to evaluate products and thereby suppliers and to see whether they are good or bad.

Q: Quality

C: Cost

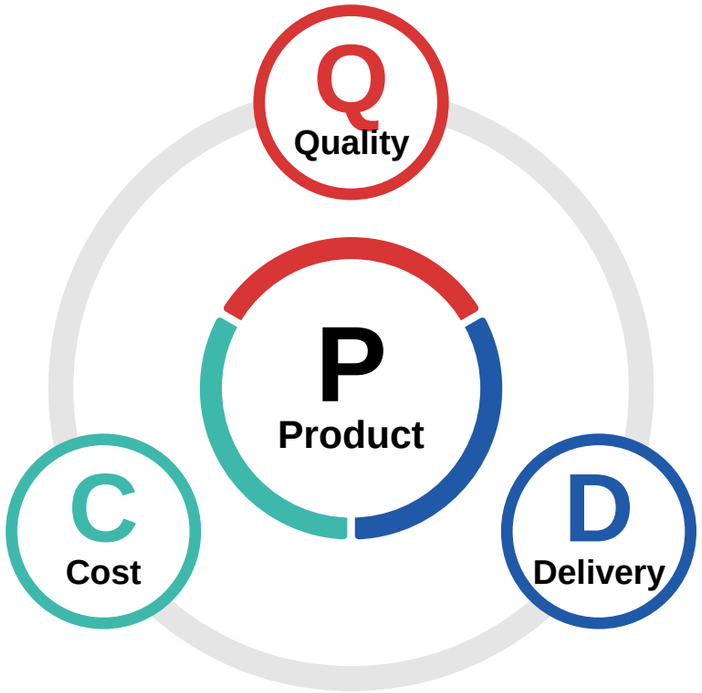
D: Delivery

P: Products ▶ **Customers**

Manufacturers should continue KAIZEN to improve QCD all the time.

Production output: QCD

- Products must be offered to customers with excellence in QCD.



		Meaning
Q	Quality	Meet customer requirements ● Product workmanship ● Function, performance, and dimensions
C	Cost	● Cost of manufacturing the product ● Costs of material, labour, and equipment
D	Delivery	● Delivery date to customer ● Manufacturing lead time

Example of QCD-Motorcycle

	What kind of indicator?	Evaluation
Q	• Fuel consumption • Engine power • Design • Durability • Function	• Good • Poor • Excellent • Good • Average
C	• Initial cost • Operating cost • Maintenance cost	• High • Average • Low
D	• Lead time	• Long

What is the PDCA cycle?

- PDCA is the abbreviation of the following words.

P = Plan D = Do C = Check A = Action

The PDCA cycle method is very useful for smooth implementation of the following.

- KAIZEN activities
- Production control
- Quality control
- Other business management

How to follow the PDCA cycle

- Key points are described below on how to proceed with the PDCA cycle to promote KAIZEN and other activities.

	Points to make best use of the PDCA cycle
P **Plan**	You have to make an implementation plan on what you need to do with its purpose. It is important that your goal setting must be expressed in a quantitative manner. The PDCA cycle can't start and work without an appropriate plan. **The plan should be made based on 5W1H: What / Who / Why / When / Where / How**
D **Do**	Implement what was decided in Plan. When doing so, you need to have a mechanism to record it. **What you have implemented must be recorded and reported as an achievement.**

How to follow the PDCA cycle

	Points to make best use of the PDCA cycle
C **Check**	Compare the result with the Plan and evaluate what you have done. Check and review should be done periodically. **Difference between Plan and Do such as delay and accomplishment should be monitored and comprehended.**
A **Action**	The original plan should be re-examined because it needs to be modified to move to the next cycle. It is critical to extract and review all points to be improved in order to reflect those points to the next P. **Your check (review and evaluation) should be reflected to the next plan. This is considered as a process to follow the PDCA cycle.**

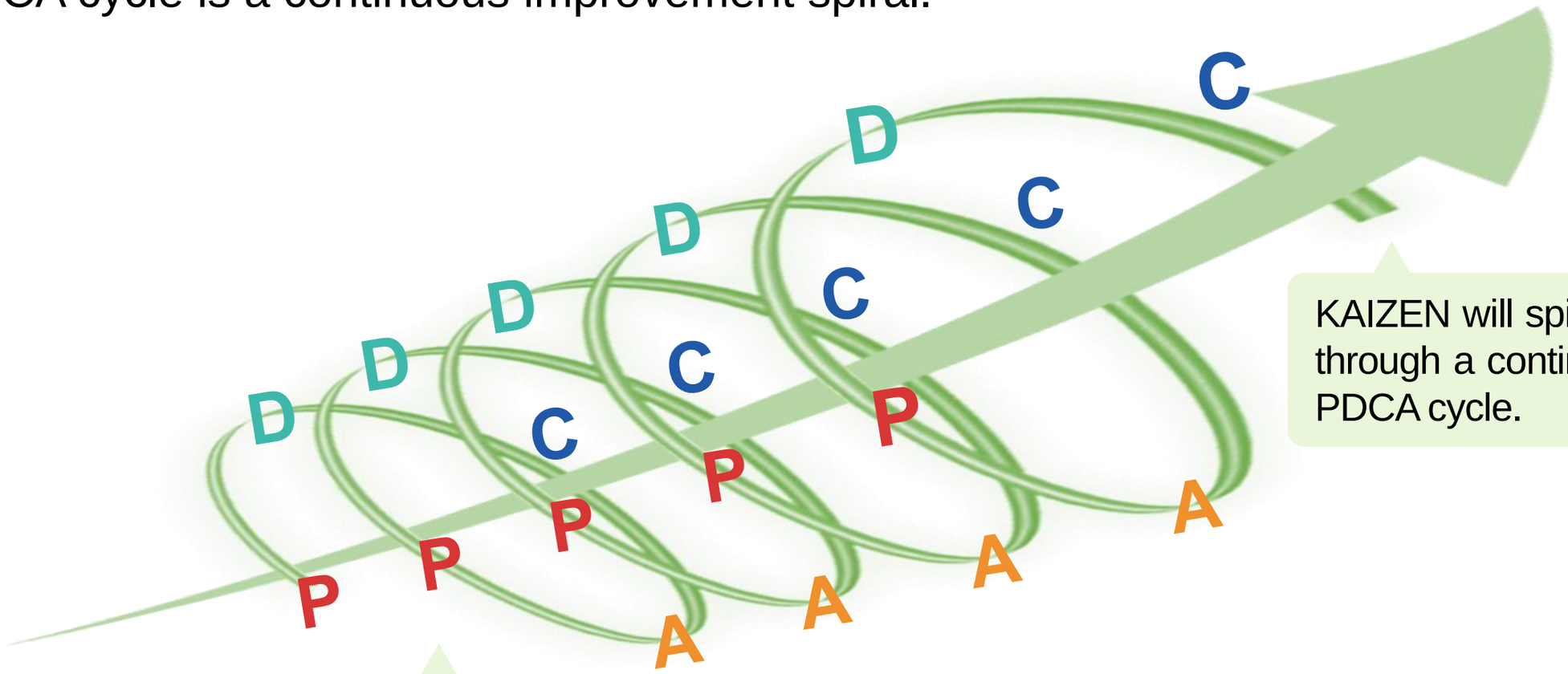
PDCA cycle in KAIZEN activities

Rising-up spiral of the PDCA cycle

- The continuous improvement has to be made by repeating the PDCA cycle. By doing so, the level of KAIZEN is raised every year like a spiral rising upward.
- It’s important to connect Check and Action with Plan of the next cycle.
- Without proper C and A in a cycle, KAIZEN may even go backward like a spiral falling down.
- The time period of the PDCA cycle should be changed according to the needs of the activity like by a week, a month or a year.

PDCA cycle in KAIZEN activities

- PDCA cycle is a continuous improvement spiral.



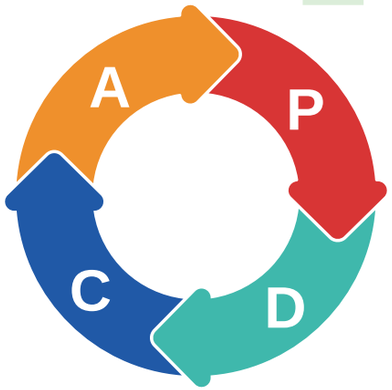
The relationship between 4M, PDCA, and QCD

- A satisfactory combination of 4M is essential to make good products and satisfy the customers with QCD.
- Additionally, any change to the 4M will affect QCD, so it’s important to manage the 4M.

4M

- **M1: Man**
- **M2: Machine**
- **M3: Material**
- **M4: Method**

PDCA



QCD

The relationship between 4M, PDCA, and QCD

4M

What is the KAIZEN Point?

M1	● Which of M1, M2, M3, or M4 should be improved? And how to improve?
M2	
M3	● Which kind of KAIZEN should be carried out?
M4	

QCD

Bad Conditions

Q	● Many defective items ● Many engine troubles ● Many scratches on the surface
C	● Material yield is bad ● Parts' cost is high
D	● Supply lead time too long

Products

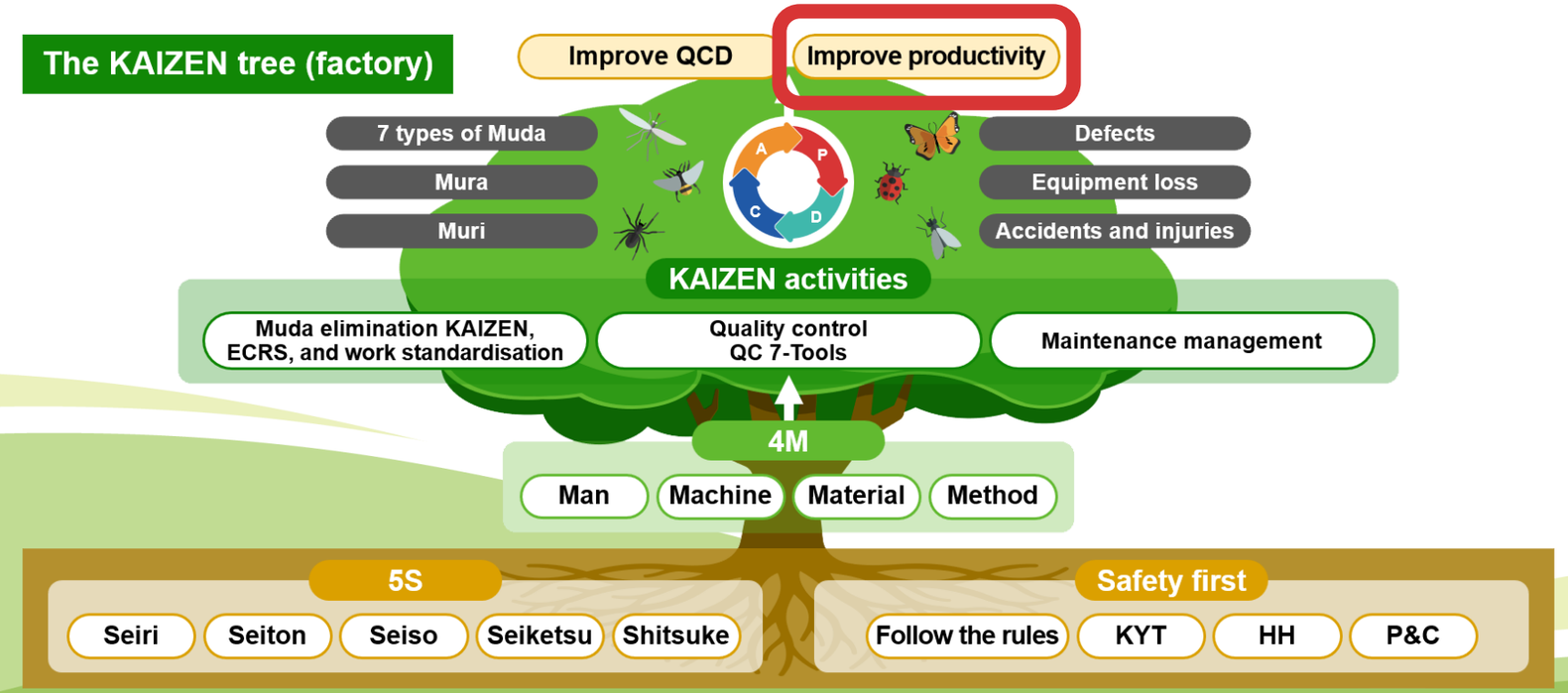
Section 4

Improving productivity

Section 4 Improving productivity

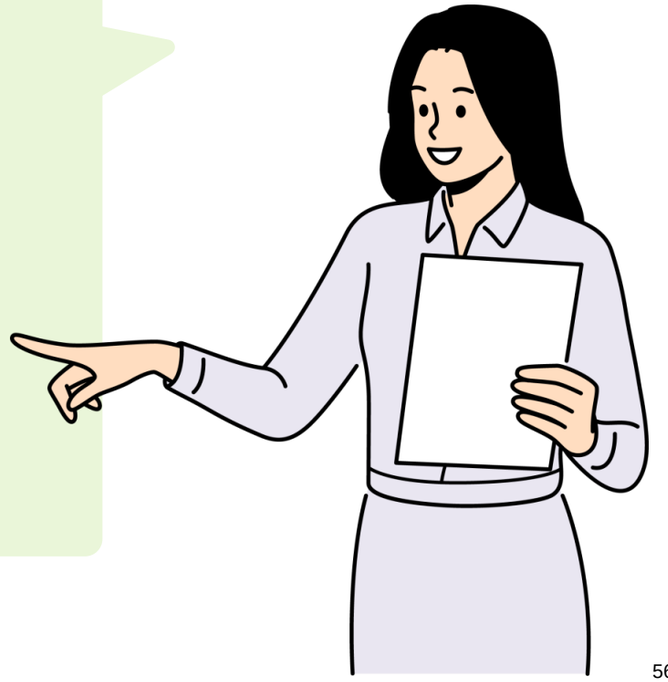
Contents

- **Definition of productivity**
- **How to improve productivity**
- **Examples of productivity**



Key points of Section 4

- Here, you will learn the meaning of productivity and ways to improve it.
- Productivity can be expressed as division. Make sure you understand what the numerator and denominator each represent.
- Once you understand the definition of productivity, learn ways to increase your productivity. Make sure to fully understand the four patterns for increasing productivity.



Definition of productivity

- Many people have probably been told by their boss or factory manager, "increase productivity!"
- But what exactly is productivity?

Definition of productivity

- Productivity is an indicator to show **‘Output’** obtained by **‘Input’**
- Think of it as the result of division between the
  - Denominator (resources put in: input) and
  - Numerator (results produced: output)

$$\text{Productivity} = \frac{\text{Results produced Output}}{\text{Resources put in Input}}$$

How to improve productivity

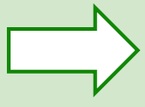
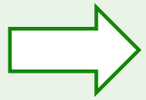
■ As outlined below, there are four main patterns for increasing productivity.

① The output produced remains the same, but fewer resources are invested

② The output produced increases, but the resources invested remain the same

③ By slightly increasing the resources invested, the output produced improves dramatically.

④ The resources invested decrease, and the output produced improves

	①	②	③	④	⑤
Output					
Input					

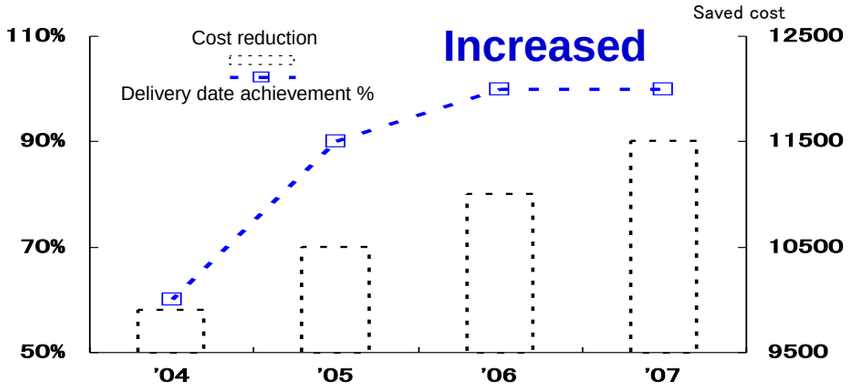
*Pattern ⑤ is not often used to improve productivity.

Common productivity indices

Productivity =

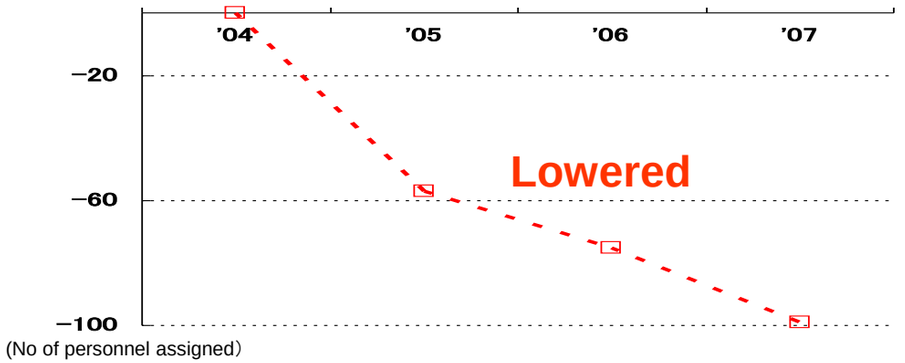
Produced Output

- Sales turnover
- Added value
- Profit
- Customer satisfaction
- Quality



Resources input

- Man
- Machine
- Material
- Time (man-hour)



Examples of productivity

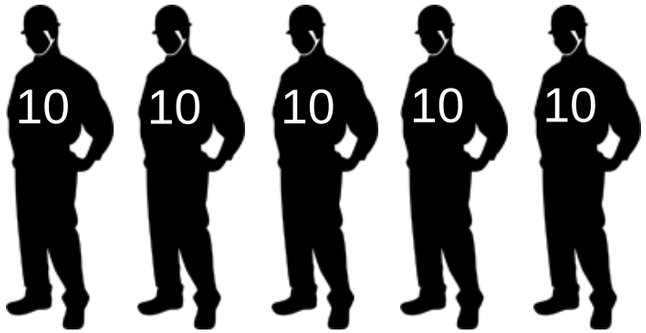
- Examples of productivity index

1 Resources input	2 Produced result	Productivity Index
Number of people	Product quantities	Product quantities per employee
Investment cost	Increased profits	Return on investment
Time (Hours)	Product quantities	Product quantities per hour for manufacturing
Amount or value of materials input	Quantity or value of quality products produced	Yield (amount of quality products / Input materials)

Examples of productivity

Q Which productivity is better?

Case 1



- Product quantities 50 sets
- Productivity = 50 sets ÷ 5 persons
  = 10 sets / one person

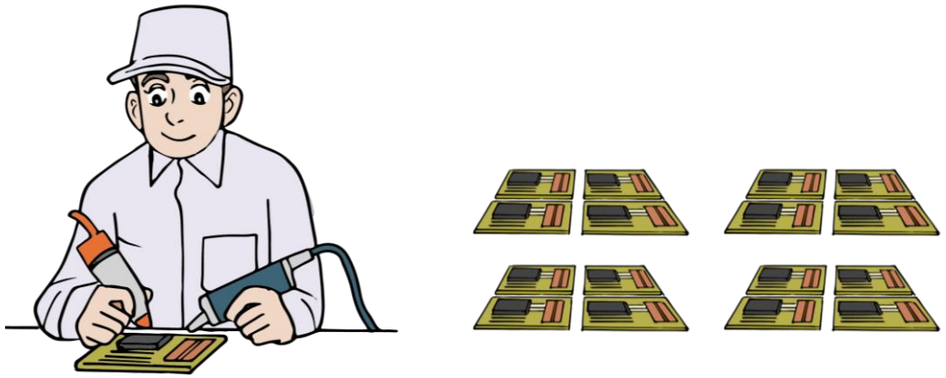
Case 2

- Product quantities 60 sets
- Productivity = 60 sets ÷ 5 persons
  = 12 sets / one person

Examples of productivity

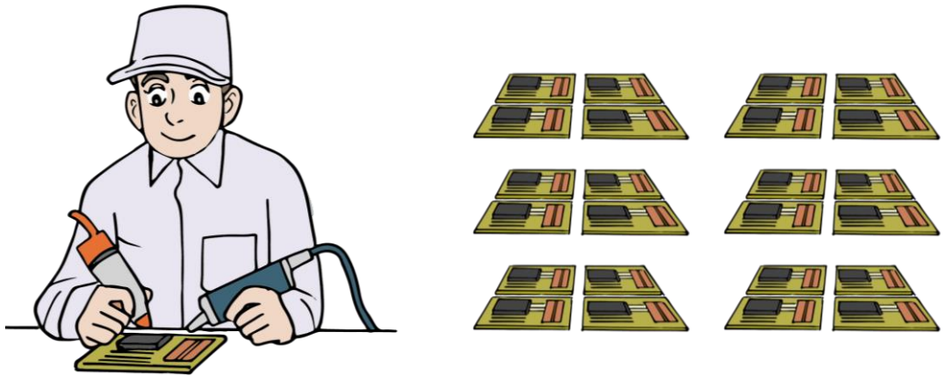
Q Which productivity is better?

Case 1



- 80 boards can be produced in 8 hours.
- Productivity = 80 sheets ÷ 8 hours
  = 10 sheets / hour

Case 2



- 120 boards can be produced in 8 hours.
- Productivity = 120 sheets ÷ 8 hours
  = 15 sheets / hour

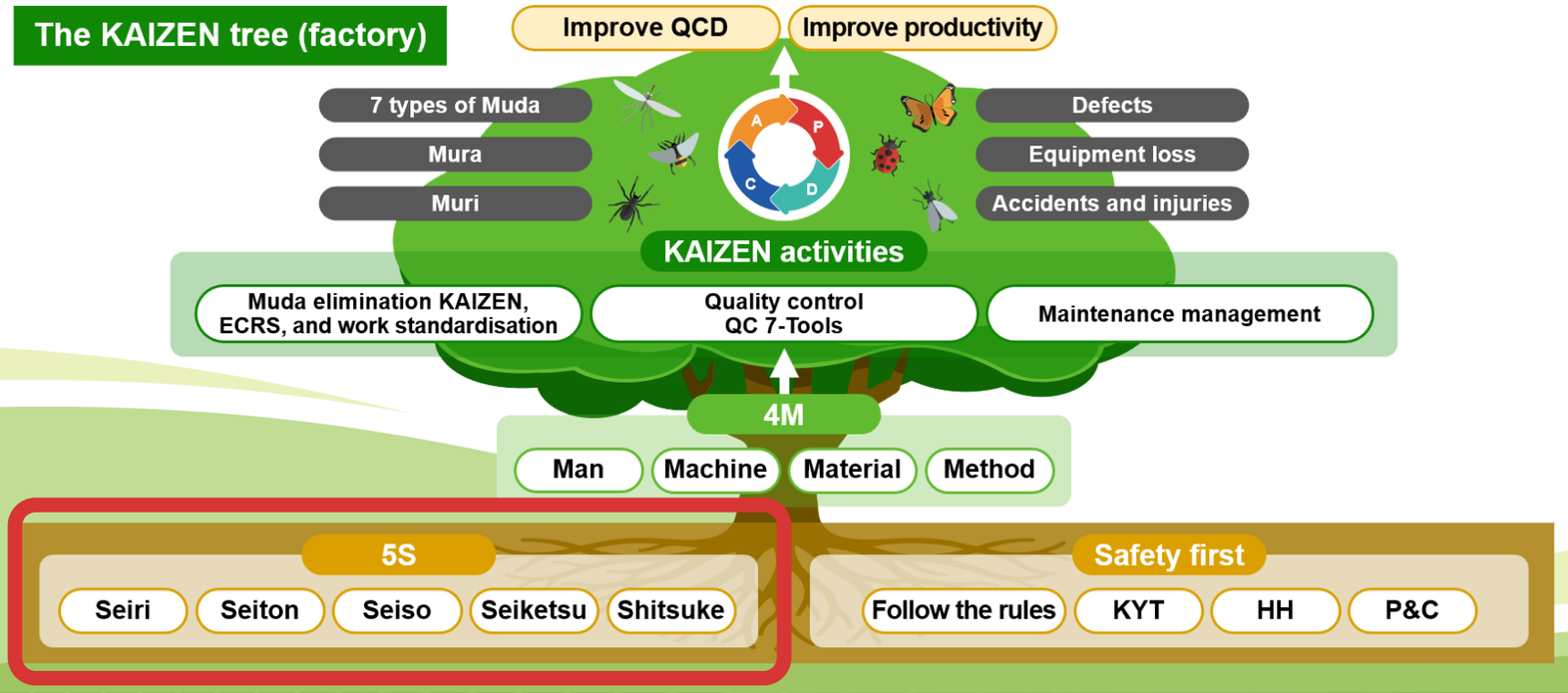
Section 5

5S

Section 5 5S

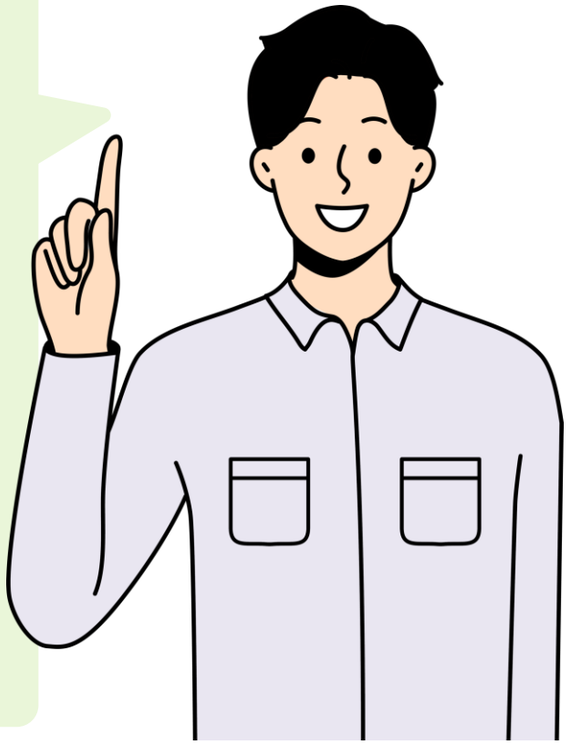
Contents

- **What is 5S?**
- **Seiri (sorting)**
- **Seiton (setting in order)**
- **Seiso (shining)**
- **Seiketsu (standardizing)**
- **Shitsuke (sustaining the discipline)**



Key points of Section 5

- 5S is not just cleaning activities. Be aware of its purpose and effects.
- The initial stage of 5S is to thoroughly implement 3S (Seiri, Seiton, and Seiso). At first, try to make it a point for everyone to practice the 3S in the workplace.
- Guiding people to continually maintain 3S will lead to Seiketsu and Shitsuke.
- Through 5S, a culture of KAIZEN will grow throughout the workplace. For this reason, 5S activities are said to be the foundation (soil) of production activities.



What is 5S?

Seiri	To distinguish between what is and isn't needed; To remove what isn't needed from the situation.
Seiton	To get ready to pick what you need when you need it at once; To return it to the right place at once.
Seiso	To keep your workplace clean by removing rubbish, dust or dirt; To keep machinery to be ready to work with at once.
Seiketsu	To repeat Seiri-Seiton-Seiso according to a predetermined schedule, improve the workplace environment and maintain it in good condition all the time.
Shitsuke	To observe what has been decided; To train people to observe it; To make an improvement at any time if it turns out necessary.

What is the effect of 5S?

Is 5S a clean-up tool?

Is 5S just cleaning?

What is the effect of 5S?

- 5S helps to expose the problems (visualisation).
- 5S helps to improve the productivity.
- 5S helps to eliminate the Muda (waste).
- 5S helps to improve the customer’s reputation.

But it’s more than that.

5S is an educational tool. The series of 5S activities promotes behavioural change among employees, ultimately resulting in increased profits for the company.

Any company that uses 5S only as a clean-up tool, will fail to make an improvement.

Seiri : ‘Sorting’

- Classify unnecessary items in the workplace, dispose of them, and keep the items only necessary for the current production.

Unnecessary items → **What you don’t need**

Distinguished and Separated

POINT!

Necessary items → **What you need**

Important points for Seiri

Important points

- Distinguish between what you need and what you don’t.
- Separate important items from unimportant ones.
- Distinguish between frequently used items and less frequently used ones.
- Distinguish between expensive items and inexpensive ones.
- Seiri should be carried out depending upon the situation in each workplace.
- Separate production parts (work-in-progress) from tools.

Sorting of unnecessary things

- Sorting criteria of unnecessary things

Reuse after reworking	Comply with the quality standards specified in drawings, specifications, etc.
Recycle	Set up the recycling standards including how to separate recyclable things from others.
Disposal	Comply with applicable laws and regulations for disposal.

Red label activity

- If you are unable to determine whether something is necessary or unnecessary, perform the red label activity.

What is red label?

The red label activity is where you attach a red label to unnecessary items or items which you don't know whether or not they are necessary, and then decide on rules for sorting and disposing of them.

1. Set up criteria to distinguish between what is needed and what isn’t.
2. Make red labels.
3. Determine when the red label activity should be conducted with date and time.

Red label activity

Detailed contents of red labels affixed to unnecessary things			
1. Classification	1. Raw material 4. Product 7. Tools	2. Work in progress 5. Machinery 8. Others	3. Semi finished 6. Dies and Jigs
2. Product name			
3. Product Model / Product number			
4. Quantity / Monetary value			
5. Reason for being unnecessary thing	1. Disuse 4. Waste	2. Defect 5. Unknown	3. Not urgent 6. Others
6. Solution	1. Discard 4.Storage	2. Return 5. Others	3. Move to red label area
7. Date	Label affixed date : Enforcement date :		
8. Reference No.			

List of unnecessary things

Fiscal year 2019

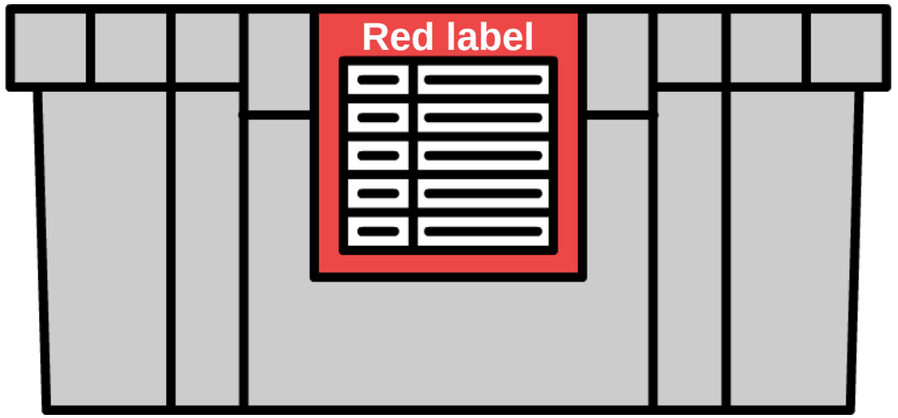
Fiscal year 2018

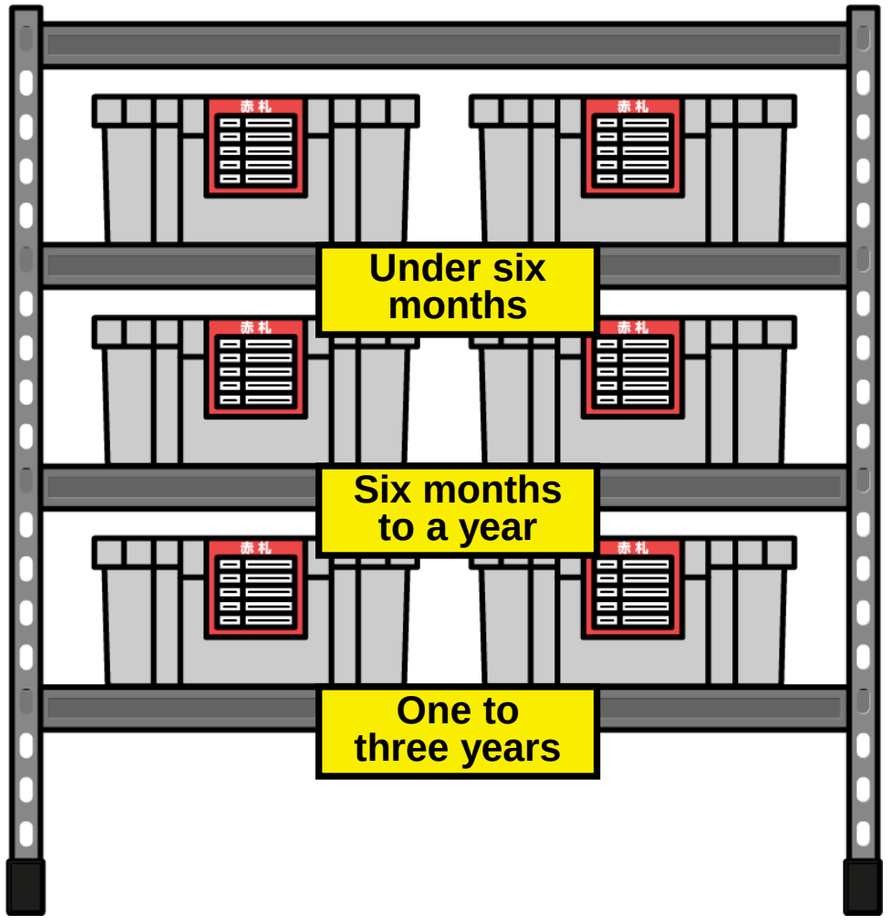
Fiscal year 2017

Record the history of how they became unnecessary things.

Take measures to prevent the same kinds of unnecessary things from being made again.

Red label activity





Seiton : ‘setting in order’

- Seiton means making it possible for anyone to find necessary things at the necessary time and return them to the right place easily.

Purpose of Seiton

- Anyone can find a storage place immediately.
- Appropriate amount is to be stored to avoid shortage and/or excess of stock.
- Things should be placed in the right direction so that anyone can pick and return them easily.

Three important elements of Seiton: the 3-Tei

- Meaning a pre-determined place.
- Meaning a pre-determined amount.
- Meaning a pre-determined direction.

Important points for Seiton

Important points

- Decide what, where, and how many items should be kept.
- Decide what kind of condition is required to keep the necessary items.
- Make it easier to take out the necessary items.
- Decide who is responsible for management of things kept in each place.

Seiton ‘visualises’ what you need

- Requirement for Seiton

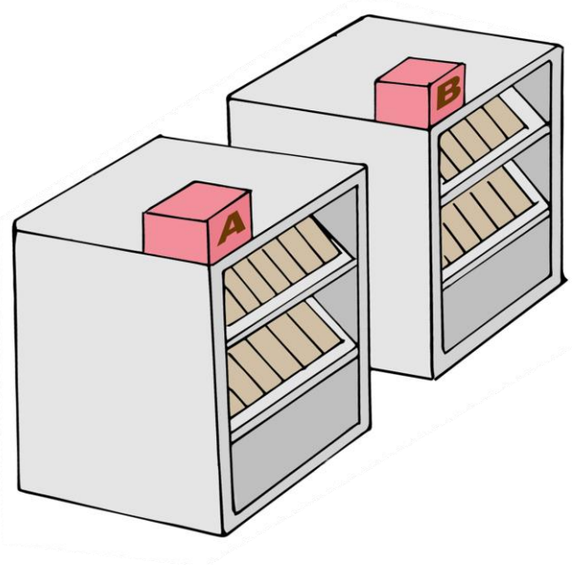
Anyone should be able to find a necessary thing immediately whenever it’s required and return it to the right place after it’s used.

Conditions to meet this requirement:

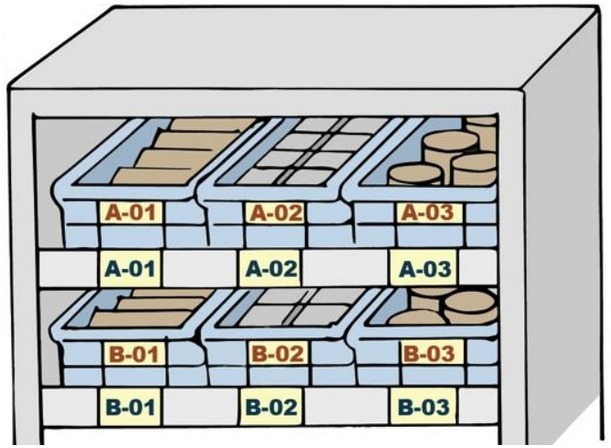
- Decide where to keep them with a certain regularity.
- Display the name, a drawing number, etc., of each item to be kept.
- Make a map of all storage places.

Example of Seiton-3Tei

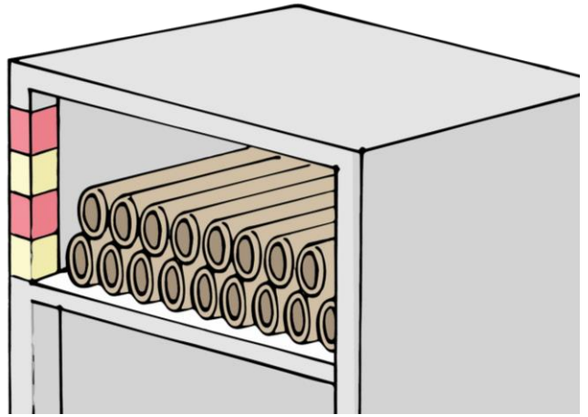
- Examples of 3-Tei



(Place)



(Amount)

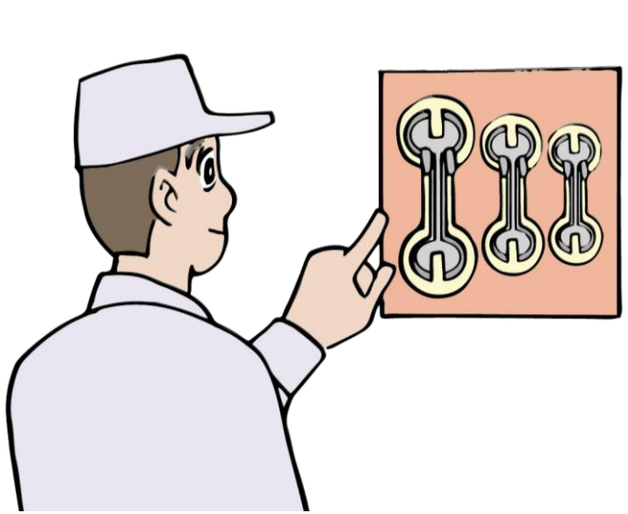


(Direction)

Example of Seiton-Tools

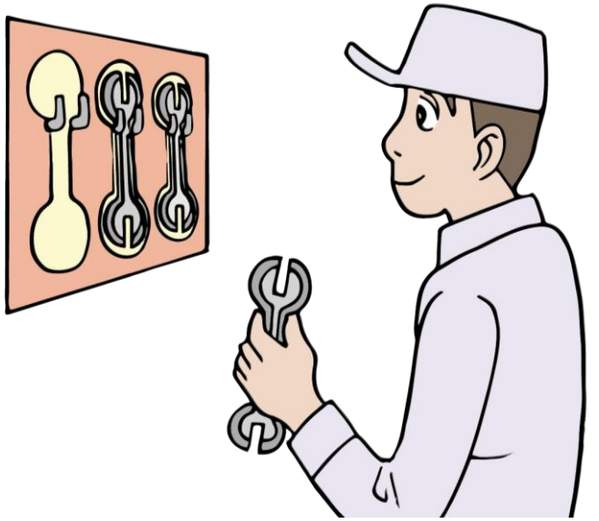
- Purpose of Seiton

Everyone should be able to find a necessary item easily at the time when it’s needed, use it and return it to the right place.



Find

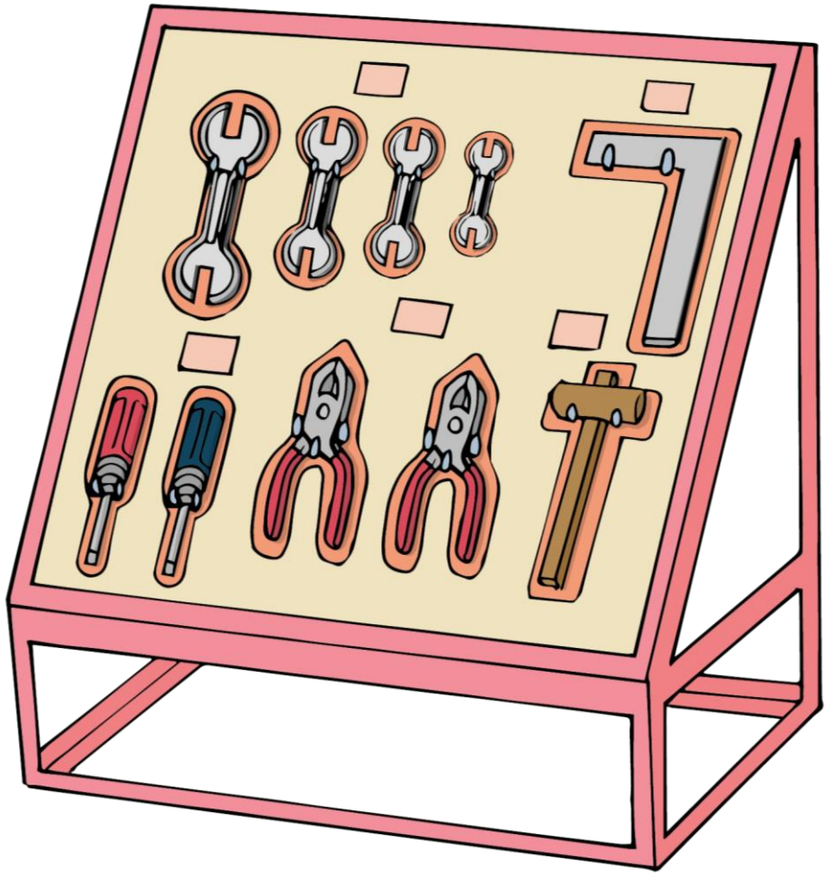
Use

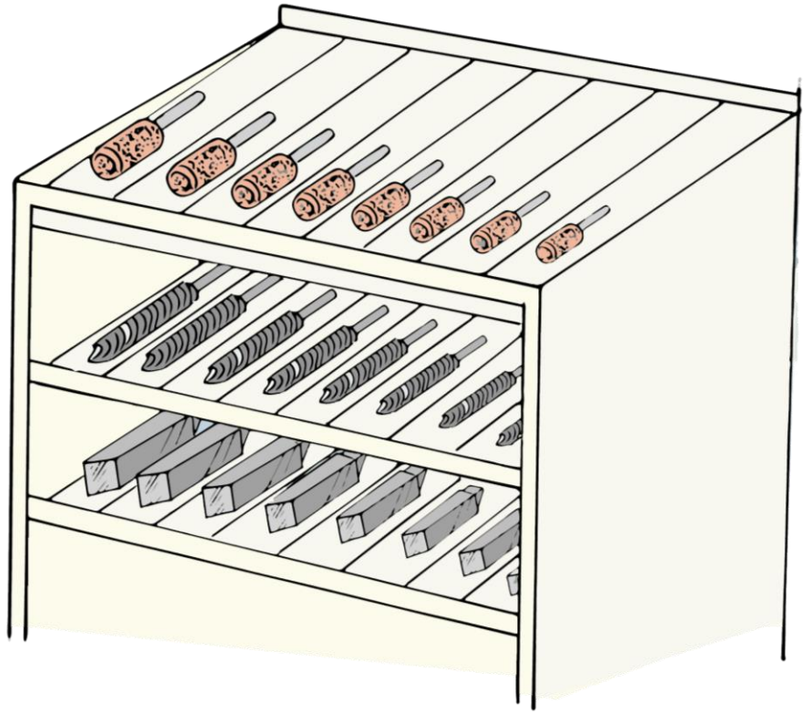


Return

Example of Seiton-Tools

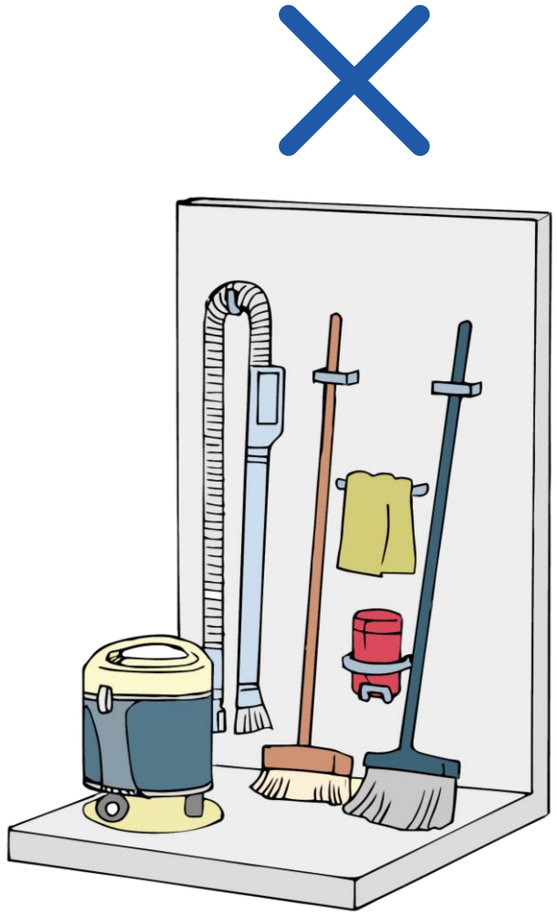
- Tools should be kept in an open space





Example of Seiton-Cleaning tools

- Open control is important for Seiton of cleaning tools

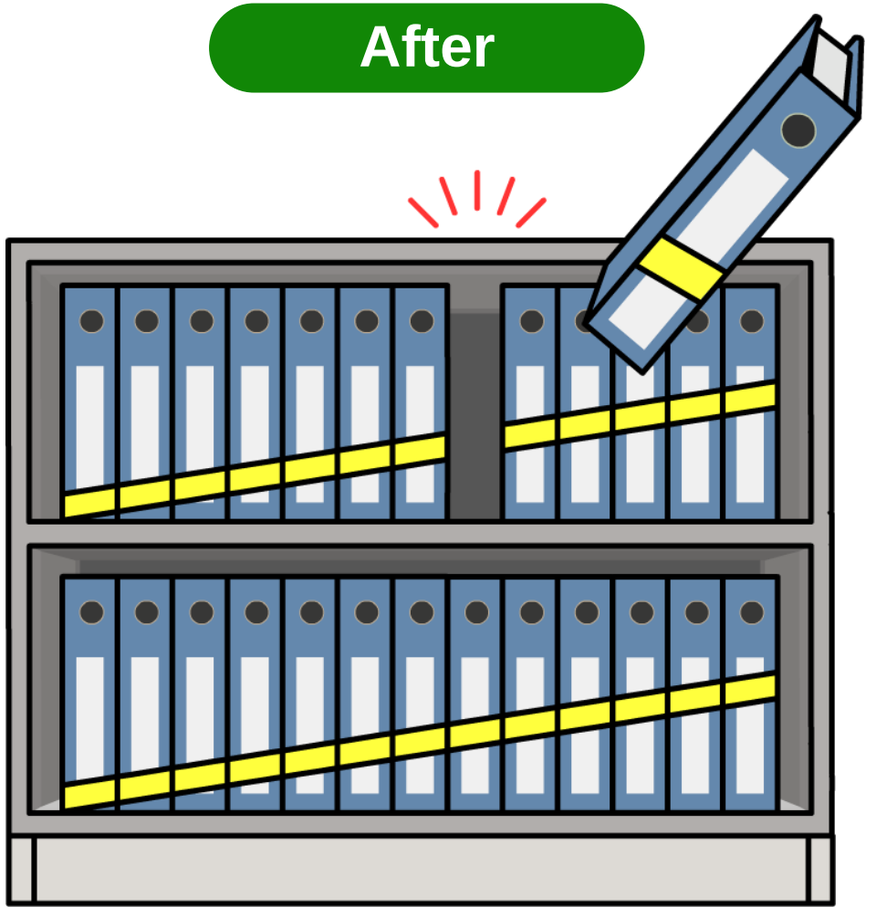


Example of Seiton-Official papers

- The key to managing documents and files is to be able to see at a glance what is missing.

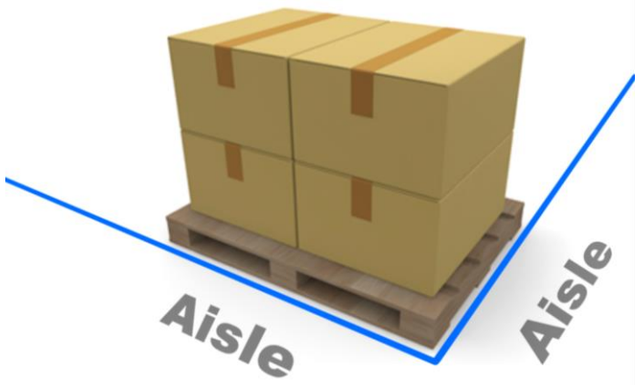
Before

After

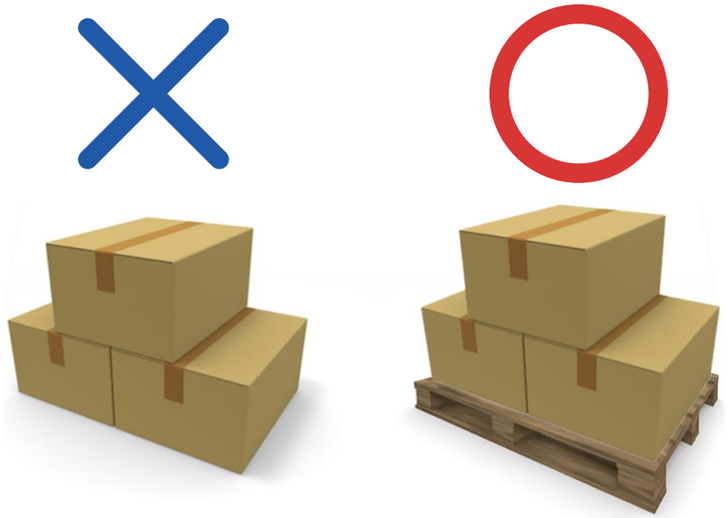


Example of Seiton-White lines

- How to place them



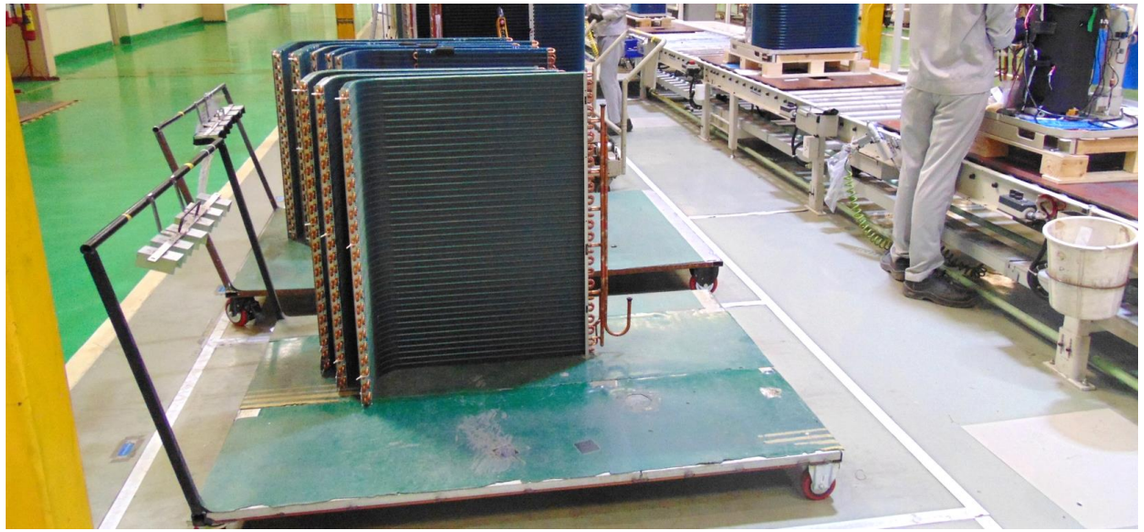
Place them in parallel
or perpendicular to a shelf
or an aisle.



Don’t place them directly
on the floor.

Don’t allow them to collapse
while they are stored.

Example of Seiton-White lines



Making a map for ‘places’

- Make everyone aware of the storage place by making a map with addresses.

Key points of location map

1. Show the location of the storage place such as the location of shelves and racks on a **layout drawing** of the workplace/factory.

2. Divide the workplace/factory into small areas and **assign an address** to each divided area with regularity. Now the shelves and racks have addresses/numbers of the area in which they are placed.

3. After defining the locations of shelves and racks by numbers, add a detailed block number on each shelf and rack as **branch addresses**.

Making a map for ‘places’

ASSEMBLY SHOP 3		
RACK 1		
LOCATION		DESCRIPTION
VSR	BIN 1	BIT SOCKET MAGNET 8X200
TRAY 5	BIN 2	BIT SOCKET MAGNET 10X75
	BIN 3	BIT SOCKET MAGNET SPR. 10X75
	BIN 4	BIT SOCKET MAGNET 10X100
	BIN 5	BIT SOCKET MAGNET SPR.10X100
	BIN 6	BIT SOCKET MAGNET 10X150
	BIN 7	BIT SOCKET MAGNET SPR.10X150
	BIN 8	BIT SOCKET MAGNET SPR.10X200
	BIN 9	BIT SOCKET MAGNET 12X75

- ASSEMBLY SHOP #
- RACK #
- TRAY #
- BIN #

Seiso : ‘Shining’

- What is the purpose of Seiso? To clean and at the same time check; the detailed condition of Seiri and Seiton.

Clean/polish the workplace’s floors, equipment and facilities.
Provide conditions for easy inspection and put them in good operating conditions.
(We call it MIERUKA)

Important points for Seiso

Important points

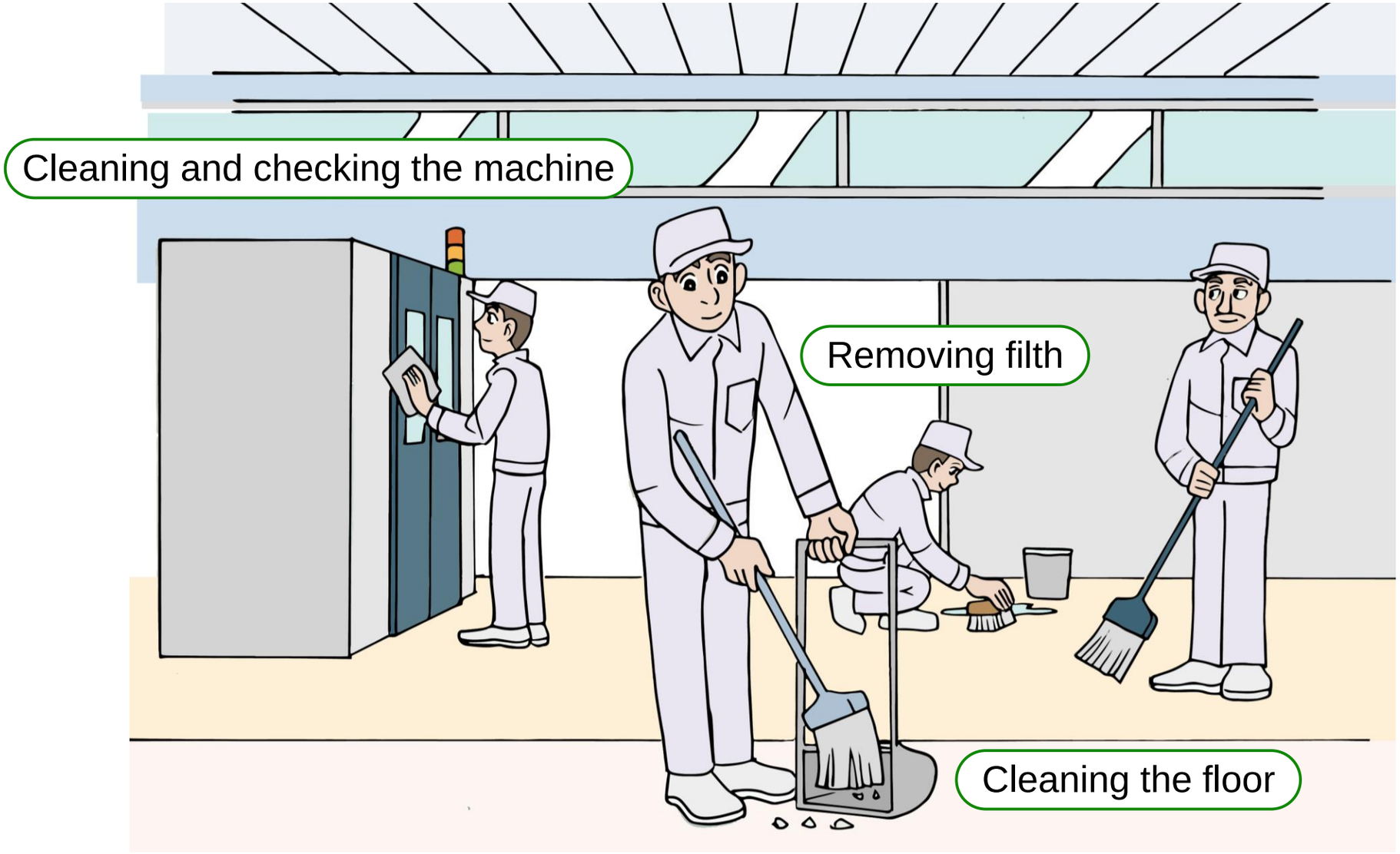
- Remove unnecessary items from the workplace.
- Eliminate all trash from the workplace.
- Remove dirt adhering to facilities and objects in the workplace.
- Find out sources of dirt and dust and eliminate the causes so they will not return.
- Confirm that all items in the workplace are placed in a designated spot/area.

Seiso means checking of the workplace

- Clean and check with an attitude not allowing any small stain.

Step	Seiso activities of workplace
1. Cleaning for checking	You cleaned the area yesterday. But it's already dirty today! You are able to notice the dirt because you once made it clean. That means your cleaning work makes it possible to detect an abnormality. In a clean environment, the difference from a normal condition becomes easily noticeable.
2. Analysis of dirt cause	Why it gets dirty? Look for the cause.
3. KAIZEN solution	By knowing the cause, you can take necessary measures to remove the cause.

Example of Seiso

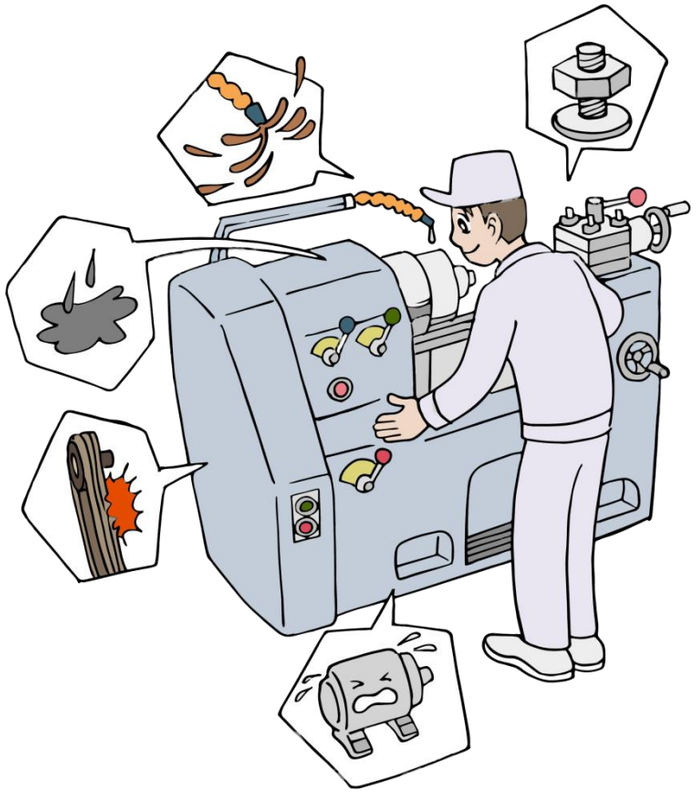


Example of Seiso-floors

Example of Seiso-machinery

Cleaning points

- Is there any sign of abnormality like dirt or scratches at sliding parts?
- Is there any strange noise or abnormal temperature rise during operation?
- Is lubrication supplied adequately?
- Is there any oil leak?
- Is there any error in instruments like pressure gauges or current gauges, etc.?
- Are those attached instruments showing normal range readouts?
- Is there any abnormality in the finish of products/parts after processing?
- Are there any oil drops or metal chips spread around the area?

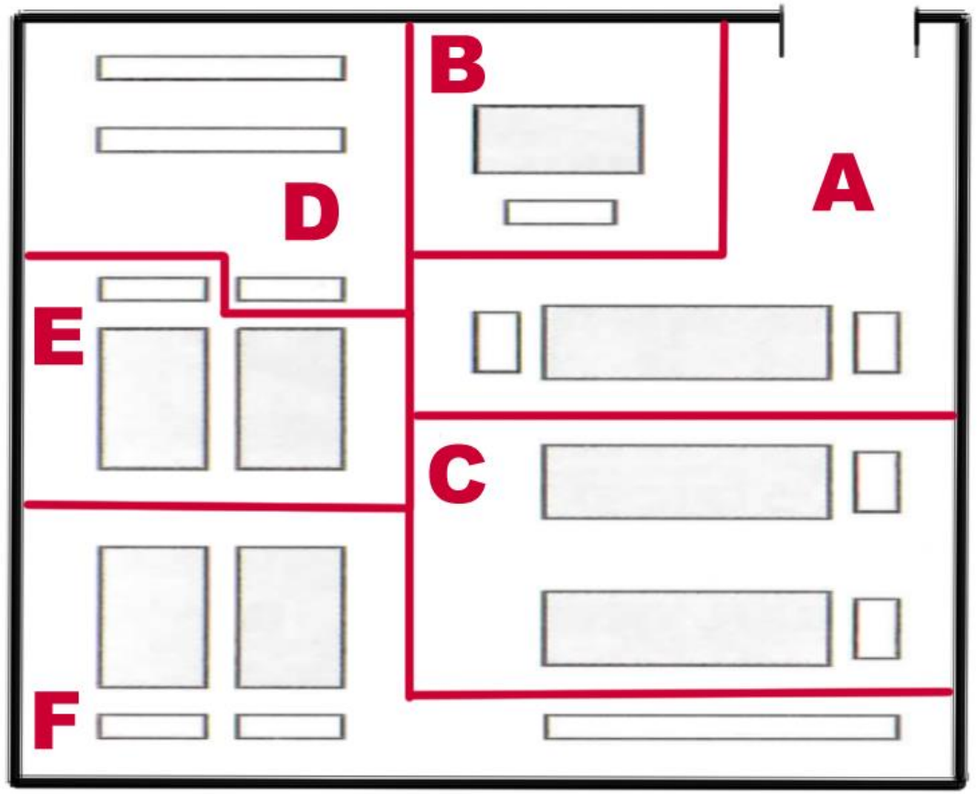


Plan for Seiso implementation

	Daily check	Periodical check
Time and frequency	● Work start time, work finish time, changeover time	● Weekly（every Monday） ● Monthly（last day of the month） ● Bimonthly（first day of the odd month)
Object of cleaning	● Critical parts for safety and quality ● Parts easy to clean and check	● Less critical parts for safety and quality ● Parts hard to clean and check due to location and time
Remarks	● As for parts that are difficult to clean but are still critical for safety and quality, some measures need to be devised to make cleaning possible. ● Set up checking rules considering the effects on safety and quality.	

Plan for Seiso implementation

- Example; Seiso checking map



Check List for Weekly Seiso						
	A	B	C	D	E	F
Mon.	✓	✓	✓	✓	✓	✓
Tue.	✓	✓	✓	✓	✓	✓
Wed.						
Thu.						
Fri.						
Sat.						

Seiketsu : ‘standardizing’

- Make rules in order to maintain the workplace in a clean condition using Seiri, Seiton, and Seiso activities (3S). These activities must be integrated into everyone’s regular work.

  - Make rules with all members
  - Make a manual & a checklist
  - Keep 3S with members

The relationship between Seiri-Seiton-Seiso and Seiketsu-Shitsuke

5S

Shitsuke

Follow the established rules

3S

Seiri

Eliminate unnecessary things

Seiton

Quickly get what you need, when you need it

Seiso

Remove filth when used and restore to original condition

Seiketsu

Maintain the 3S condition

Important points for Seiketsu

Important points

- Keep clothes clean, neat and tidy.
- Determine the lanes and line markings that distinguish equipment areas, aisles, storage spaces, etc.
- Make checklists, manuals, rules, etc., in order to keep the area and things clean.
- Appoint a responsible person for the activities to maintain a clean workplace.

Fixed-point observation: Recording the state in which 3S is maintained

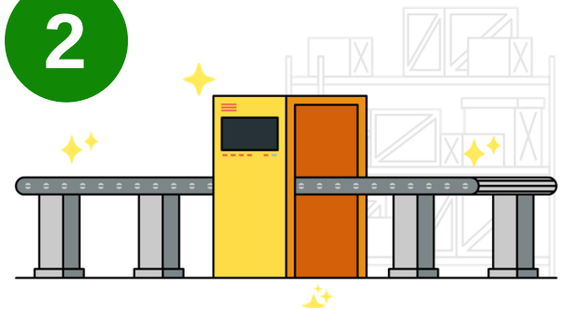
- Fixed-point observation is where photos of the same location are taken before and after KAIZEN, and records the state in which 3S is maintained

Fixed-point shooting example 1

1

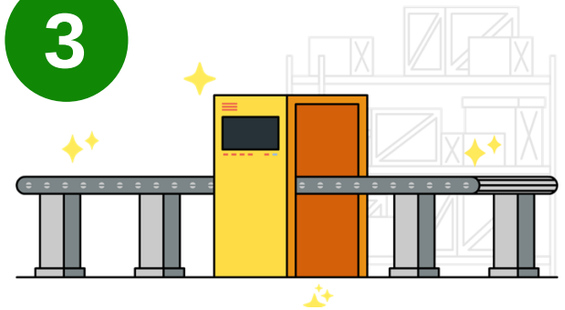
1st stage (before KAIZEN)
Taken: x May, 200x
[Comment]
xxxxxxxxxxxxx
[Next scheduled shoot date]
x June, 200x

2



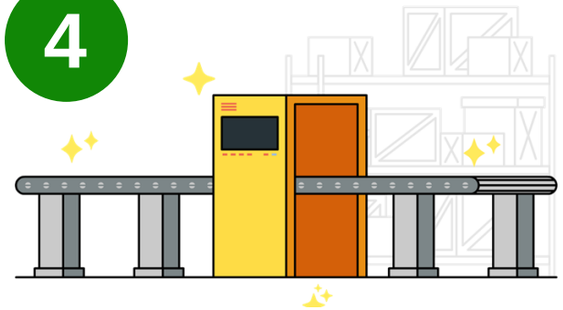
2nd stage
Taken: x June, 200x
[Comment]
xxxxxxxxxxxxx
[Next scheduled shoot date]
x July, 200x

3



3rd stage
Taken: x July, 200x
[Comment]
xxxxxxxxxxxxx
[Next scheduled shoot date]
x August, 200x

4



4th stage
Taken: x August, 200x
[Comment]
xxxxxxxxxxxxx
[Next scheduled shoot date]
x September, 200x

Shitsuke :‘Sustaining the Discipline’

- The basis of social life and work life is to comply with the established rules and regulations. In the workplace, work is done collaboratively. So if someone doesn’t follow the rules and regulations, it will cause confusion. Selfish actions are not allowed.
- Shitsuke is a Japanese word having the combined meaning of education, training, discipline and so forth. By Shitsuke people learn the mindset to follow social rules, workplace rules and/or business etiquette such as being punctual, greeting each other and/or keeping work standards.

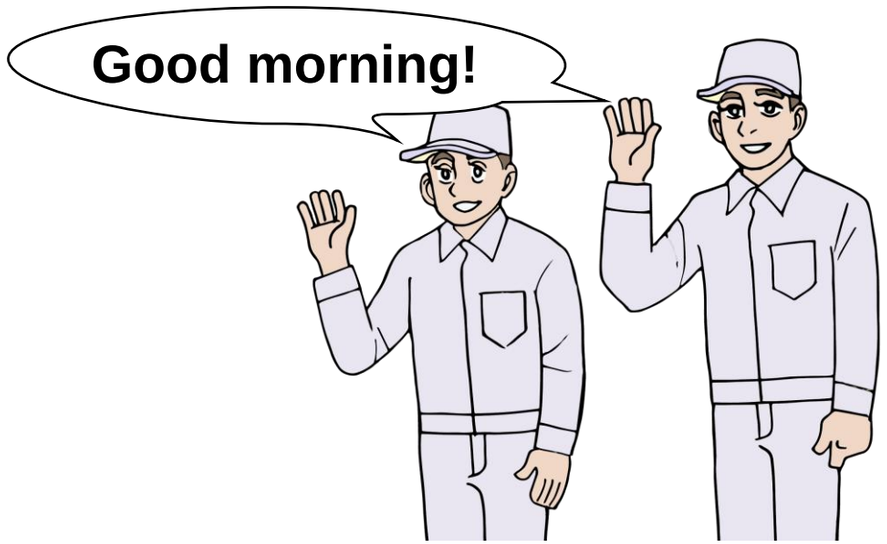
Important points for Shitsuke

Important points

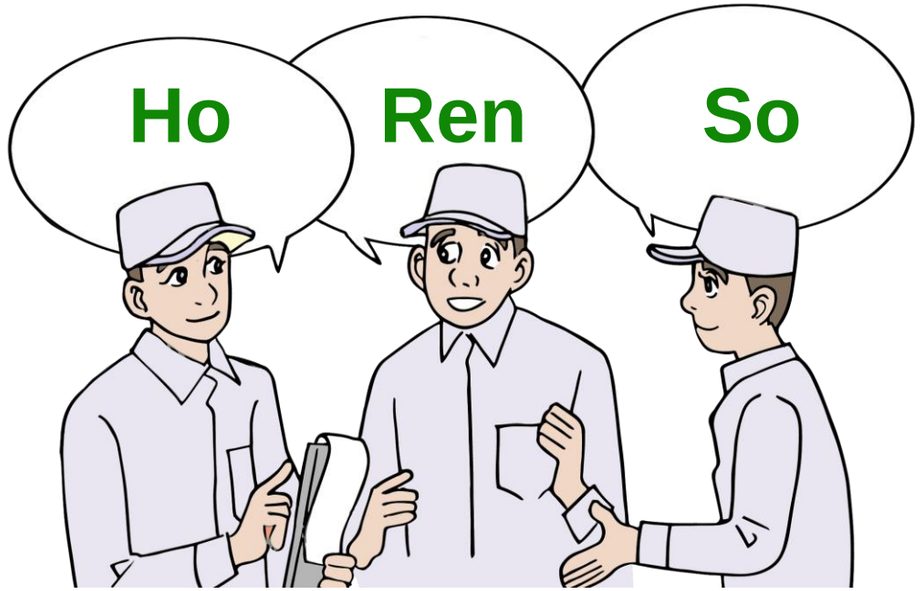
- Determine each standard condition of Seiri, Seiton, Seiso, and Seiketsu.
- Make work-standards, checklists, manuals and rules on how to proceed with 5S.
- Confirm all the rules and agreements that already exist.
- Be sure to observe work-standards, checklists, manuals and existing rules.

Shitsuke

- To realise Shitsuke;
  - Teach rules, etiquette, etc., over and over again.
  - Start in an easy matter such as everyday greetings.



Shitsuke here is to teach the necessity of greeting each other.



Training to practice Hou-Ren-Sou is one part of Shitsuke.

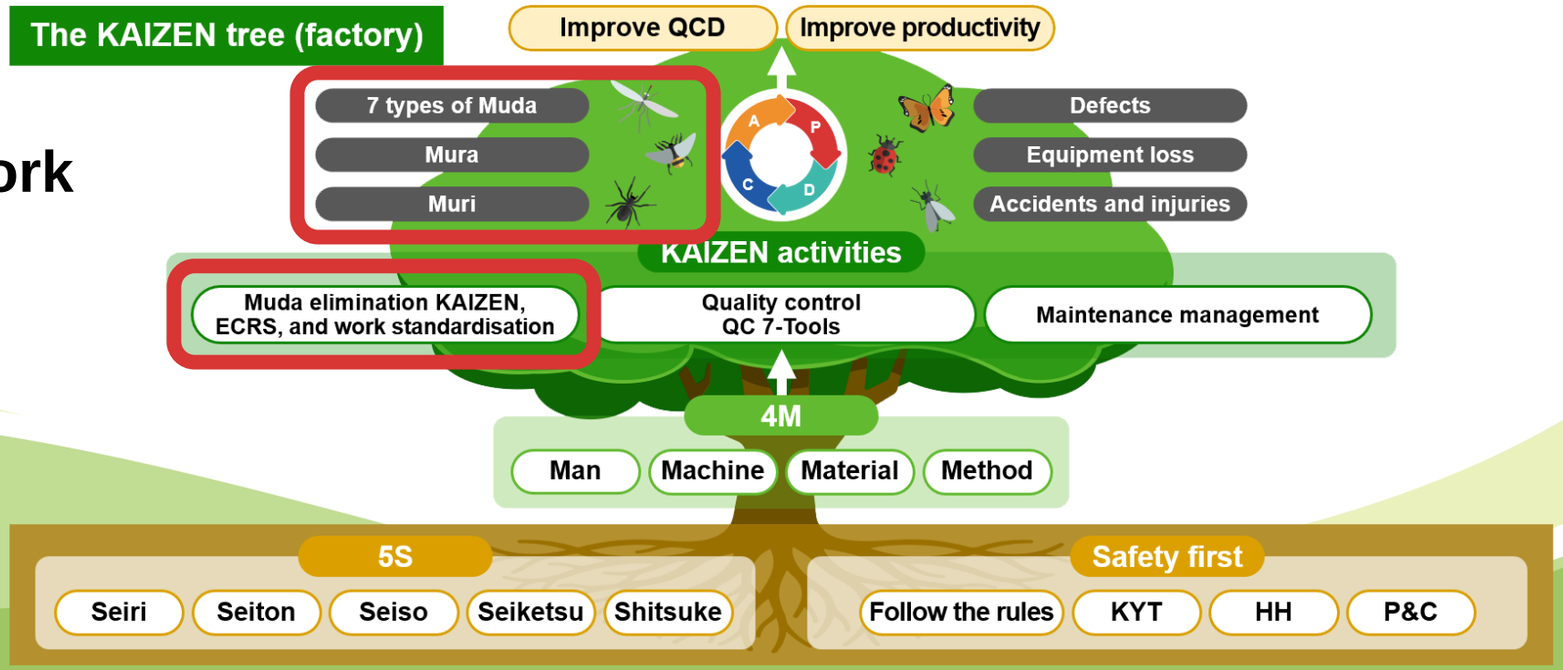
Section 6

Muda elimination
KAIZEN

Section 6 Muda elimination KAIZEN

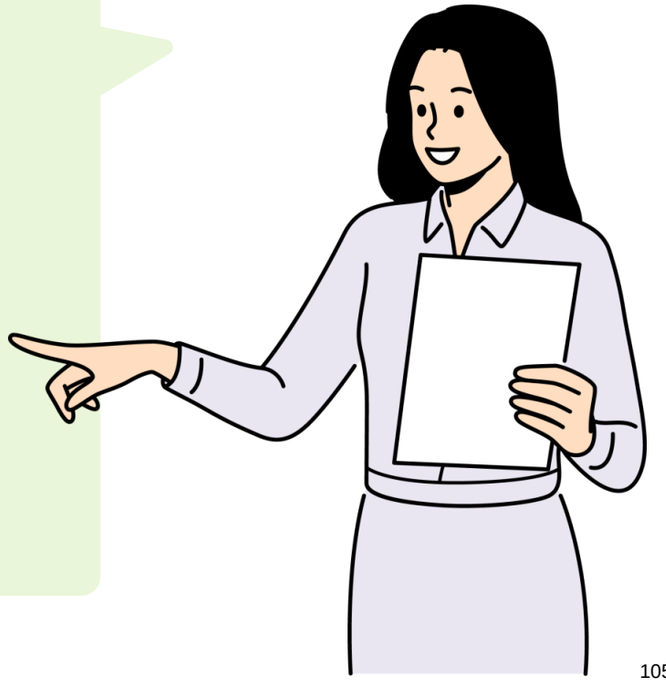
Contents

- **Definition of 3M (Muda, Muri, Mura)**
- **Seven types of Muda hidden in manufacturing sites**
- **Four principles of KAIZEN to reduce Muda (ECRS)**
- **Analysis methods to find Muda**
  - **Operation analysis**
  - **Motion study**
- **Standardisation of work**

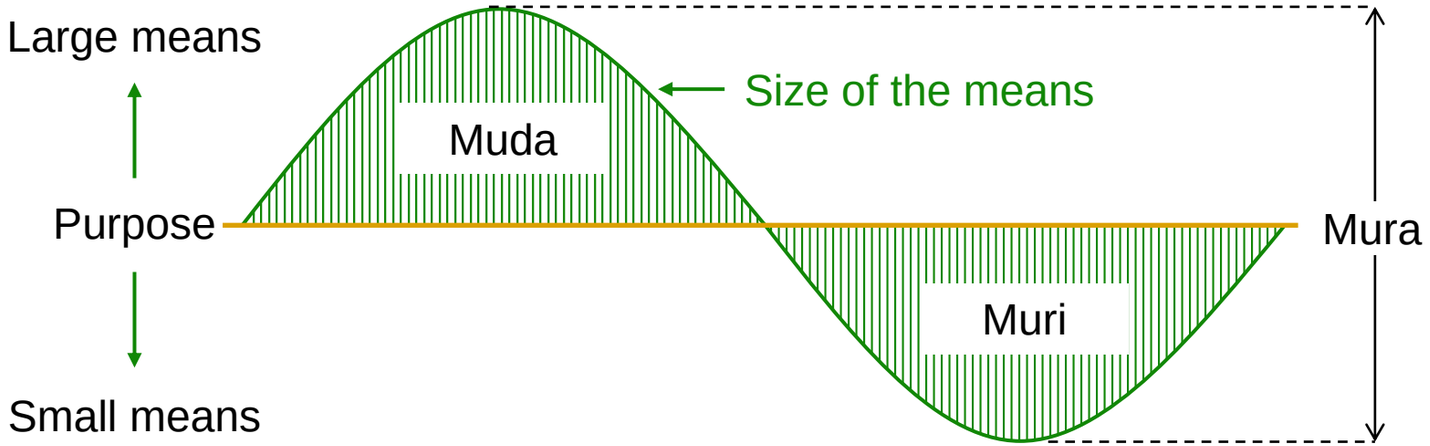


Key points of Section 6

- Various forms of Muda, Muri, and Mura occur at production sites. First, let's get a clear image of what these are.
- Once you understand what Muda is, you will learn how to reduce it. There are various methods that you will come across, so make sure you understand each one.
- Finally, you will learn about standardizing work. Standardisation is a system that allows production to be done safely and easily in the same way, no matter who does it, at any time.



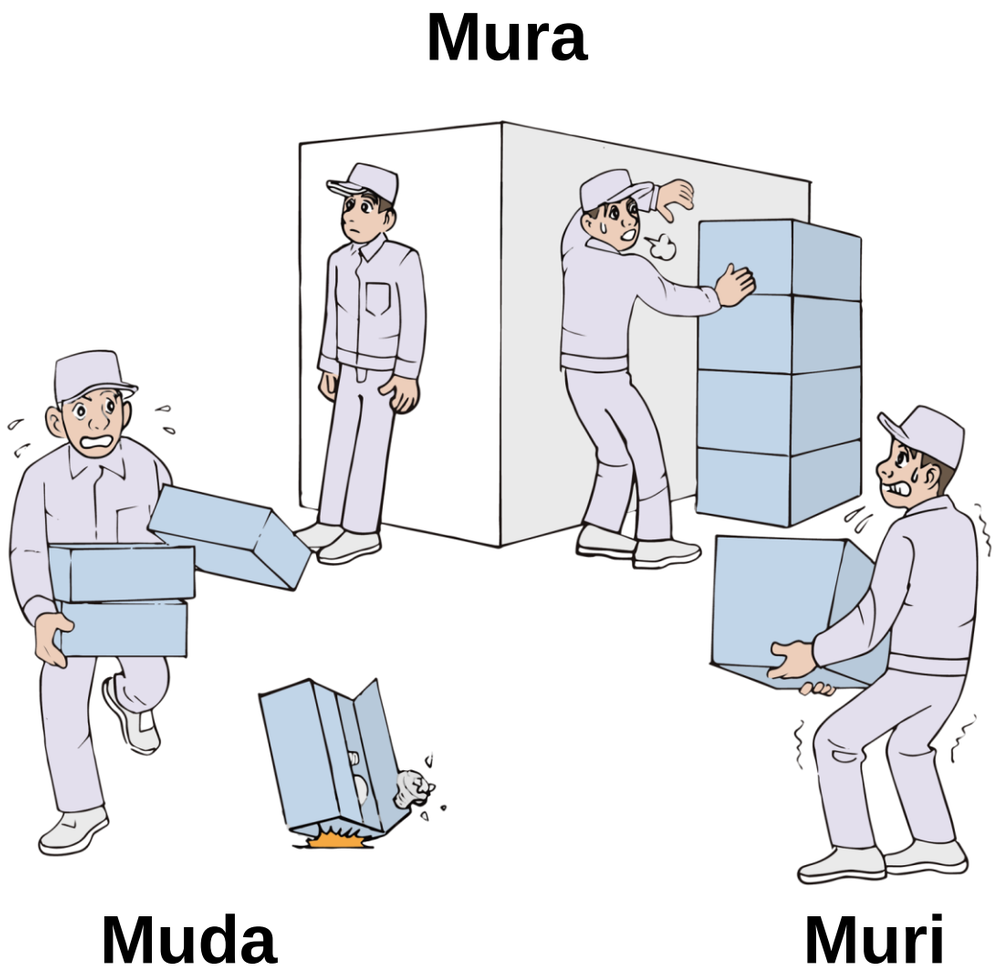
Definition of 3M (Muda, Muri, and Mura)



Purpose = means	Good productivity: Best way to achieve a purpose
Purpose < means	**Muda**: The means to achieve the purpose are too great (Examples of Muda: searching, moving, redoing, etc.) ⇒ **A state of doing many unnecessary things**
Purpose > means	**Muri**: The means are too small to achieve the purpose (Examples of Muri: no time, no tools, uncomfortable posture, etc.) ⇒ **A state of not being able to do what you want correctly**

Mura
A state with
Muda or Muri

3M（Definition of Muda, Muri, and Mura）



- Muda means unnecessary jobs.
- Muri occurs when there is a lack of resources (ability, time, tools, information, etc.).
- A state where Muda and Muri coexist is a state where Mura is present.

Remove Muri-Mura-Muda from your workplace.

Example of Muda / Mura / Muri

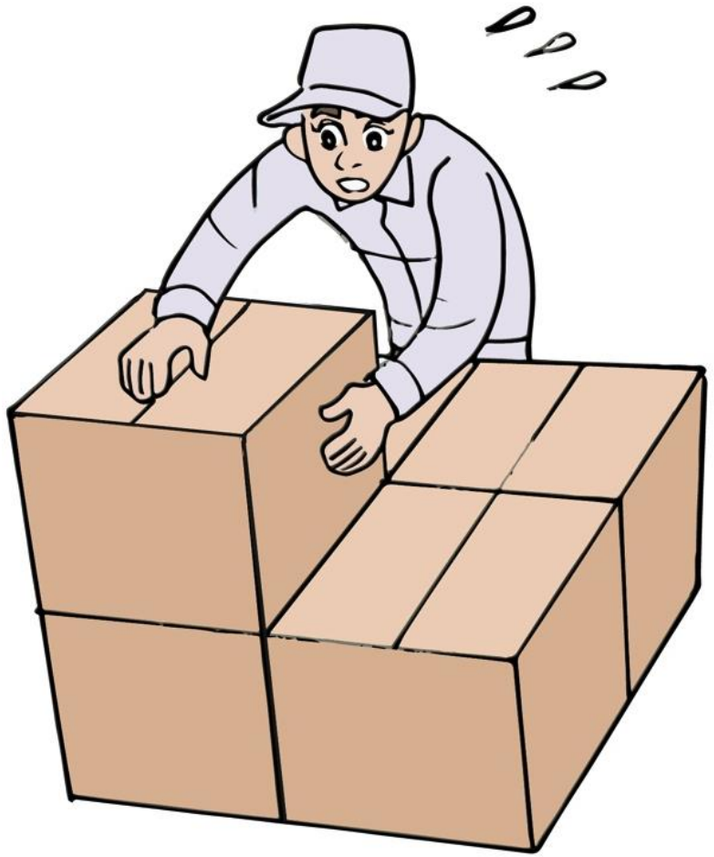
- Productivity seen from the relation between purpose and means.

Productivity	Relation between purpose and means		Example Purpose: Carry two cartons of beer in 350ml cans (0.38kg × 48 = 18.4kg)	Example Purpose: Dig a small hole
High	Purpose ＝ Means		Means: Carried by a dolly	Means: Dug by a shovel
Low	Muda	Purpose ＜Means	Means: Carried by a forklift	Means: Dug by a bulldozer
	Muri	Purpose ＞Means	Means: Carried by hand	Means: Dug by hand

What kinds of Muda, Muri, and Mura are hidden?

Q What kinds of losses and waste can you find in production situations?

Case 1



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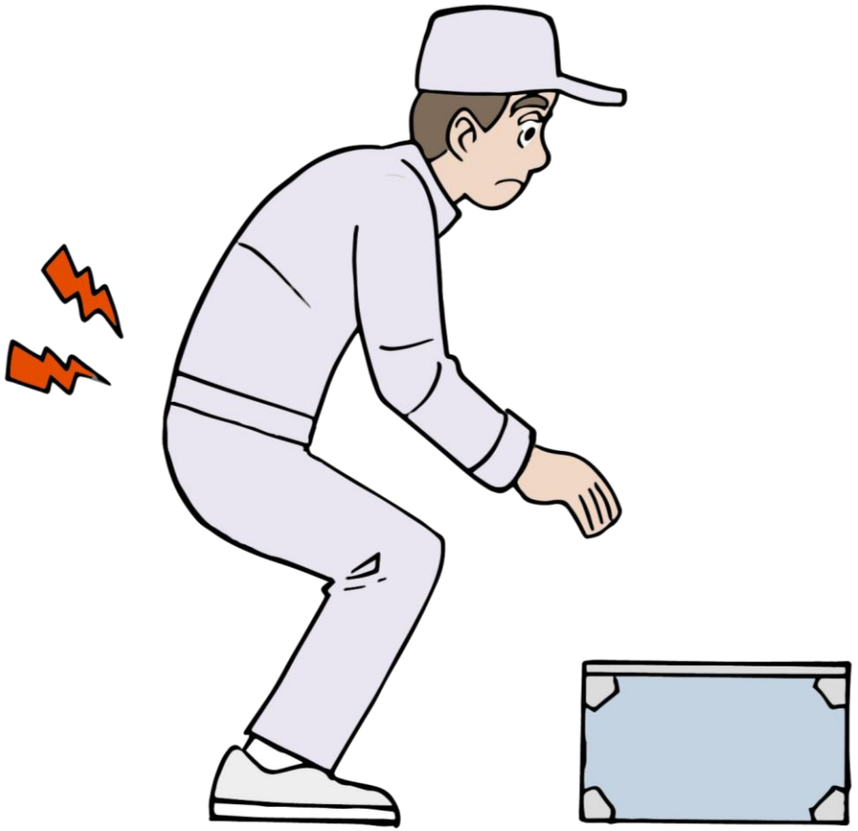
Case 2



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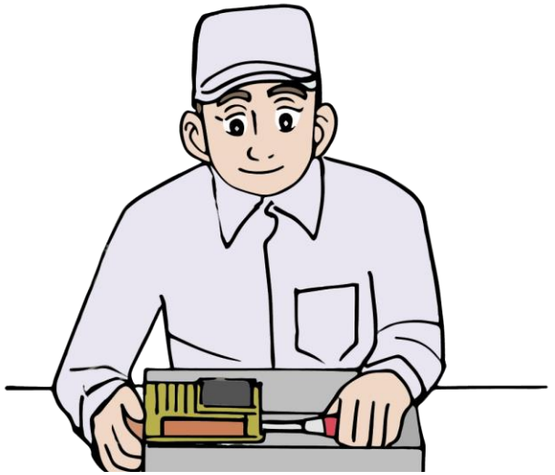
Case 3

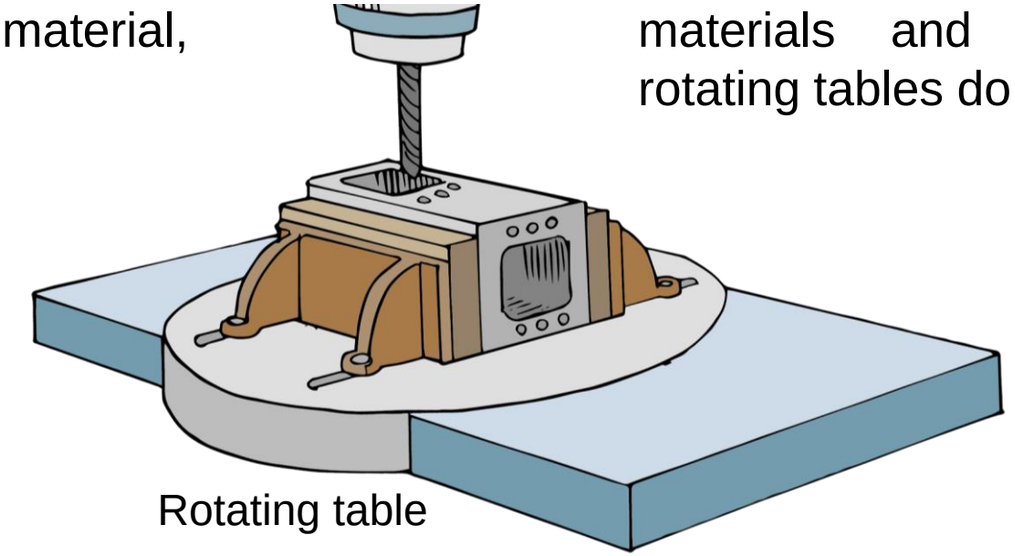


Meaning of added value of work

- What is value-added work? It's the work adding value to a product.
  - Working: Adding value by changing shapes and/or characteristics.
  - Motion: Adding no value by looking for something, just storage, or simply moving or transferring some parts.

Working

Cutting processes, like the one shown below, change the shape of the material, creating added value.



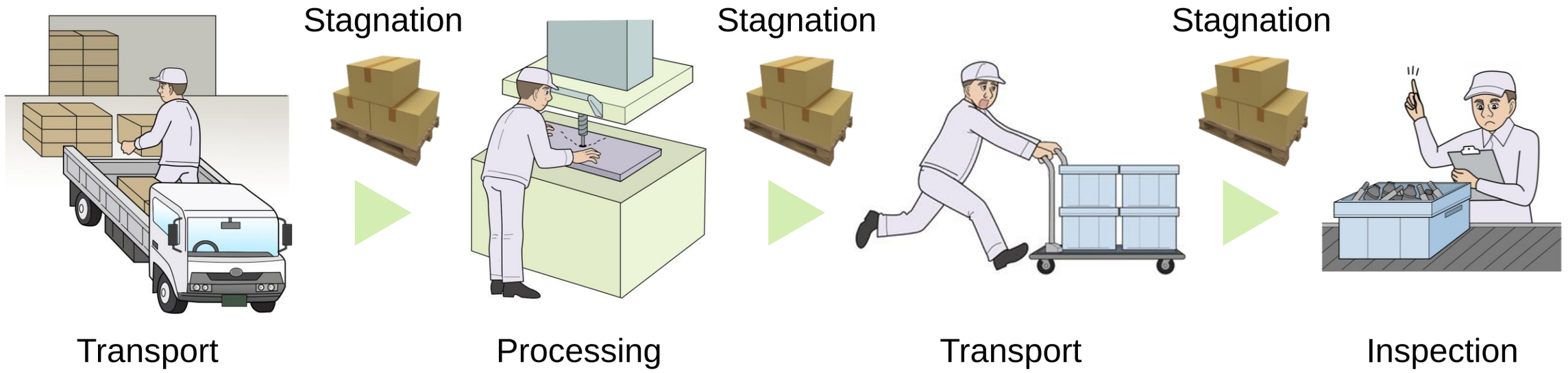
Rotating table

Motion

In contrast, tasks such as transporting materials and attaching materials to rotating tables do not create added value.

Muda in the four elements process

- Production requires several processes. Among these processes, there are processes that create added value and processes with Muda that do not create added value.
- Can you identify Muda operations that don’t create values? Among Muda, can you tell what is necessary Muda and what is unnecessary one?



Muda in the four elements process

Process by element	Content of process	Value added	Level of Muda
(1) Processing	The object of production is changed in shape or nature. e.g., machining, welding, painting	Value added (Contributing to making profits)	No Muda
(2) Transport	This changes the location of the object in production.	No value added	Necessary Muda

Muda in the four elements process

Process by element	Content of process	Value added	Level of Muda
(3) Stagnation	The object in production is either →stored for some reason, or →simply stagnating against schedule	No value added	Unnecessary Muda
(4) Inspection	This inspects the object in production for quantity and quality, and then compares the results with standards to judge its conformity.	No value added	Necessary Muda

Seven types of Muda hidden in manufacturing sites

- All those activities that are just consuming labour, materials and money but not adding any value are regarded as Muda, which means waste.

What kinds of Muda can you find?

There are many kinds of Muda at a production site. Focusing on human motions and machinery, all of the following things are Muda.

KAIZEN means activities to eliminate all these Muda.

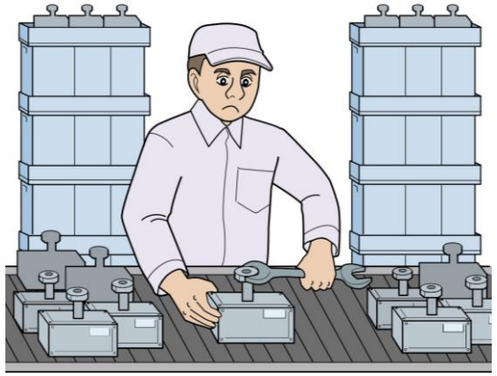
Seven Muda

① Overproduction
② Just waiting
③ Just transporting
④ Wasteful process
⑤ Extra inventory
⑥ Wasteful motion
⑦ Defect making

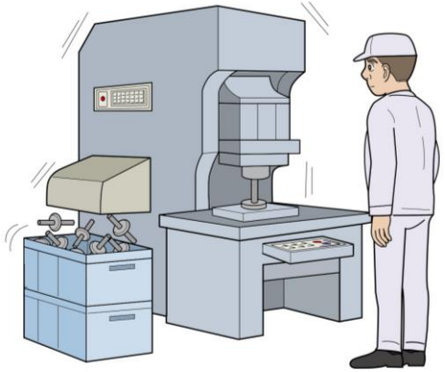
What is Seven Muda?

7 Muda	7 Muda at production factory
1. Overproduction	Too much material for production
2. Waiting	Just waiting due to process
3. Transporting	Only transportation of some parts and manufacture
4. Processing	Waste processing also exists
5. Inventory	Have too much inventory
6. Motion	Too much motion and just moving
7. Defect making	Many defective production

What is Seven Muda?

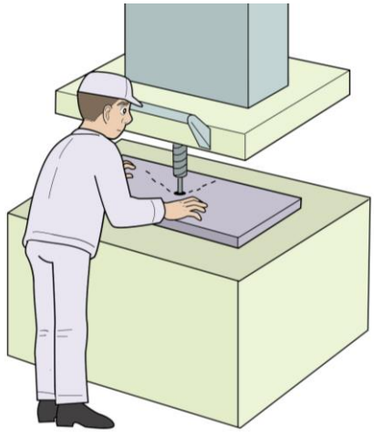


1. Overproduction



2. Just waiting or just monitoring

3. Just transporting



4. Wasteful process

5. Extra inventory

6. Wasteful motion

7. Defect making

Muda 1 - Overproduction

- Every product stocked in progress, and every material/part stocked in works is cost. Every object in the work area might become Muda. Do you think all of them will be used sometime? If you don’t, you have to do something to reduce them.

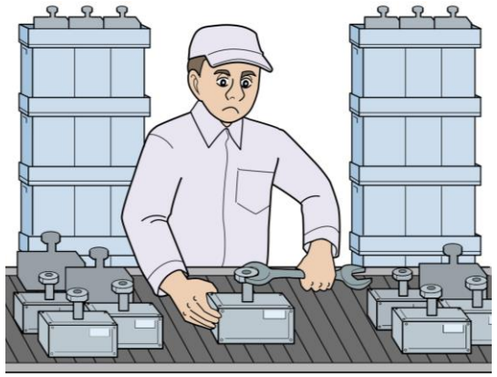
Harmful effects

- Deterioration of turnover ratio of funds
- To lose flexibility against market change
- To lose flexibility in production planning
- To hide Muda of waiting
- To need more space to stock

Muda 1 - Overproduction

- Muda of overproduction will generate new Muda (waste).
- Waste creates new Waste. (Negative chain reaction)

Manufactured but unsold excess products.



Muda of overproduction

Transporting and handling those unsold products.

Muda of transporting
Muda of waiting

Renting extra storage space, inventory control, product deterioration, additional running funds, due to the overproduction.

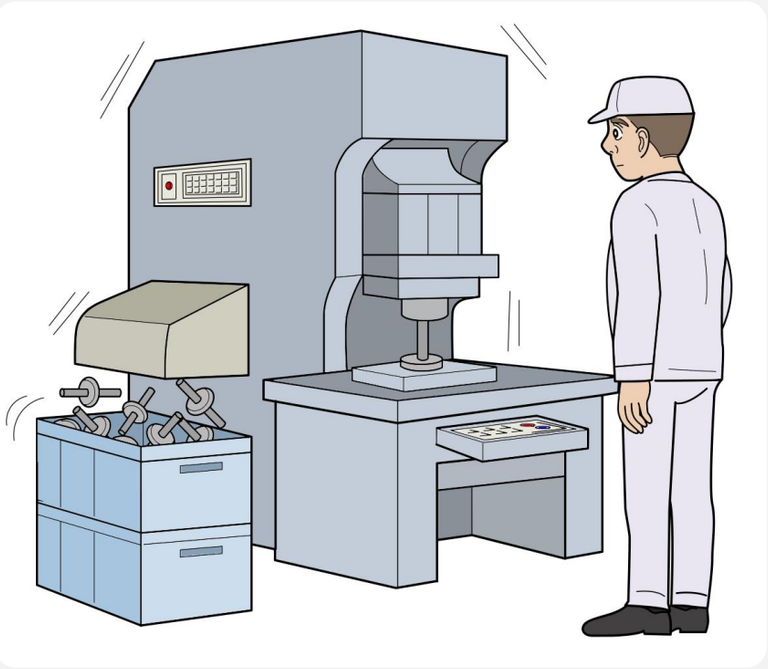
Muda of inventory

Muda 2 - Waiting

- If a worker is just waiting until the process is completed, it’s a waste of time, Muda.

Harmful effects

- Waste of manpower and machine utilisation
- Increase of in-process inventory
- To create a moral hazard



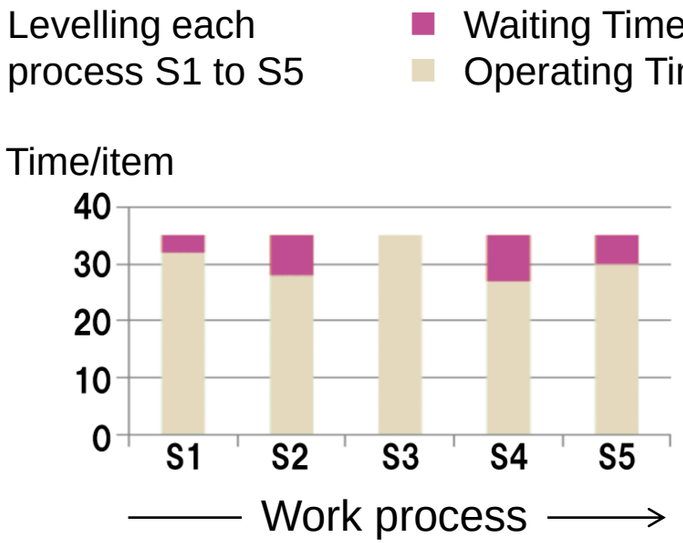
Why the waste of time occurs?
What is the cause of it?

Muda 2 - Waiting

- In Muda of waiting, a worker can't work because the previous process has not been completed yet. Therefore, he has to simply wait while doing nothing.
- Muda of waiting is caused by various reasons such as excessive production, lack of parts, machine trouble, etc.

How to eliminate/reduce waiting MUDA

- Find a process of waiting. (Observe a workplace objectively from outside.)
- Level each process as evenly as possible.
- Re-arrange operations of each process to level each operating time. (Resource re-arrangement)



Muda 3 - Transporting

- Transporting various kinds of items such as materials, parts and products is inevitable in production. However, the transport itself doesn’t add any value to a product but incurs some cost. Therefore, it’s classified as unnecessary Muda. For this reason the transport should be reduced or avoided as much as possible.

Muda 3 - Transporting

How to reduce Muda in transporting

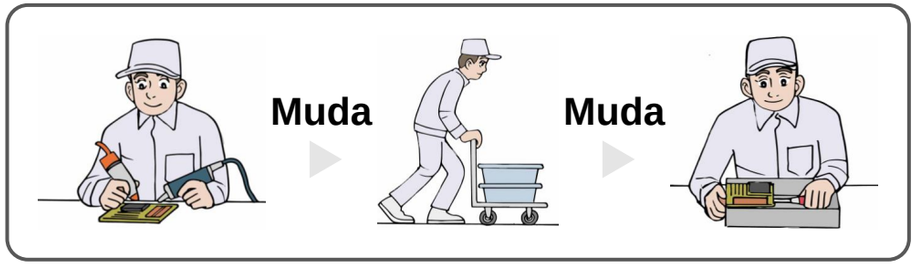
1. Improve or change the production process.

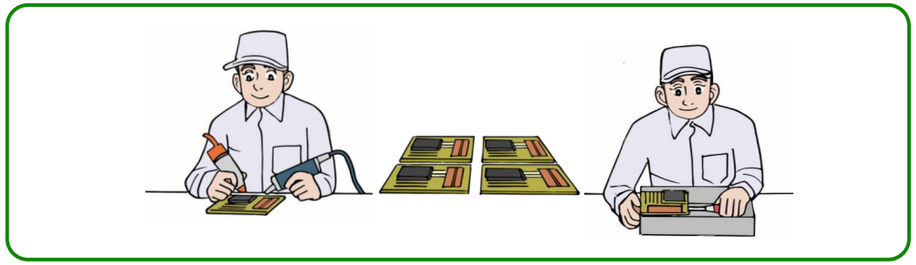
- Change the layout of the production area.
- Change the storage place.
- Change the procedure of production, etc.

2. Improve or change the method of transport.

- Change the means of transport.
- Change the frequency.
- How often materials and/or products are transported.
- Change the distance.

Reduce frequency and distance
as much as possible.





Muda 4 - Processing

- Try to find an unnecessary process such as an unnecessary machine. Look at the current process from a different viewpoint. Think about the required functions and/or characteristics carefully and avoid excessive ones.
- Remember that people are usually reluctant to change the current process, when it has been used for a long time and they are used to it. Therefore you have to have a tenacious attitude to think if there is some possibility of improvement in the current process at all times.
- There is an advancement in the production method and technology at any time. That means we always have a good chance of improvement, KAIZEN.

Harmful effects

- To need additional materials and labour
- Increase of defects

Muda 4 - Processing

How to reduce unnecessary processes

- Waste in the process can be reduced by using the principle of ECRS. Refer to the following ECRS method.

E: Eliminate	Is it possible to eliminate some process?
C: Combine	Is it possible to combine some process with others?
R: Rearrange	Is it possible to change the order of process?
S: Simplify	Is it possible to simplify some processes?

Muda 5 - Inventory

- The inventory itself may not look useless. However if the products aren’t sold as expected, they will bring a huge loss.
- Keeping stock carries cost and wastes time. Inventory (stagnation), as well as transport and inspection, doesn’t generate any value. It is Muda, waste, so it should be reduced as much as possible and hopefully eliminated.

Harmful effects

- To need more working capital
- To hide other Muda
  (However a great deal of stock indicates the presence of Muda.)
- To need more space to stock

Muda 6 - Motion

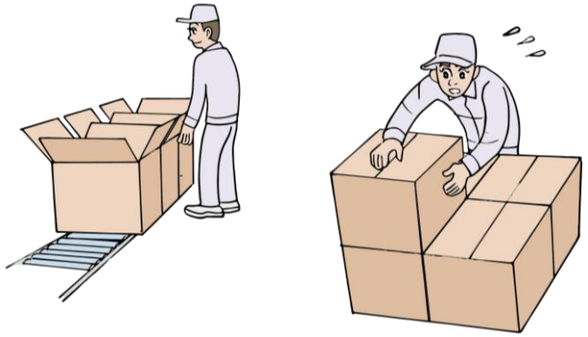
- Unnecessary motion in production is waste. It may cause unsafe conditions, quality problems and/or cost increase.
- Removal of waste in motion is essential for safe work, good quality and cost reduction.

Harmful effects

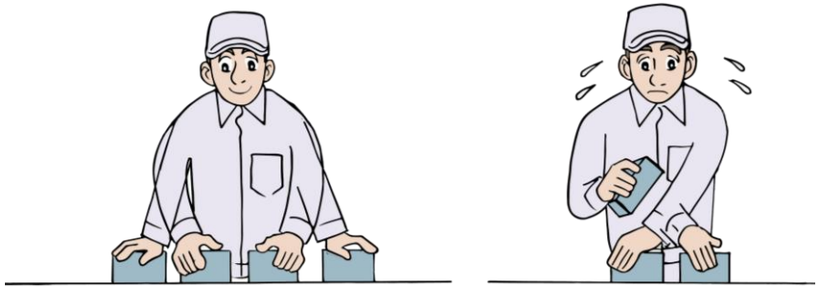
- To waste time. It may affect cycle time.
- Instability of operation
- Defects caused by fatigue of an operator

Muda 6 - Motion

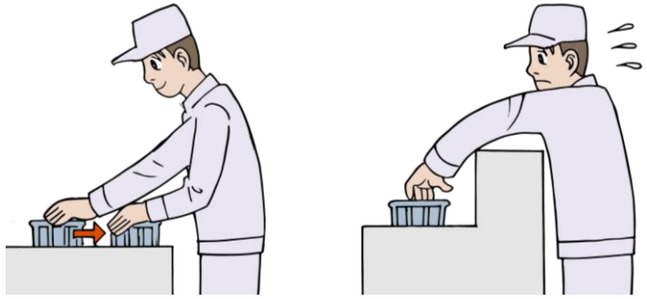
- Principle of motion economy: A method for eliminating unnecessary motion and working safely, correctly and efficiently.



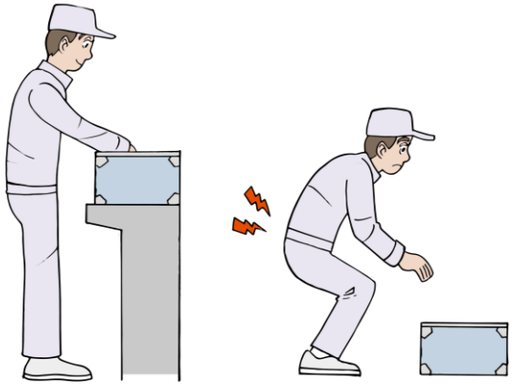
Reduction of steps and motion itself.



Do some types of work simultaneously.



Reduction of motion distance.



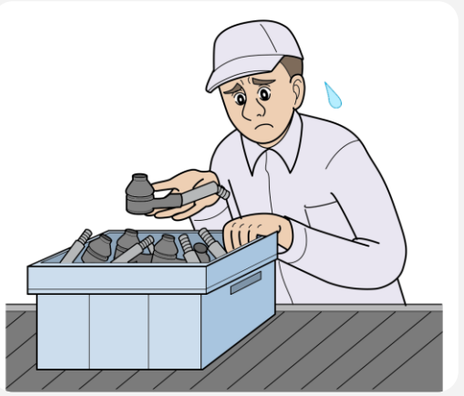
No complication. Work simply & easily.

Muda 7 - Defect making

- When defective products are made, all resources used in their production process such as time, labour and material become Muda. More importantly, you will lose the customers' confidence and he/she won't give you another order. We should remember that good products are made by good workers. So what you have to do first in order to make good products, is to develop good people. They should have a high work ethics and morals and be motivated not to produce defective products.

Harmful effects

- To need extra cost to rework a defective product
- To damage the customers' confidence



Muda 7 - Defect making

- What are the required qualities of a good worker?

  - To have a good personality
  - To practice 5S activities consistently
  - To be a good role model, exercise workplace rules, follow work standards, and share useful information such as his/her failure experience, management knowledge, etc., with co-workers.

Four principles of KAIZEN to reduce Muda (ECRS)

What is ECRS?

As one of the improvement methods to eliminate Muda at production sites, ECRS represents the essence of four types of thinking to promote KAIZEN.

ECRS is an abbreviation of :

- Eliminate（to remove or to get rid of ）
- Combine（to combine or to separate）
- Rearrange（to replace or to substitute）
- Simplify（to make it simple and easy）

Using ECRS: Sequence

- The ECRS method should be applied in the order of E to C to R to S.

E: Eliminate	Is it possible to eliminate that operation?
C: Combine	Is it possible to combine that operation with others?
R: Rearrange	Is it possible to alter that sequence of operation?
S: Simplify	Is it possible to simplify that operation?

How to use ECRS

- How can the ECRS method be applied to eliminate various elements of Muda hidden in the following four processes of A,B,C and D at production sites places?

A: Processing	**Operation with added values** → Should reduce processing time.
B: Inspection	**Necessary Muda** → Should try to reduce it as much as possible.
C: Transport/Move	**Necessary Muda** → Should try to reduce it as much as possible.
D: Stagnation/Storage	**Pure Muda** → Should always try to eliminate it to zero.

Case of KAIZEN with ECRS

How to reduce Muda of transportation

1. Improve or change the production process.

- Change the inventory place.
- Change the procedure of production and others.

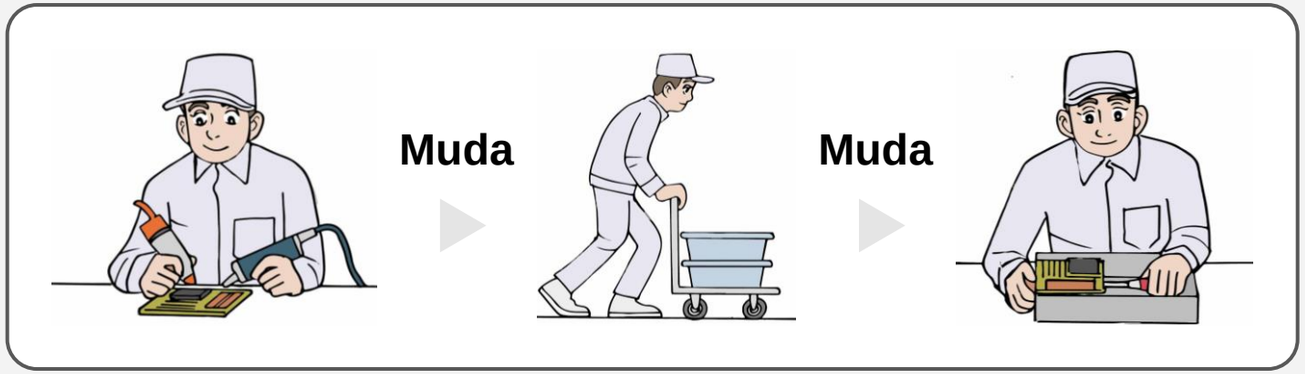
2. Improve or change the production condition, the transportation method and the transportation distance/frequency.

- How is the workplace?
  → Make it easier and simpler.
- How often is material transported?
  →Reduce the number of times it needs to be transported to as few as possible.

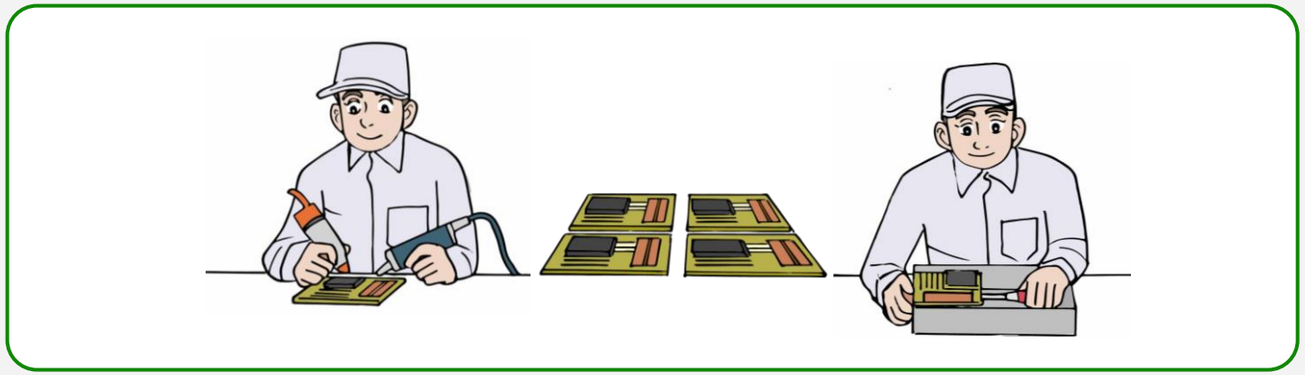
Case of KAIZEN with ECRS

How to reduce Muda of transportation

Before



After



Analysis methods to find Muda

- Muda is not easily found, so it’s necessary to analyse and visualise the production process in order to expose problems.

  - To make a process flow diagram by dividing an operation into the four categories of processing, transport, inspection and stagnation.
  - To detect any process with problems by visualising the operation time for each process.
  - To reduce a lead time and Muda in operations by applying KAIZEN to the process with problems.

What is Operation analysis?

- Operation analysis identifies the time that each task takes.

- To grasp the current state of operation by surveying the contents of operator/ machinery job such as operation time, etc.
  - How much of the time the operator/machinery is not working.
  - Why the operator/machinery is not working.
  - Investigate the cause and find a hint for improvement.
- To obtain the time ratio used for each operation category.
- To define the standard time for standard operation. For example:

Category	Main operation	Associated operation	Allowance	Non working	8 hrs
ratio	30%	35%	25%	10%	100%

Classification of work contents

Classification of work contents

Classifications		Contents	Examples
Work time	Main operation (Net opr)	Value-adding operation to transform material and change parts	● Direct processing time (Grinding, Drilling, Assembly, Screw driving, Soldering)
	Associated operation	Associated operation taking place before and after main operation	● Supplying and removing material ● Machinery operation, Taking parts and tools
Allowance time	Work allowance	Not directly related associated operation but necessary time	● Daily checking of machinery, Maintenance of tools ● Transporting of materials and products
	Management allowance	Common time at a work place	● Machine trouble ● Waiting due to lack of materials ● Clerical work: Instructions, Morning meeting
	Personal allowance	Time required for physiological needs	● Lavatory, Drinking water, Wiping sweat, Getting warmth
	Fatigue allowance	Recess to restore fatigue	● Recess (rest due to high temp., high humidity work, lifting heavy loads, etc.)
Non working time		Due to operator's laziness	● Chatting, Loitering

Classification of work contents

- Investigation state of operation

Watching movement of operators and machinery, measure working time and study if there is any time to be reduced.

Associated operation

Not adding value but necessary job (such as changeover, fixing/removing products)

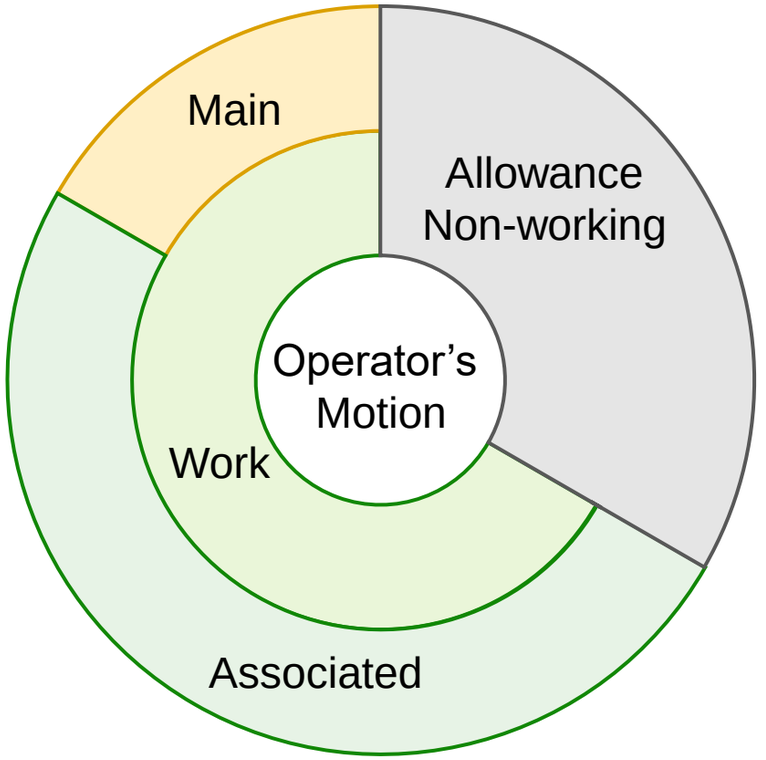
Can this operation be shortened?

Allowance and Non-working

Wasting time without adding any value

Minimise it to as little as possible

Can it be replaced with any other operation?



Reduced by changing process/conditions

What is Motion study?

- Motion study is used to analyse the detailed movements (actions) of work.

  - To visualise any useless motion by analysing each motion of the operator thoroughly.
  - To reduce time by detecting useless motions and eliminating them. To find a better motion to reduce fatigue.
  - To promote a motion-oriented mind for better work efficiency by repeating this approach. For fast, correct, easy, clean and inexpensive work.

Important points of Motion study

- What has to be considered in a motion study?

Points of view	Contents in ‘motion study’
1. Object of analysis	Movement of human ‘body’ and ‘eyes’
2. Point of thinking	Exercise motion-oriented mind (consciousness of motions) Understand the difference between a good and bad motion. Be aware of improvement order of motions Manual work → Jigs → Mechanisation → Automation
3. Method of motion analysis	A. Both-hand work analysis: Four jobs ① Work ② Transport ③ Hold ④ Carry B. Micro-motion analysis: ‘Therblig’ analysis to analyse and evaluate work by breaking it down to 18 basic motions.

Therblig motion analysis

- Therblig motion analysis
  - According to the Therblig analysis, human work can be divided into 18 basic motions.
  - Those 18 basic motions can be categorised to three classes by criteria of value.
  - The motions having added value are categorised in Class 1, but those having no-added value are categorised in Class 2 or 3.

(Note) This theory was advocated by Gilbreth.

Classifi-cation	18 basic motions for work			Value	What to change
Class 1	1 to extend arm 4 to assemble 7 to release	2 to grab 5 to use 8 to check	3 to transport 6 to disassemble	Motions with value	**Minimise supplementary work if any**
Class 2	9 to search 12 to pre-position	10 to select 13 to finish positioning	11 to find 14 to think	Necessary motions but without value	**Devise a way to eliminate these**
Class 3	15 to hold 18 to rest	16 an unavoidable delay	17 an avoidable delay	Motions without value	**Devise a way to eliminate these**

Therblig motion analysis

- Various motions

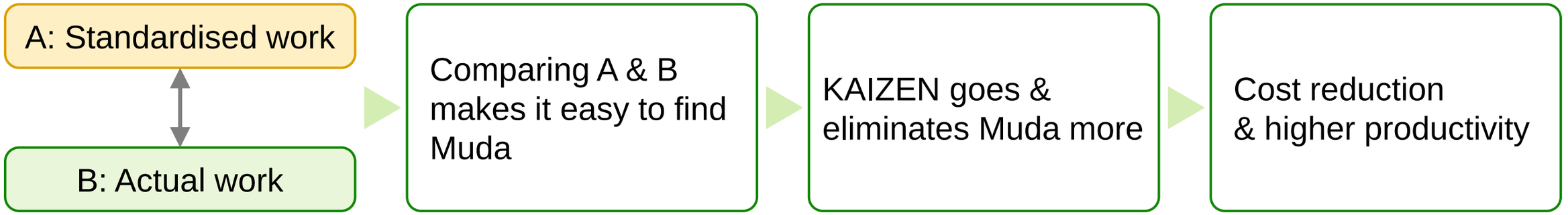
Find the motion for eliminating unnecessary motion and working safely, correctly and efficiently.

What is standardised work?

If manufacturing in a factory is performed in each person's own way, the product quality and cost will vary greatly and then it won't be possible to produce good and inexpensive products with stability. Also, in some cases the same product has to be manufactured in a different factory. So, in order to maintain a good level of quality and cost consistently, the manufacturing process has to be standardised with a good combination of 3M (Man/Machine/Material) for a Muda-free, safe, easy, fast and accurate production way.

Purpose of standardised work

- Standardised work is an important tool for KAIZEN.
- By comparing standardised work (A) with actual work (B), various Muda become visible.
  (e.g.) Difference of operation time, bottleneck process, inventory of work-in-progress and waiting hours, etc.



Purpose of standardised work

Muda becomes visible

- Muda becomes visible for everyone.
- Waiting becomes visible.
- Can find a root cause as you repeat the same work?
- Processes with bottlenecks become visible?
- Changing volume of work-in-progress becomes visible.
- Can tell you the needs of new layout?

Muda elimination by KAIZEN

- We can reduce:
  - Muda of waiting
  - Muda to add extra motions
  - Muda of processing itself
- Solve processes with bottlenecks.
- Reduce work-in-progress.
- Enhance production capability.
  (with lower man-hours)
- Re-examine the layout to reduce transporting.

Cost reduction, Higher productivity

Three elements for standardised work

- What kind of operations should the standardised work be applied to?
  - Human motion-centric operations
  - Operations with repeated actions

Three elements for standardised work	Parameters to define
1. Tact time **Cycle time**	• Required work speed per 1 cycle of operation • Time taken to make one part
2. Work sequence	• Sequence to complete an operation such as: Attachment of parts to machinery → Processing → Detachment → Assembly
3. Standard Stock	• In order to repeat the work sequence, a certain level of stock is required. Define necessary but minimum stock of work-in-progress.

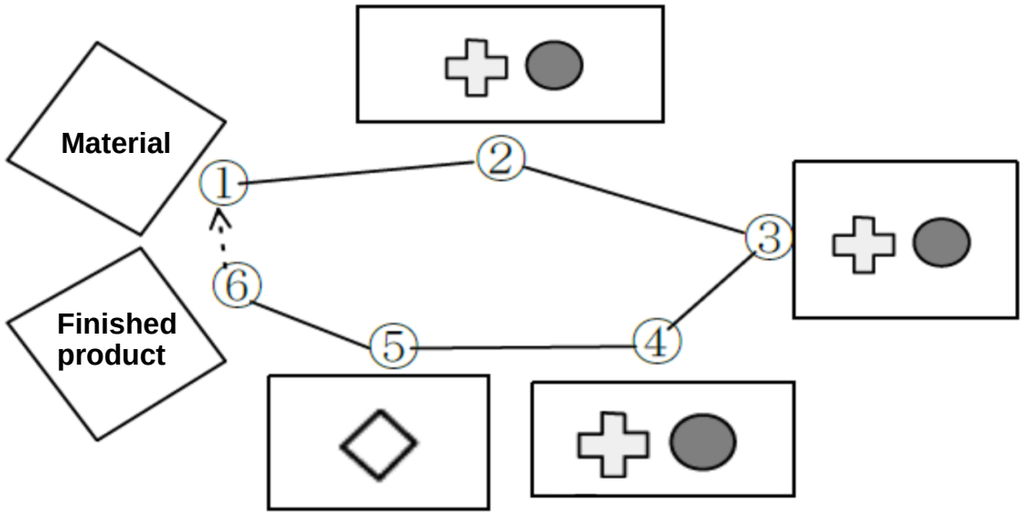
Three elements for standardised work

- A case of standardised work

Processes:

① Start→②→③→④→⑤→⑥Completion

Operations	From picking up raw material
	To placing finished product



Quality Check	Safety	Std Stock	Stock Vol	Takt Time	Net Time
◇	✚	●	3	3”	3”

Tools for standardised work

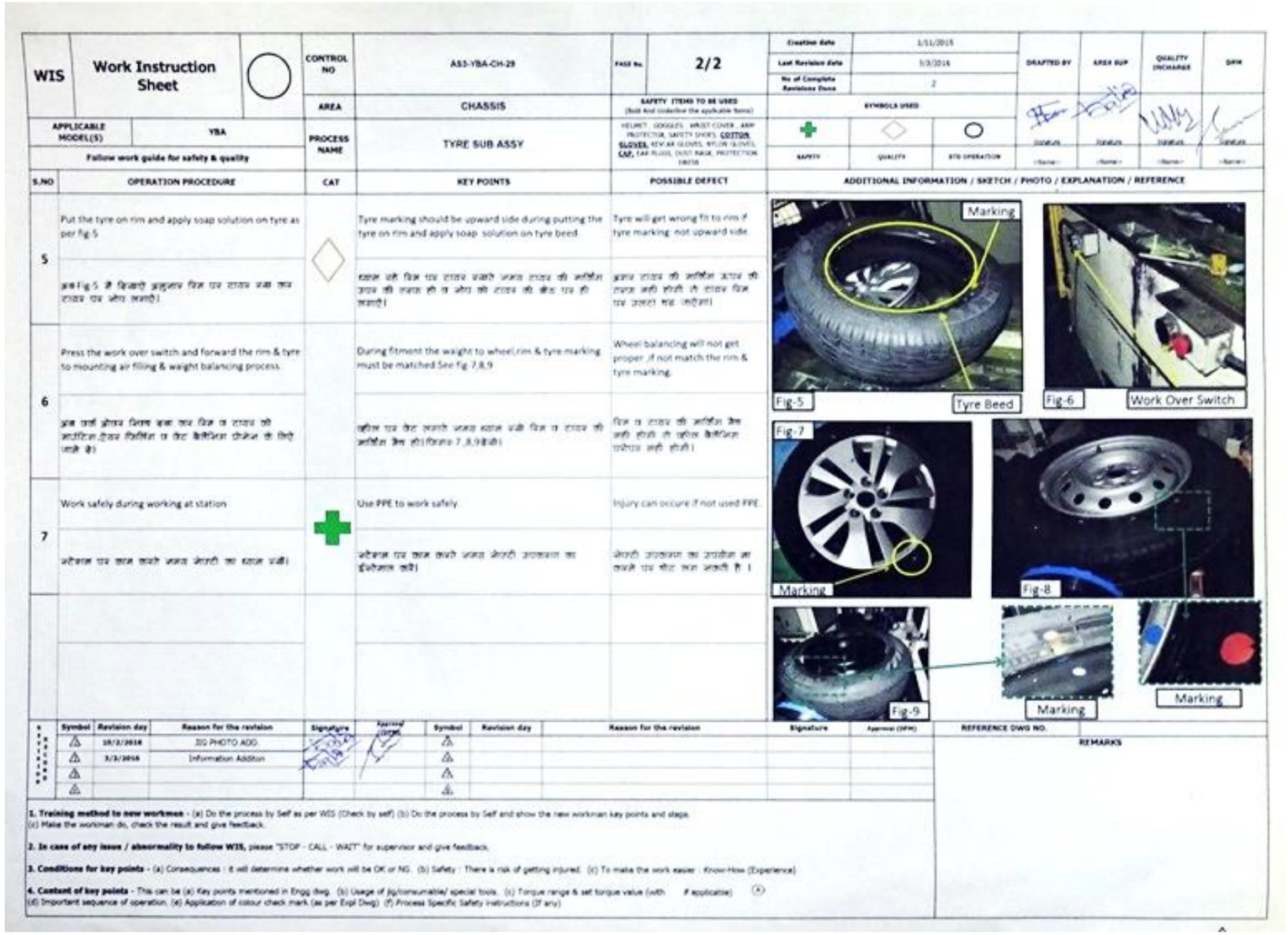
- Five forms to implement standardised work

Five form tools	Parameters to decide
1. Process capability table	A tabulation of production capability (volume and time) by process.
2. Standardised work combination table	To indicate types of machinery and sequence performed by an operator in one cycle (time and sequence).

Tools for standardised work

Five form tools	Parameters to decide
3. Work manual	To show how job should be done such as operation of machinery, exchange of cutting tools, changeover, parts processing, assembly, etc.
4. Work tutorial	To show the entire scope of jobs to be performed by an operator with an indication of essential points of quality and safety.
5. Standardised work sheet	Extracting a part of the work tutorial, especially the critical parts, to be seen by operators at worksite.

<Specimen> Tools for standardised work



WIS	Work Instruction Sheet	CONTROL NO	AS3-YBA-CH-29	PAGE No.	2/2
		AREA	CHASSIS	SAFETY ITEMS TO BE USED (Tick And Underline the applicable Items)	
APPLICABLE MODEL(S)	YBA	PROCESS NAME	TYRE SUB ASSY	HELMET, GOGGLES, WRIST COVER, ARM PROTECTOR, SAFETY SHOES, COTTON GLOVES, KEVLAR GLOVES, NYLON GLOVES, CAP, EAR PLUGS, DUST MASK, PROTECTION SHEETS	
Follow work guide for safety & quality					

Creation date	1/11/2015
Last Revision date	3/3/2016
No of Complete Revisions Done	2

SYMBOLS USED		
SAFETY	QUALITY	BTO OPERATION

DRAFTED BY	AREA SUP	QUALITY INCHARGE	DPM
Signature / Name	Signature / Name	Signature / Name	Signature / Name

S.NO	OPERATION PROCEDURE	CAT	KEY POINTS	POSSIBLE DEFECT	ADDITIONAL INFORMATION / SKETCH / PHOTO / EXPLANATION / REFERENCE
5	Put the tyre on rim and apply soap solution on tyre as per fig 5 फिग 5 के दिखाये अनुसार रिम पर टायर लगा कर टायर पर ओप लगाऐं।	◇	Tyre marking should be upward side during putting the tyre on rim and apply soap solution on tyre beed टायर को रिम पर लगाते समय टायर की मार्किंग ऊपर की तरफ हो व ओप को टायर के बीड पर लगाऐं।	Tyre will get wrong fit to rim if tyre marking not upward side अगर टायर की मार्किंग ऊपर की तरफ नही होगी तो टायर रिम पर उलटा बैठ जाऐगा।	Fig-5 Marking Tyre Beed
6	Press the work over switch and forward the rim & tyre to mounting air filling & waight balancing process अब वर्क ओवर स्विच दबा कर रिम व टायर को माउंटिंग,एयर फिलिंग व वेट बैलेंसिंग प्रोसेस के लिए भेजे दें।		During fitment the waight to wheel,rim & tyre marking must be matched See fig 7,8,9 व्हील एवं वेट लगाते समय स्टाम्प वाले रिम व टायर की मार्किंग मैच होनी(फिगर 7,8,9देखें)।	Wheel balancing will not get proper ,if not match the rim & tyre marking. रिम व टायर की मार्किंग मैच नही होगी तो व्हील बैलेंसिंग परफेक्ट नही होगी।	Fig-6 Work Over Switch Fig-7 Marking Fig-8
7	Work safely during working at station स्टेशन पर काम करते समय सेफ्टी का ध्यान रखें।	✚	Use PPE to work safely स्टेशन पर काम करते समय सेफ्टी उपकरण का इस्तेमाल करें।	Injury can occure if not used PPE सेफ्टी उपकरण का उपयोग ना करने पर चोट लग सकती है ।	Fig-9 Marking Marking

Symbol	Revision day	Reason for the revision	Signature	Approval (DPM)
△	10/2/2016	JIG PHOTO ADD		
△	3/3/2016	Information Addition		
△				
△				

Symbol	Revision day	Reason for the revision	Signature	Approval (DPM)
△				
△				
△				

REFERENCE DWG NO.

REMARKS

1. Training method to new workmen - (a) Do the process by Self as per WIS (Check by self) (b) Do the process by Self and show the new workman key points and steps. (c) Make the workman do, check the result and give feedback.

2. In case of any issue / abnormality to follow WIS, please "STOP - CALL - WAIT" for supervisor and give feedback.

3. Conditions for key points - (a) Consequences : it will determine whether work will be OK or NG. (b) Safety : There is risk of getting injured. (c) To make the work easier : Know-How (Experience)

4. Content of key points - This can be (a) Key points mentioned in Engg dwg. (b) Usage of jig/consumable/ special tools. (c) Torque range & set torque value (with # applicable) (d) Important sequence of operation. (e) Application of colour check mark (as per Expl Dwg) (f) Process Specific Safety instructions (If any)

Work Instruction Sheet

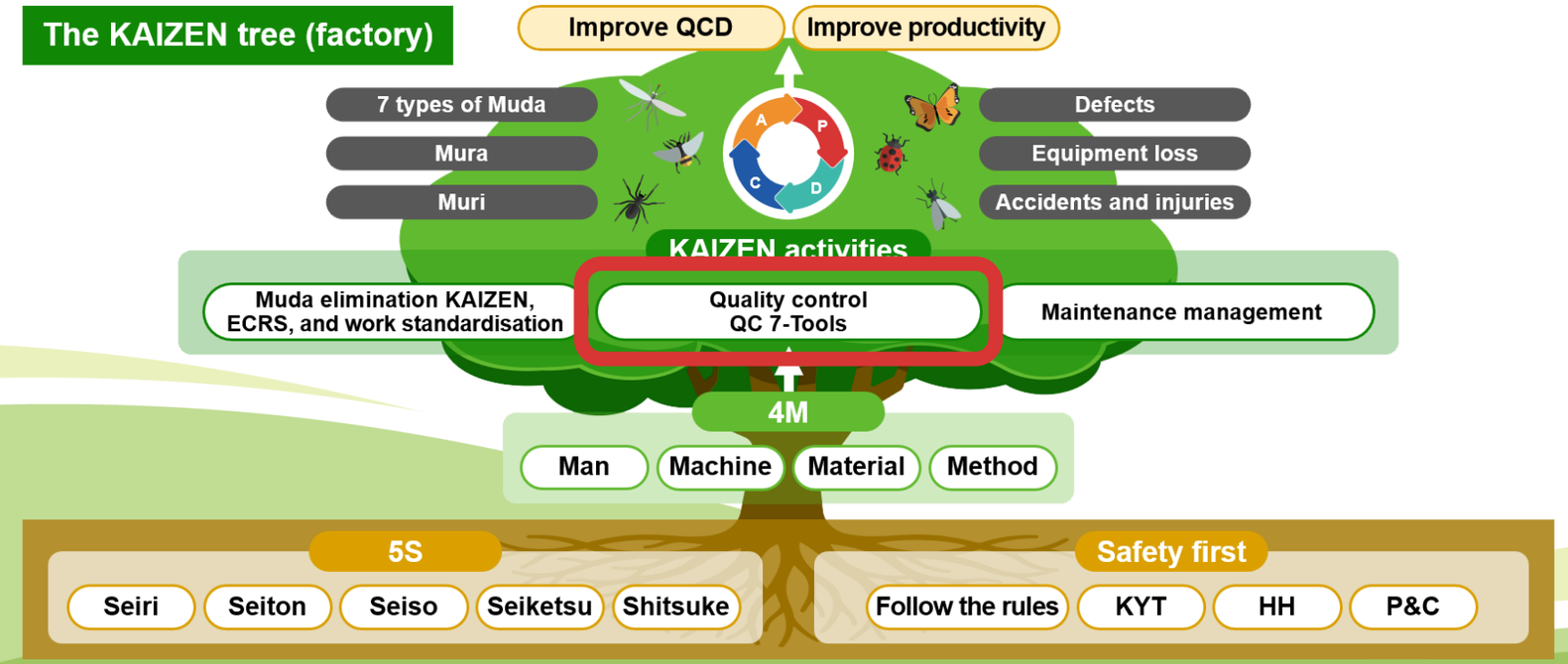
Section 7

Quality Control

Section 7 Quality Control

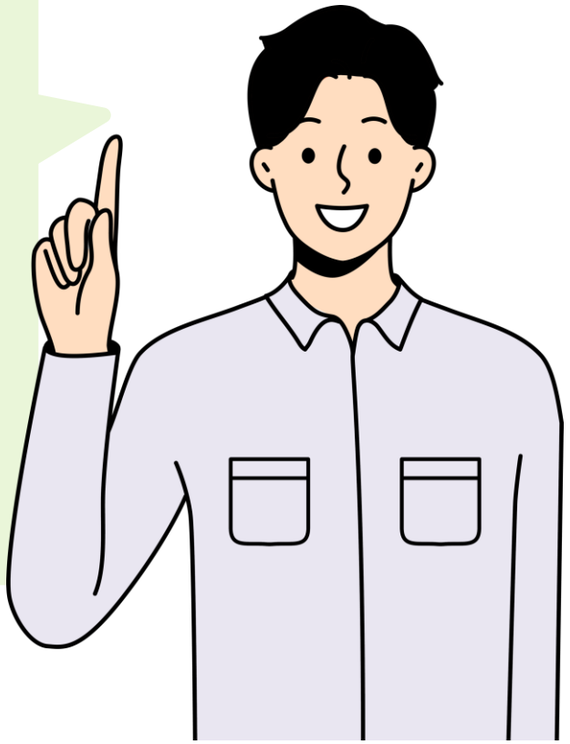
Contents

- **What is quality control?**
- **Basic Approaches to Reducing Defective Products(QC story)**
- **Usage of QC 7-Tools & What is 5-Why?**



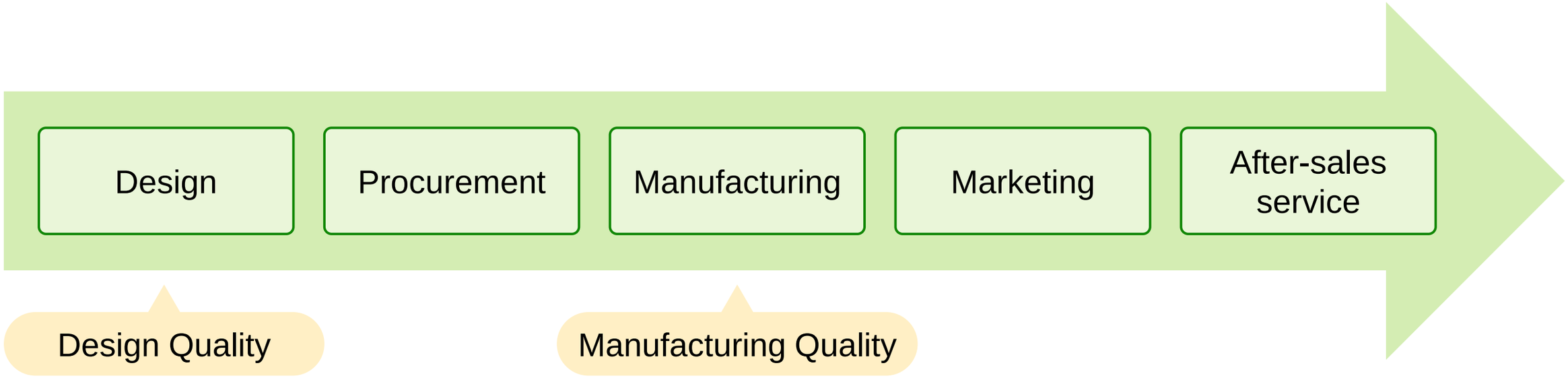
Key points of Section 7

- The approach to KAIZEN for quality control is called a QC story. It’s important to keep this QC story in mind for quality control KAIZEN.
- In a QC story, the QC 7-Tools are used to visualise KAIZEN activities. Make sure to remember the purpose, meaning, and features of each of the seven QC tools.
- Finally, we will introduce 5-Why. 5-Why is used to investigate the root cause of a problem.



What is quality control?

- Quality control is a system to make products with required quality which covers product design, procurement of parts and materials, manufacturing processes, marketing, after-sales service, etc.



Quality classifications

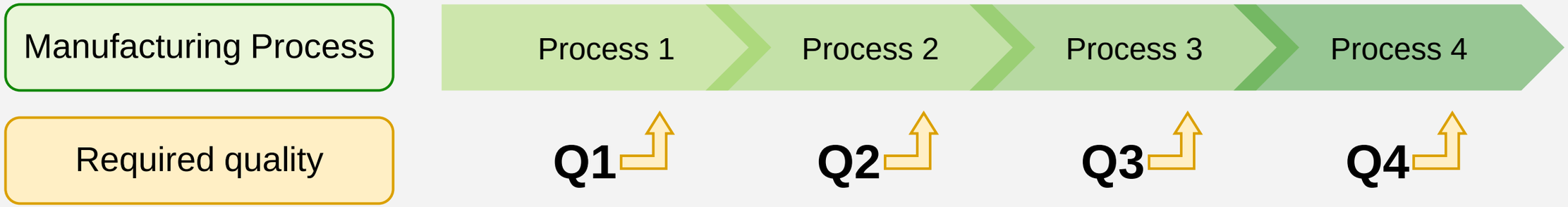
- ‘Quality’ can be different depending upon the viewpoints of persons who may be engineers, manufacturers, users and so on. Therefore, it can be classified into the following three categories, with the balance between them being important.

Required quality	Quality that consumers expect to have
Design quality	Quality that is specified in design and engineering
Manufacturing quality	Quality that is assured in manufacturing processes

Quality control in the manufacturing process

- Try to keep the following points to improve and maintain quality in manufacturing processes.

  - To make “good/bad” quality visible in each process
  - To make no defects
  - To maintain product quality within the targets (Prevent product quality from varying)
  - To complete the required quality in each process



Basic Approaches to Reducing Defective Products(QC story)

- QC story refers to a set of procedures to solve problems using QC 7-Tools in production places.
- It is widely applied in production places in Japan and represents an essential way of thinking for KAIZEN.
- It is widely used in other fields as well.

Basic Approaches to Reducing Defective Products(QC story)

- Basic steps of QC story are shown below.

Basic Steps	<Case> Defects are found.
1.Set the target and grasp the current situation	Grasp the situation of defects quantitatively including frequency, ratio, etc.
2. Analyse the current situation (Identify problems)	Identify problems to focus. Use a Pareto diagram.
3. Analyse the causes (Find the root cause)	What causes the problem? Extract relevant causes and identify the root cause by repeating the question as to why it happened many times. Use the 5-Why analysis.
4. Plan the solution (Attack on causes)	Conceive solutions to get rid of the cause of the defect.
5. Check the effectiveness of the measures implemented	Check the effect of the solution after implementation.
6. Standardisation	Take the measures such as a work standard to prevent the same defect from occurring again.

Usage of QC 7-Tools

Purpose of QC 7-Tools:

- It is a set of tools used in KAIZEN and QC activities for visualisation.
- They are widely used beyond the area of quality control.

Usage of QC 7-Tools:

- As tools to find problems
- As tools to identify causes of a problem
- As tools to confirm if the problem was resolved

Usage of QC 7-Tools

QC 7-Tools	Usage and description
1. Cause-effect diagram	● Also called a ‘Fishbone chart’. Effects and relevant causes are organised like fish bones and it is used to identify causes. (NOTE) This is used with 5-Why analysis
2. Check sheet	● Often used to prevent overlooking something. ● It is a table or list for the easy checking of predetermined items. ● It can help you to confirm a fact or obtain information by item.
3. Pareto chart	● A chart named after Pareto, an Italian economist. ● Items shown are arranged by size. It’s also called an ABC analysis chart. ● Vital few, trivial many; The theorem states that important things are fewer while things with no importance are many.

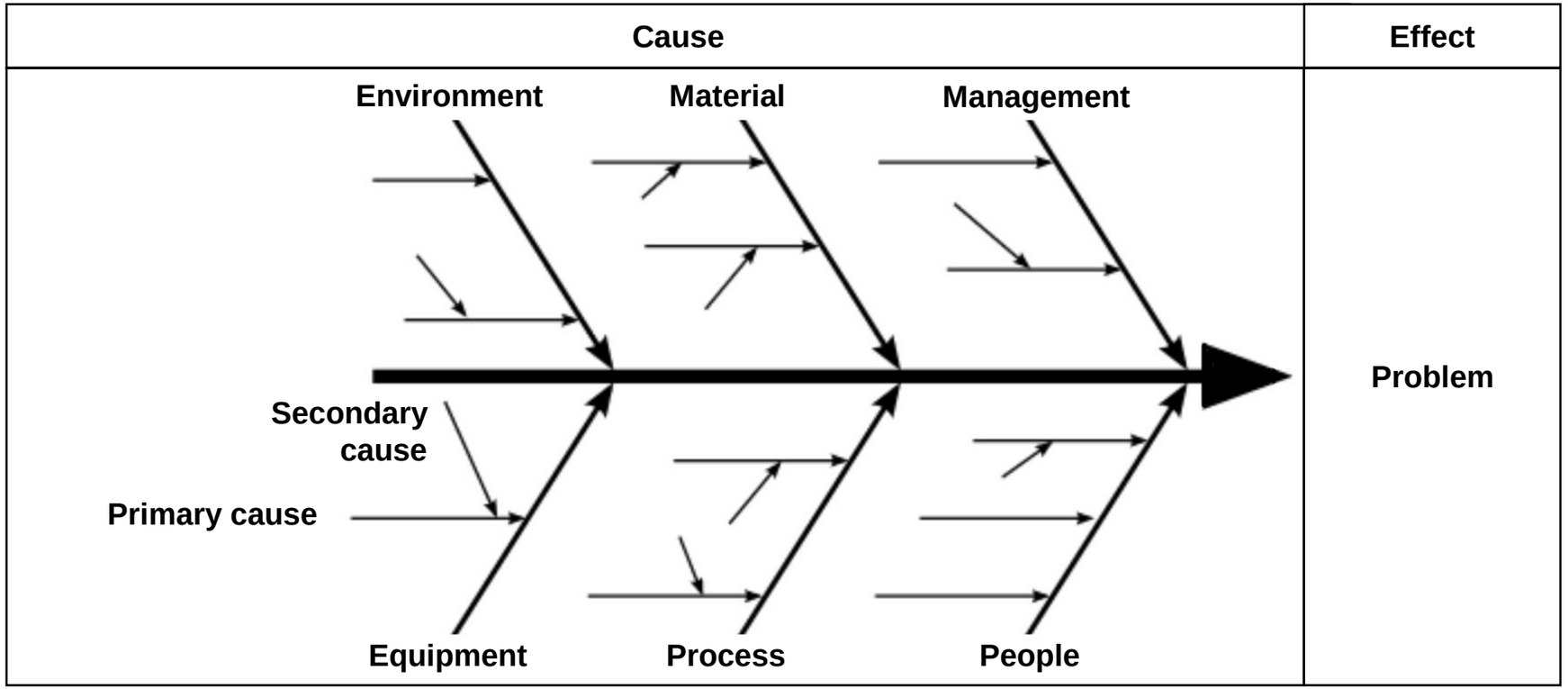
Usage of QC 7-Tools

QC 7-Tools	Usage and description
4. Scatter diagram	• A pair of data are loaded on vertical and horizontal axis, representing the paired data by dots for plotting. You can identify distribution patterns of the two data items and see if a correlation exists.
5. Histogram	• Used to see dispersion of data. • Also called a ‘Column diagram’. It shows a state of distribution of data.
6. Graph/Control chart	• A control chart is used to manage variation in your process with upper and lower control limits as well as mean values for selected data such as dimension tolerance.
7. Stratification	• This is a method to compare things with different characteristics. It’s very useful to deal with data and make them visualise.

Each tool-1 Cause-effect diagram

- Purpose and How to Use it

Used to organise causes of problems such as troubles and flaws in a systematic way; Extracting various causes to find effective counter measures for problem solving.



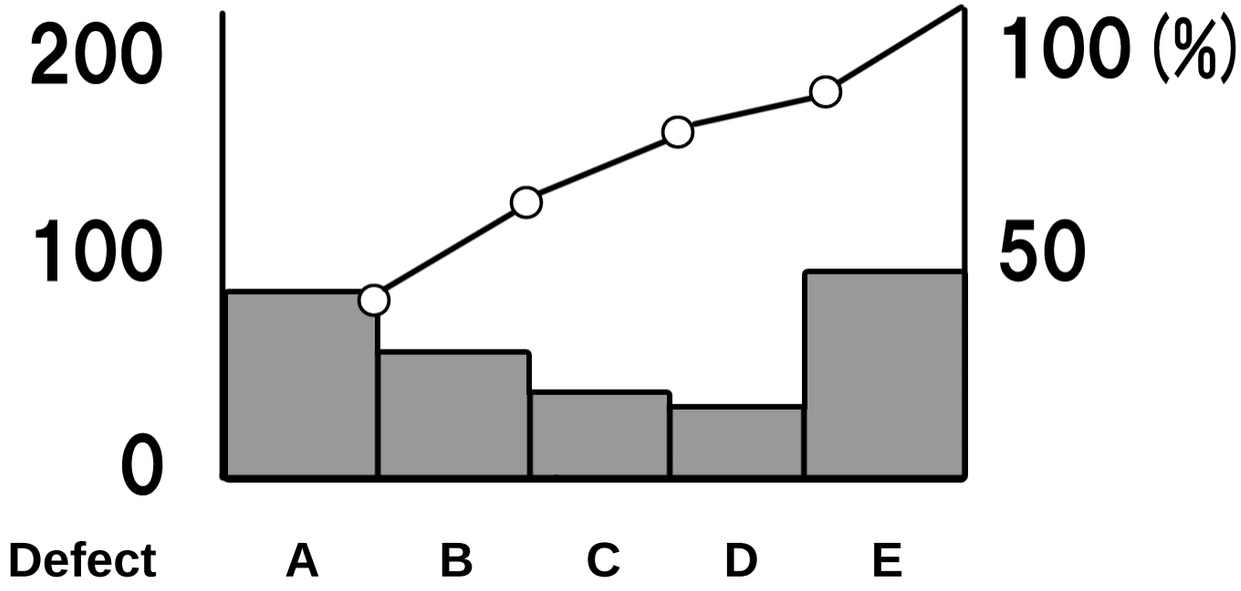
Each tool-2 Check sheet

- Purpose and How to Use it
  - It is either a table or a diagram made for easy identification of results and is very good for checking data.
  - It is useful in collecting data and preventing any missed or overlooked data.

Date	4/1	4/2	4/3	……	Total
Defect A	//	/	/	……	6
Defect B	///// /	///	///// ///	……	21
Defect C	/	///	/	……	8
……	……	……	……	……	
Total	23	18	29		85

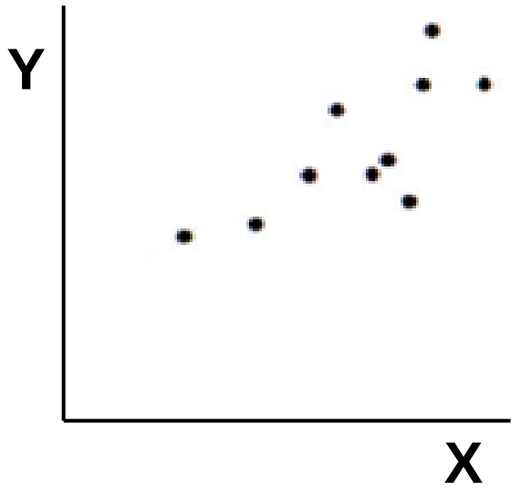
Each tool-3　Pareto chart

- Purpose and How to Use it
  - Used for analysis of important issues.
  - Used to choose the most influential issue.
  - A highly important and effective tool.

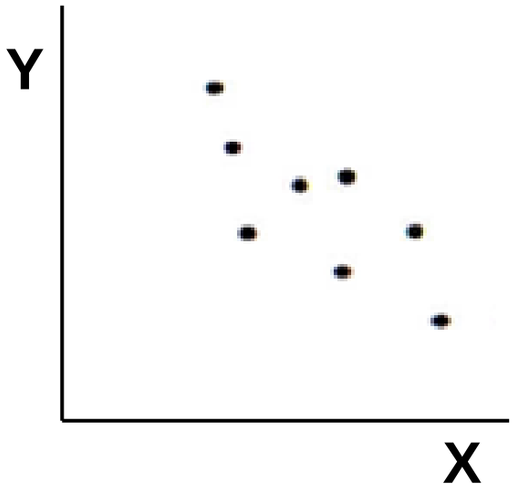


Each tool-4 Scatter diagram

- Purpose and How to Use it
  - Used to data clarify if there is a correlation between two sets of data.
  - Paired is to be plotted on X and Y axis to see if a correlation exists.



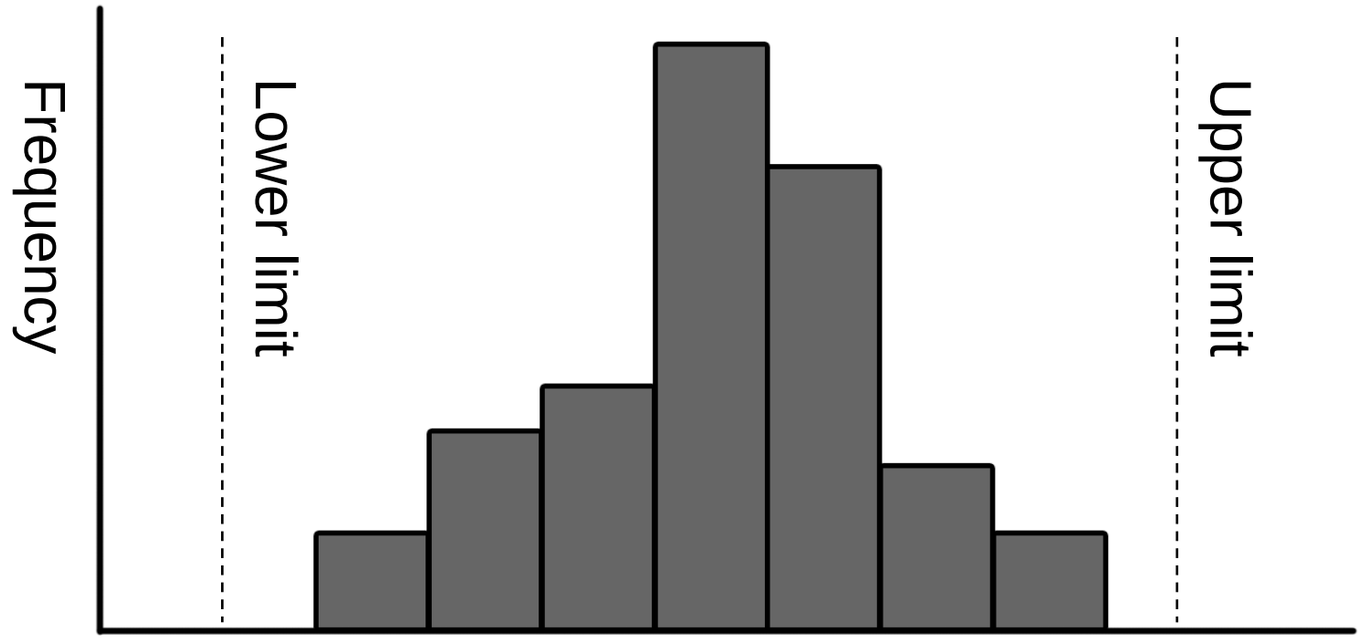
A positive correlation exits



A negative correlation exits

Each tool-5　Histogram

- Purpose and How to Use it
  - Used to examine dispersion of data.
  - Data has dispersion and this tool is used to clarify the shape of data distribution.



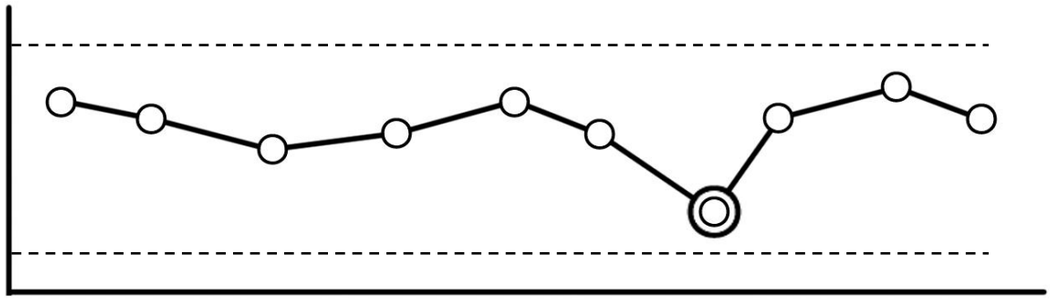
Each tool-6　Control chart

Purpose and How to Use it

Data is displayed by line graph with upper and lower control limit lines. When data falls outside control limit lines, it is considered that there is an abnormality in the process.

X Control Chart

X= mean value of data

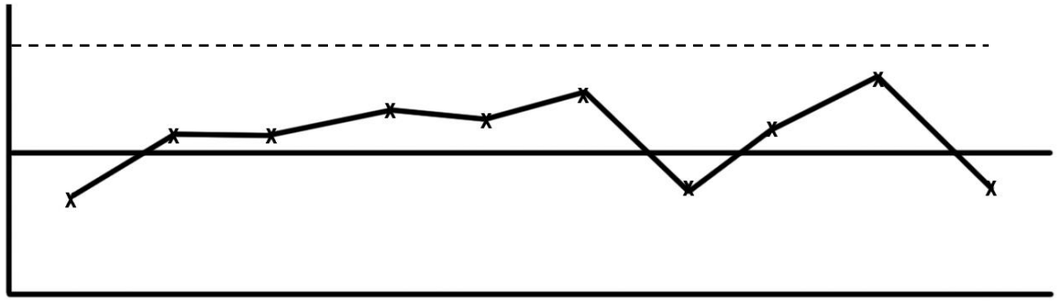


Upper control limit line

Lower control limit line

R Control Chart

R= a range of data (Max-Min)



Upper control limit line

Centre line

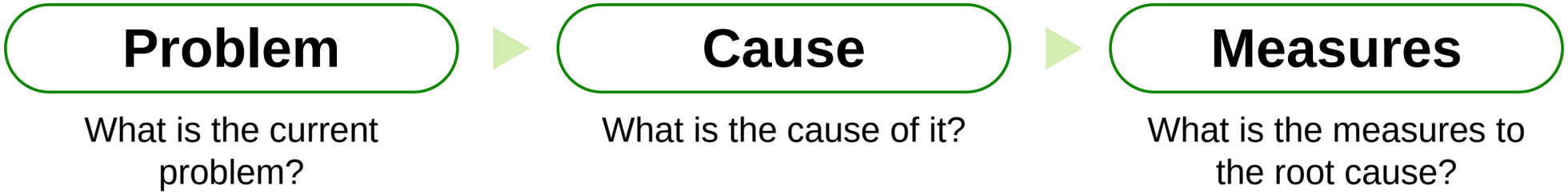
Each tool-7 Stratification

- Purpose and How to Use it
  - It is a tool to visualise a large amount of data by sorting it out according to the conditions.
  - For instance, a defect may be a result of many causes; sorting them out like cause by operator, cause by machinery, cause by material and such to visualise the case.
  - It is used with other tools.

	Scratch	Dirt	Defect	Others	Total
Process A	/////	//	///	//	12
Process B	//	/	///// ///	//	13
Total	7	3	11	4	25

What is 5-Why Analysis?

- 5-Why analysis is the method to investigate the root cause of a problem by asking the question “Why“ repeatedly, until you finally reach the root cause.



The cause found here may not be the root cause. If it’s not the root cause, measures taken here won’t be effective. That is why you have to repeat the question “Why” many times, until you find the root cause.

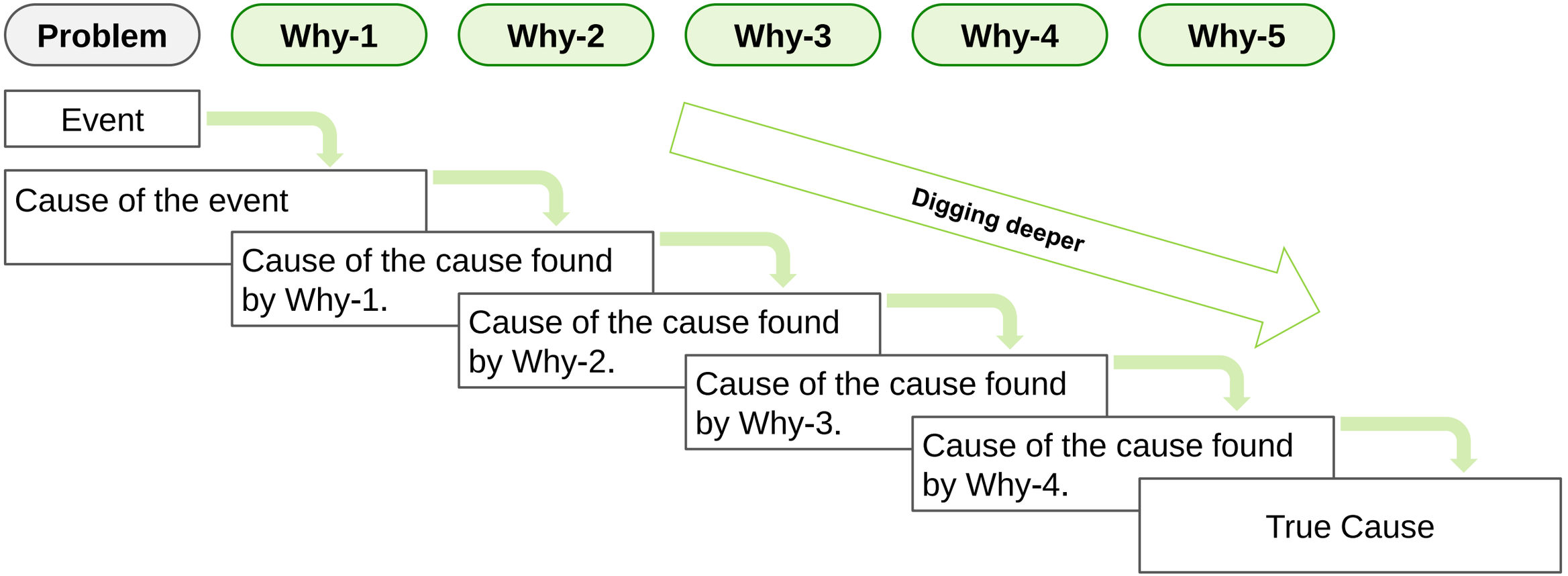
What is 5-Why Analysis?

■ How you should think when trying to solve a problem

	Thinking in problem solving
1. Genchi-Genbutsu Principle	It is also called the 3-Gen Principle. (Genchi; actual place, Genbutsu; actual thing, Genjitsu; fact) ● Look at an actual scene closely. ● Check the actual thing directly to comprehend the fact. ● Based on data, look for the real cause of the problem.
2. Pursuit of the real cause **5-why**	Investigate the root cause of the problem with 5-Why. Cause → Result → Cause → Result → Cause → Result (Why?) (Why?) (Why?) ● The root cause should be identified to find effective measures.

What is 5-Why Analysis?

- Ask the question “Why” repeatedly, until you finally reach the root cause.



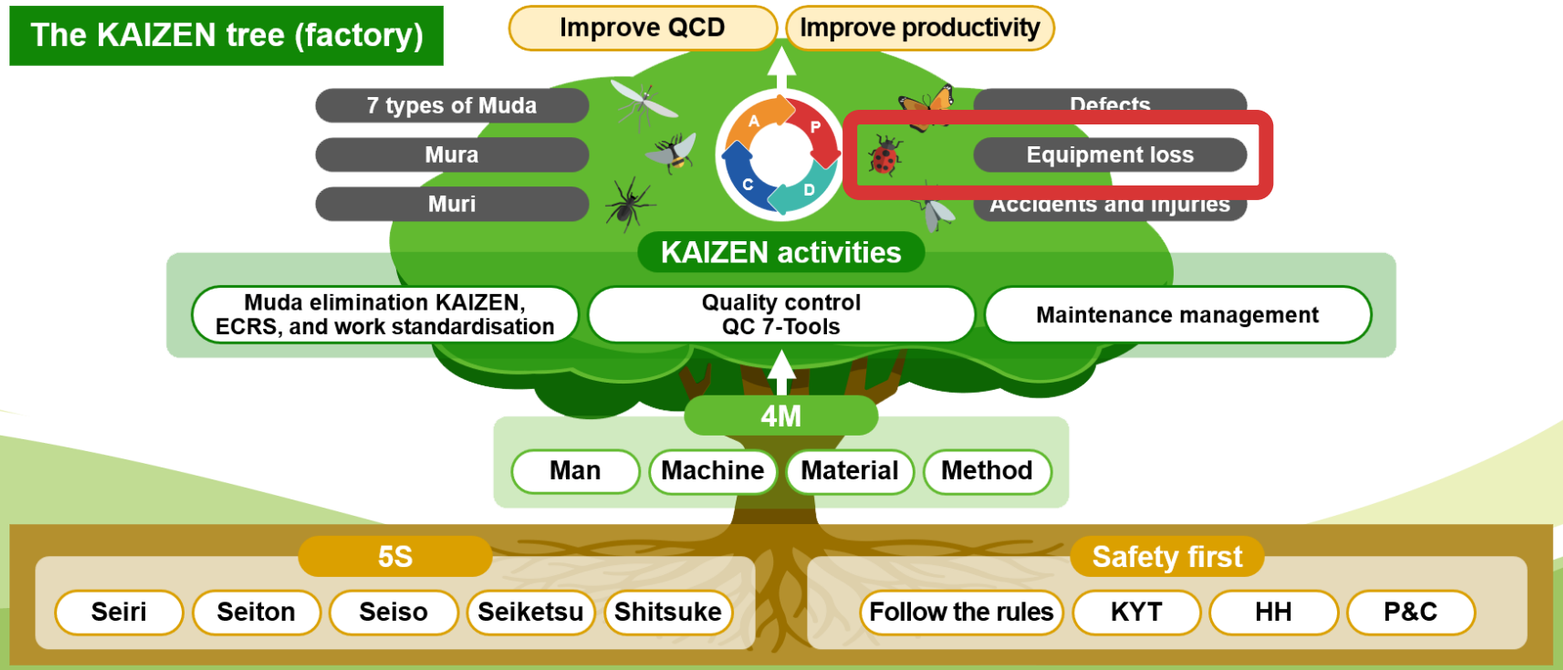
Section 8

Equipment management

Section 8 Equipment management

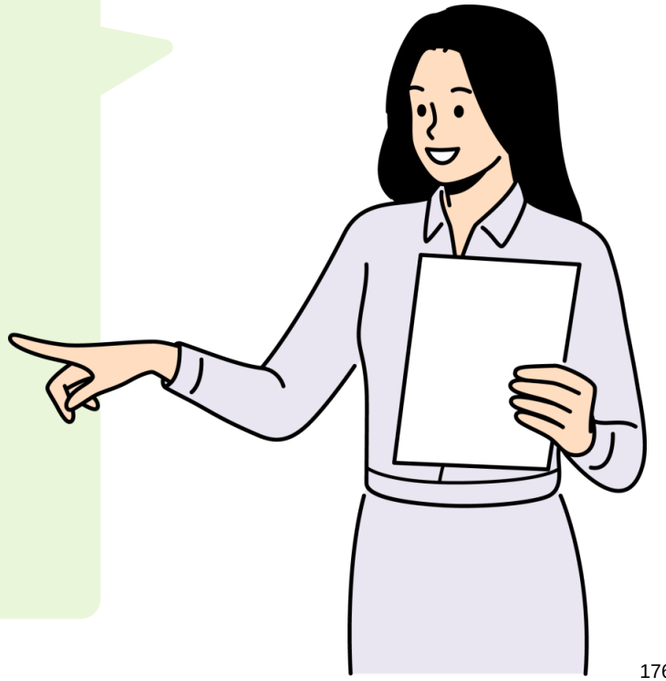
Contents

- **Relationship between equipment operating time and the seven types of equipment loss**
- **Importance of equipment maintenance**
- **Visual control**
  - **Andon**
  - **Using a production management board**



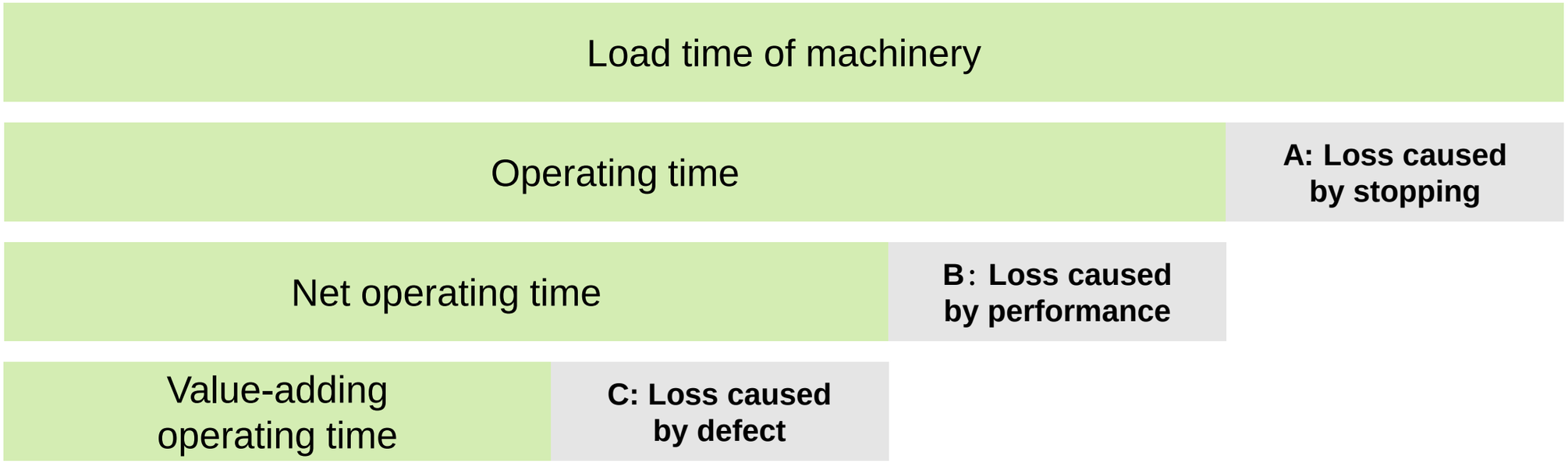
Key points of Section 8

- First, understand the definition of equipment operating time and the seven equipment losses that lie within it.
  ***Note that this is different from the seven Muda in Section 6**
- To increase productivity, it's necessary to reduce equipment losses and increase value-adding operating time.
- Maintenance is important to reduce equipment losses. Deepen your understanding of equipment maintenance.
- Visual control is an effective way to quickly respond to equipment malfunctions and defects.



Seven major losses by machinery

- From the viewpoint of operating time, losses caused by machinery can be divided into three types (A-C). From the viewpoint of work, they can be divided into seven types (1-7).



Productivity increases by reducing equipment loss and increasing value-adding operating time

Seven major losses by machinery

- Description of 3 types of losses (A-C) and 7 types of losses (1-7)

A: stopping	1. Loss by breakdown	Stopping time by breakdown
	2. Loss by changeover and adjustment	Changeover time of moulds and jigs
	3. Loss by cutting tool change	Changing time of cutters for machinery
	4. Start-up loss	Time spent without expected performance right after start
B: performance	5. Loss by idle run or temporary stop	Time during idle running or loss by temporary stop
	6. Loss by lower speed	Loss by slower speed than original capability
C: defect	7. Loss by defect and rework	Loss by defect and rework

What is machinery maintenance?

- There are many machines at a production site, but once trouble occurs with any of the machines, productivity and product quality can be affected very seriously.

The following often happens in production facilities:

The machine may not be able to operate at a time when it’s needed to!
It may stop suddenly during operation!

If the production machinery can be operated without any trouble, productivity can be increased.

Machinery maintenance means keeping and improving performance of machinery to avoid such troubles.

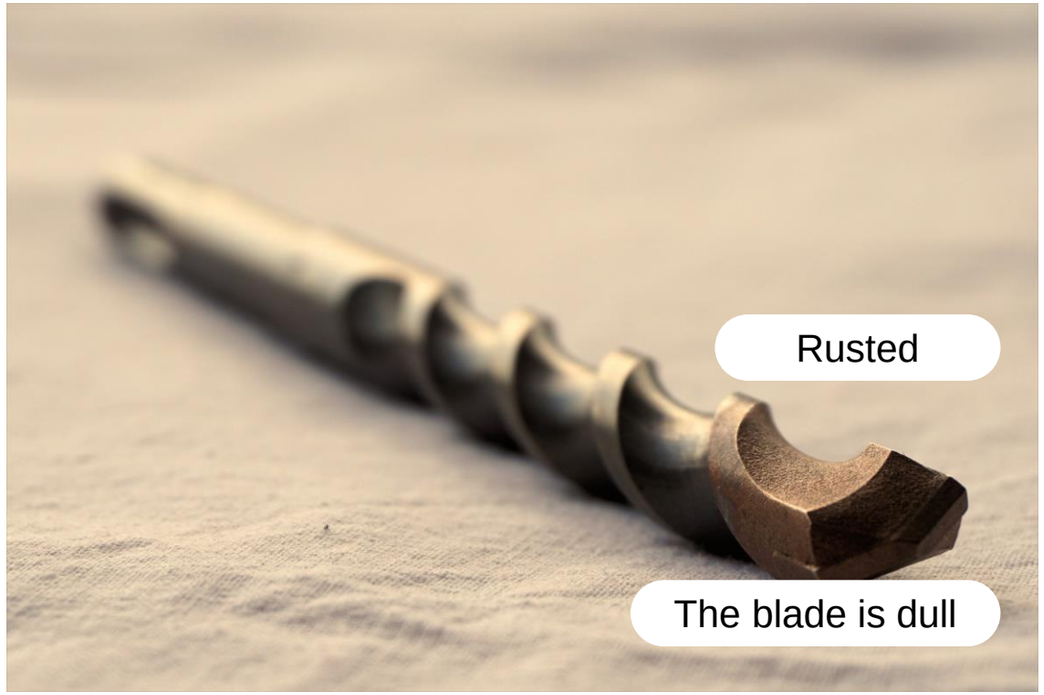
What is machinery maintenance?

- Purpose of Machinery Maintenance
  - Activities to maintain and improve performance of machinery
  - Work consisting of check-up, inspection, adjustment, maintenance and repair of machinery

Prevention of deterioration	Daily care including lubrication to prevent deterioration
Measurement of deterioration	Measure machinery performance and judge the degree of deterioration
Recovery from deterioration	Restore machinery performance by replacing parts and so on

What is machinery maintenance?

Machinery without maintenance



Machinery with maintenance

Keeping and improving performance of machinery

Check-up, inspection, adjustment, maintenance and repair of machinery

Outline of machinery maintenance

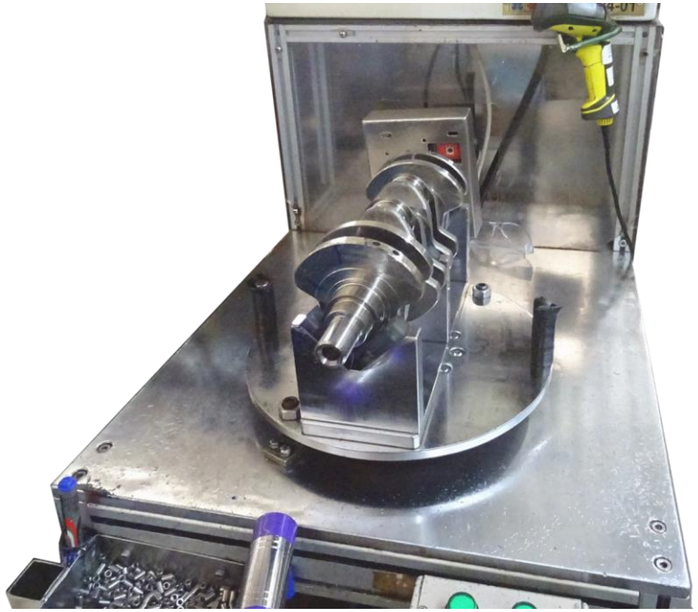
- Machinery maintenance is divided into 4 major approaches based on the characteristics of the machinery, namely :

Breakdown maintenance	To repair after a breakdown has occurred
Preventive maintenance	To repair before a breakdown happens by predicting it in advance. This approach is most commonly used
Corrective maintenance	To improve performance of machinery so that breakdown is unlikely to occur
Maintenance prevention	To design machinery with the aim of minimising maintenance cost

Major activities of preventive maintenance

- Preventive maintenance needs daily check-ups and scheduled inspections. What specifically should be done?

Cleaning of machinery	Prioritised work among various daily check-ups	Daily
Daily check-up	Detect abnormalities like strange noises and vibration in advance by daily checking	Daily
Lubrication	Basic work to prevent machine deterioration	Scheduled
Tightening	Many cases of noise and vibration can be fixed by further tightening of bolts and nuts	Scheduled
Replacement of worn parts	Define expendables to be changed by each piece of equipment	Scheduled
Overhaul	Solution for inner wear and deterioration that are hard to see from outside	Scheduled



What is Visual control?

- Firstly, a visual control makes it possible to grasp the workplace situation at first glance whether it’s in a normal operation or not.

By a visual control, anyone including supervisors and operators can immediately tell the current situation in the workplace such as work progress, occurrence of defects, operating status of machinery, sudden troubles, etc.

- Secondly, it’s helpful and essential to eliminate Muda.

By a visual control, the hidden problems and Muda will come to light and become a tangible target subject to KAIZEN continuously.

What is Visual control?

- The problems and Muda become recognisable due to a visual control and therefore can be shared by all members concerned. Under these circumstances, the necessary action can be taken quickly by a team and not just by a single person.

- The visual control is therefore a very important mechanism to improve the performance in a workplace.

How to practice Visual control

- This section is dedicated to the introduction of specific examples of ‘visual control’ .

Case 1 Information display board (called ANDON) at a production line and the site of machinery

Case 2 Use of a production control board

The goal in both cases is to make the difference between the plan and the current situation visible at a glance, allowing for early detection of delays in progress, problems, and Muda, and encouraging appropriate action.

How to practice Visual control

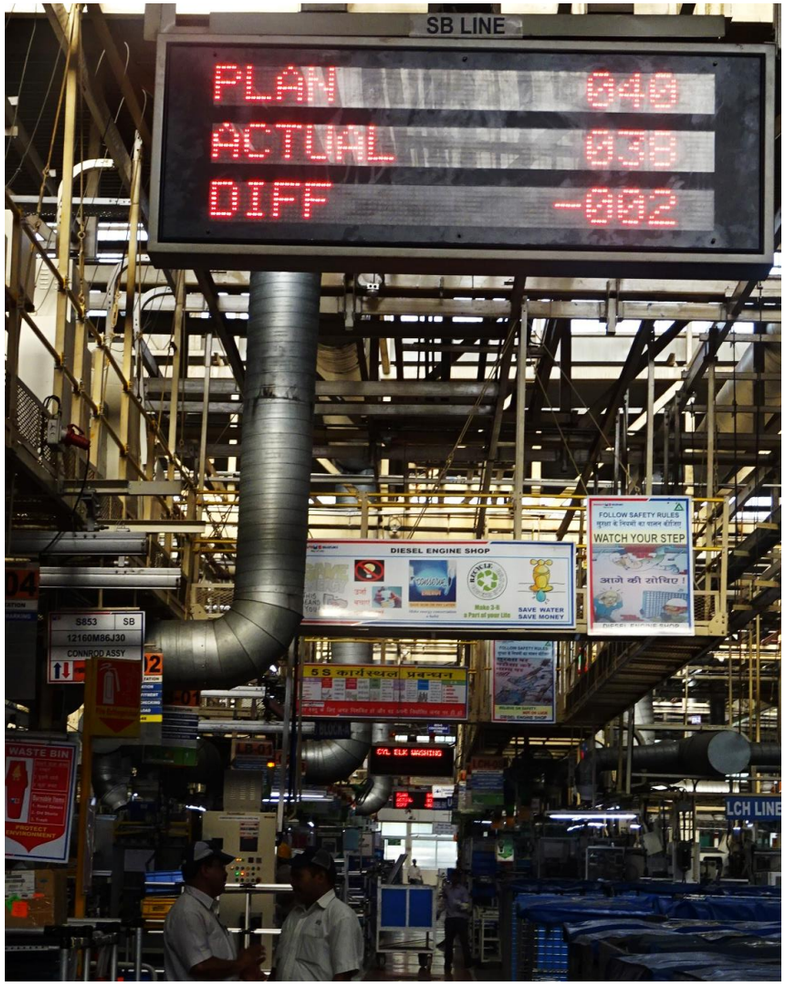
What is ANDON? One of the tools for visual control

- ANDON means to visualise states of the assembly line and machinery. It's a tool for 'visual control' to inform the people concerned of necessary information in a timely manner.

- ANDON shows abnormality information and it also gives other information such as:
  - Direction of quality check
  - Time to change cutting tools
  - Instruction for transport

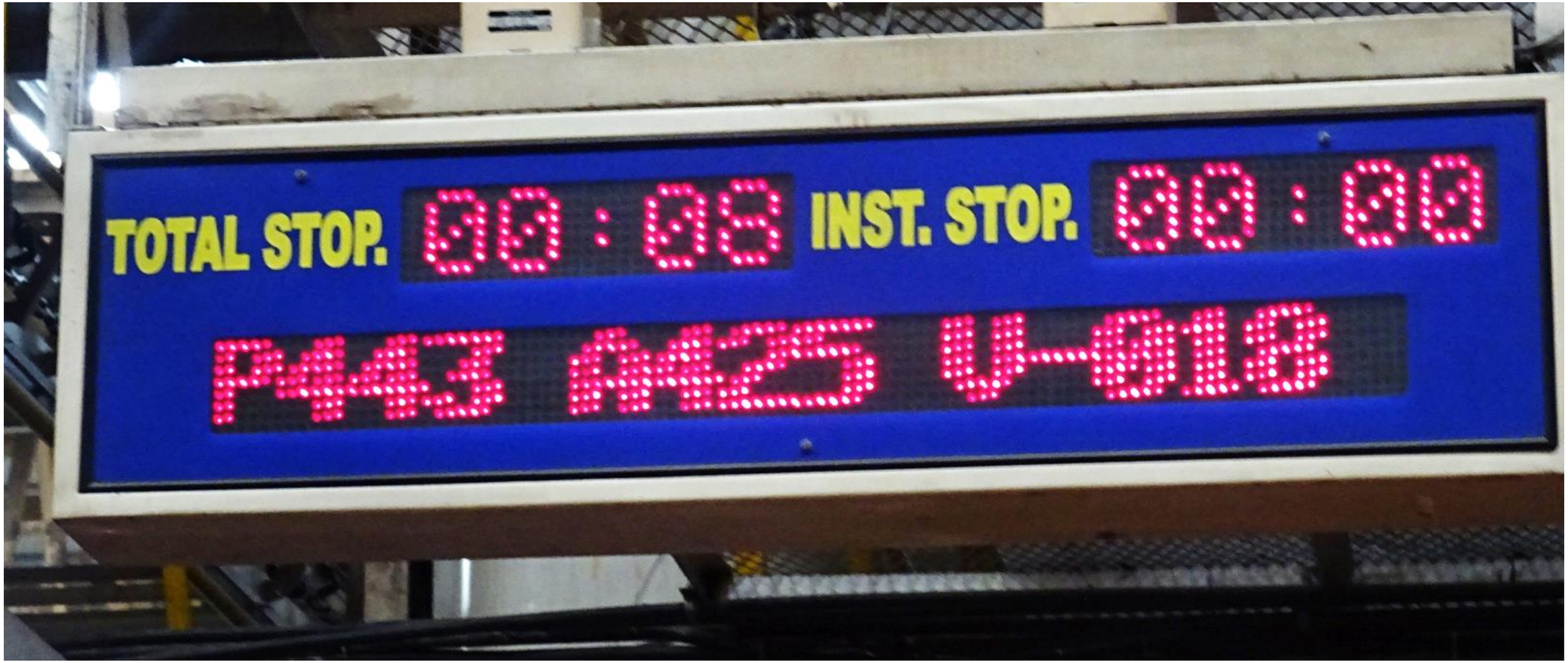
Case 1: ANDON at production line and machinery #1

- ANDON to show production output



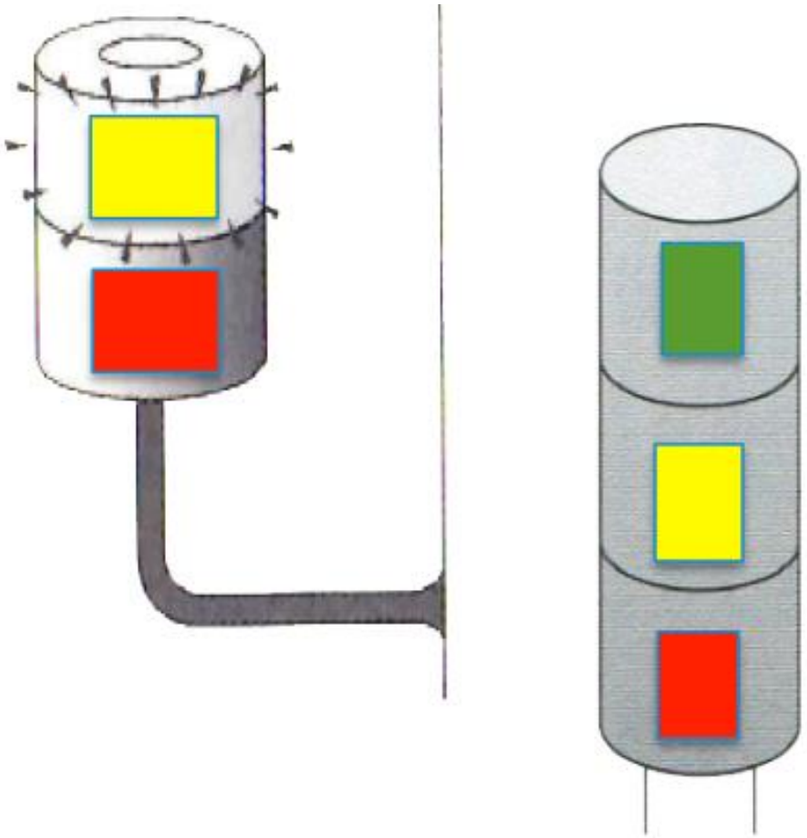
Case 1: ANDON at production line and machinery #2

- ANDON to show operation status



Case 1: ANDON at production line and machinery #3

- ANDON to call emergency attention

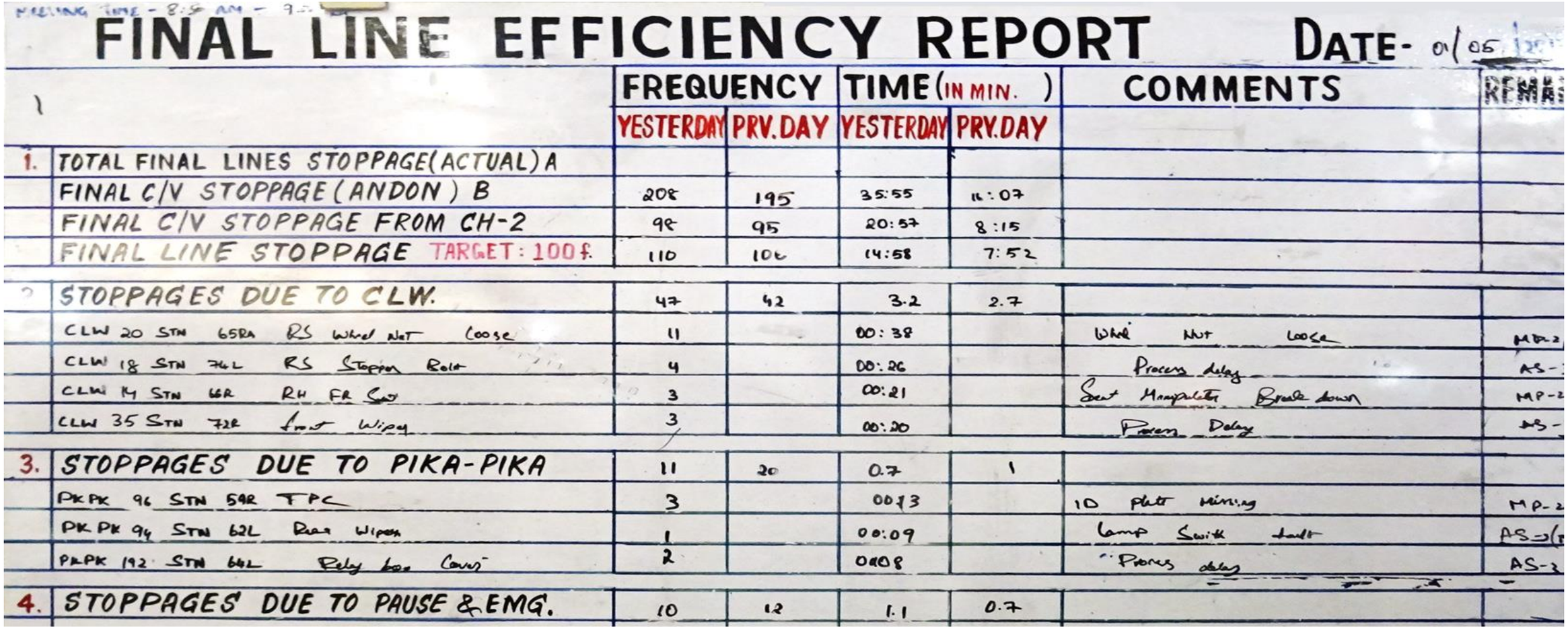


Silent Green lights during normal operation

Music When abnormality occurs such as parts in short or a defect, the operator presses an alarm button to change the colour to yellow

Buzz Red lights when a line is stopped

Case 2: Visual control by production monitor board



MEETING TIME - 8:5 AM - 9:..

FINAL LINE EFFICIENCY REPORT

DATE- 01/05/20..

		FREQUENCY		TIME (IN MIN.)		COMMENTS	REMA
		YESTERDAY	PRV.DAY	YESTERDAY	PRV.DAY		
1.	TOTAL FINAL LINES STOPPAGE(ACTUAL) A						
	FINAL C/V STOPPAGE (ANDON) B	208	195	35:55	11:07		
	FINAL C/V STOPPAGE FROM CH-2	98	95	20:57	8:15		
	FINAL LINE STOPPAGE TARGET: 100 f.	110	100	14:58	7:52		
2	STOPPAGES DUE TO CLW.	47	42	3.2	2.7		
	CLW 20 STN 65RA RS Wheel Nut Loose	11		00:38		Wheel Nut Loose	MP-2
	CLW 18 STN 74L RS Stopper Rela	4		00:26		Process delay	AS-1
	CLW 14 STN 66R RH FR Seat	3		00:21		Seat Manipulator Break down	MP-2
	CLW 35 STN 72R front Wiper	3		00:20		Process Delay	AS-1
3.	STOPPAGES DUE TO PIKA-PIKA	11	20	0.7	1		
	PKPK 96 STN 59R TPC	3		00:13		10 Plate missing	MP-2
	PK PK 94 STN 62L Rear Wiper	1		00:09		Lamp Switch fault	AS-2(R
	PKPK 192 STN 64L Relay box Cover	2		00:08		Process delay	AS-2
4.	STOPPAGES DUE TO PAUSE & EMG.	10	12	1.1	0.7		

A monitoring board installed at production scene can show progress of work, any trouble and occurrence of Muda. →More commitment to KAIZEN

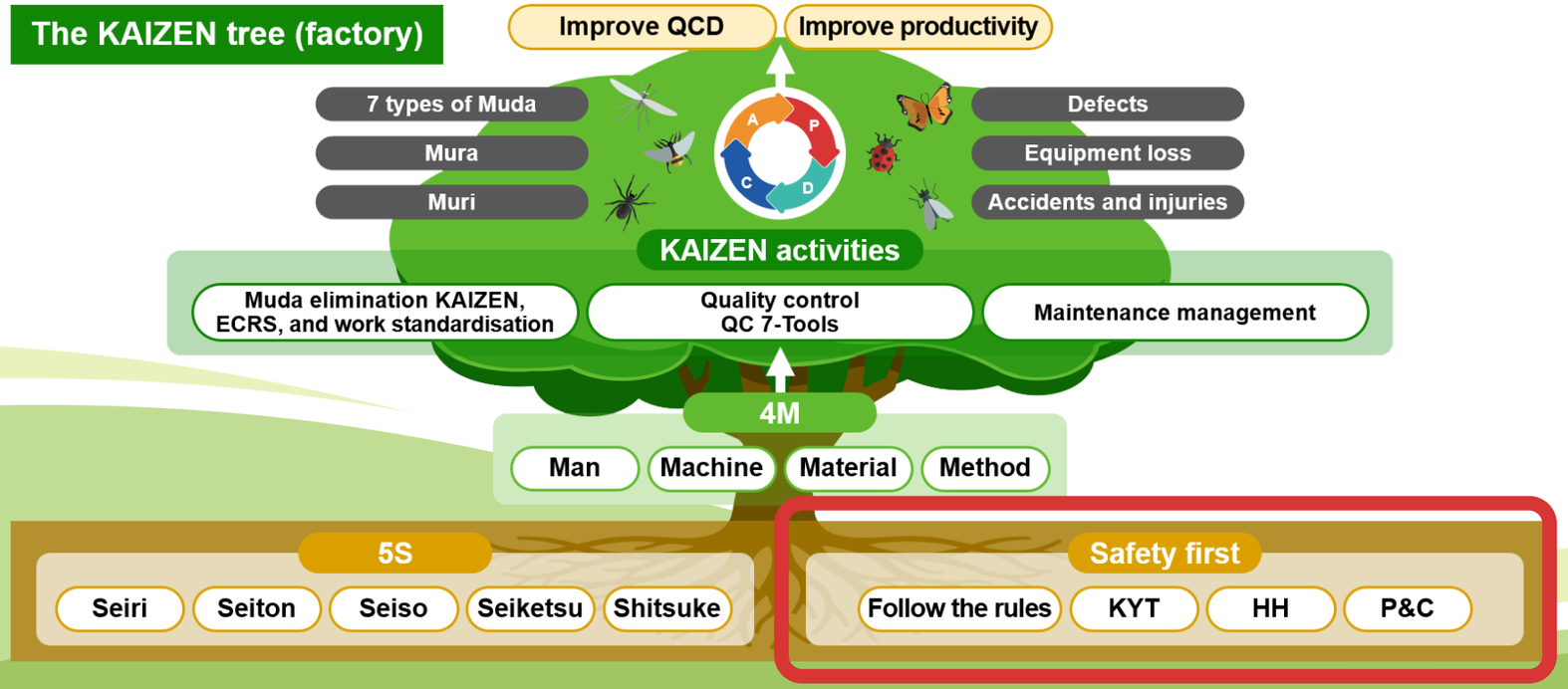
Section 9

Safety management

Section 9 Safety management

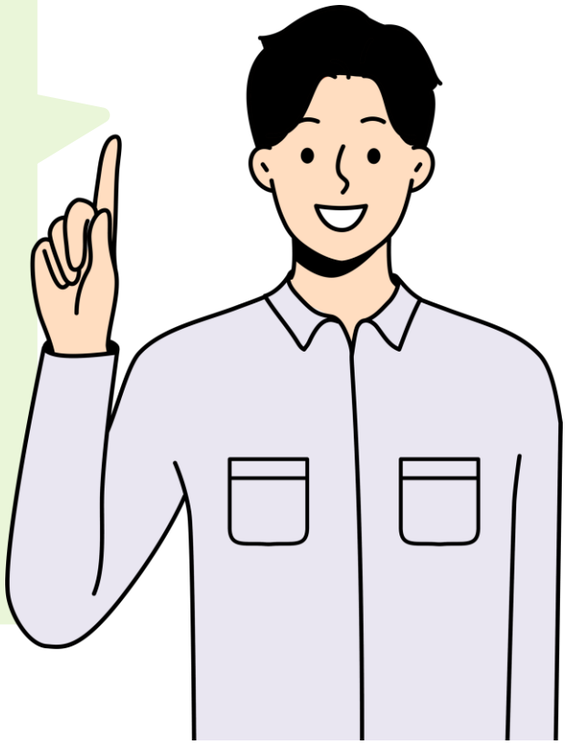
Contents

- **Prevention of risk**
- **KY Training**
- **Hiyari-Hatto**
- **Pointing and Calling**



Key points of Section 9

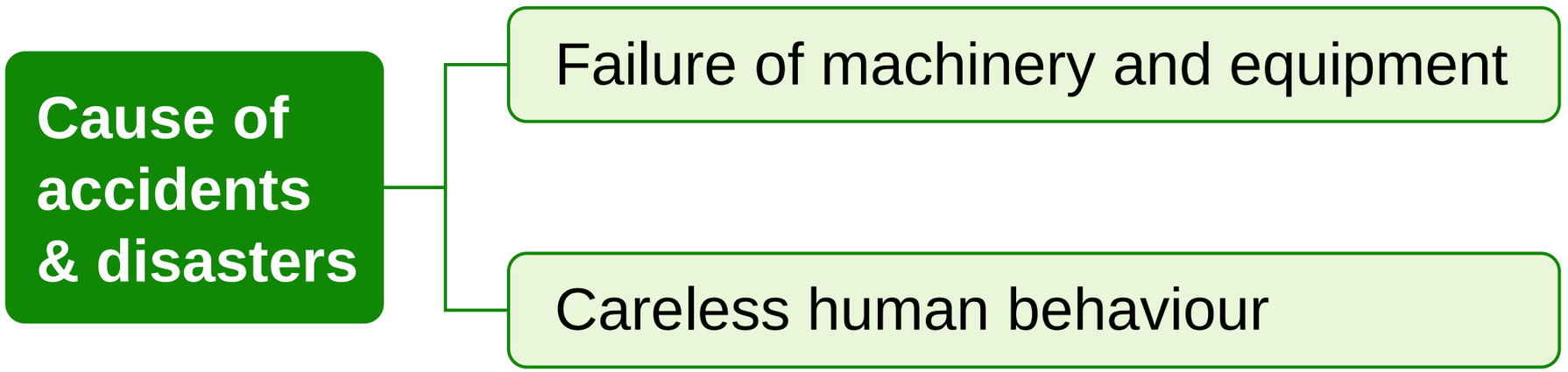
- In this section, you will learn management techniques for maintaining safety.
- Here we will introduce three safety management techniques used in various Japanese production sites.
  (KYT, Hiyari-Hatto, Pointing and Calling)
- Be sure to remember these and implement them at your workplace. The level of safety management at your production site will improve dramatically.



Accidents, Disaster and hazards

Accident	An incident that may possibly injure humans
Disaster	An accident that causes injury and/or death of humans
Hazard	Dangerous place, condition, machinery, object, motion, etc. ⇒ All those hazards may cause an accident and/or a disaster

Why do accidents and hazards occur?



Human beings often make errors.

More than 80% accidents/disasters are caused by careless human behaviour.

Prevention of risk

- There are three approaches to preventing risks, namely :

Kiken-Yochi (Risk prediction)	To avoid risks by predicting a potential hazard that may lead to an accident and/or disaster.
Hiyari Hatto (Near miss)	A tiny incident without any injury. But this near miss case gives an important clue about a potential hazard. Be sensitive to it to prevent an actual accident.
Pointing and Calling	Pointing and Calling is a method of checking that minimises mistakes. By doing this, checking mistakes will be reduced to 1/3.

What is KY (Risk Prediction)?

Accidents and hazards are invisible. Nobody knows when he/she will be suddenly involved in an accident.

Accidents cannot be avoided unless you can sense the danger. How can we avoid the risk of an accident?

Sharpen your sensitivity to a danger. Predict a possibility of an accident.

Let’s enhance risk predicting ability!

KY Training by yourself

- Enhance your risk prediction ability by imagining latent risks that you might be involved in. Think of some cases using the sentence pattern “You may xxx.”

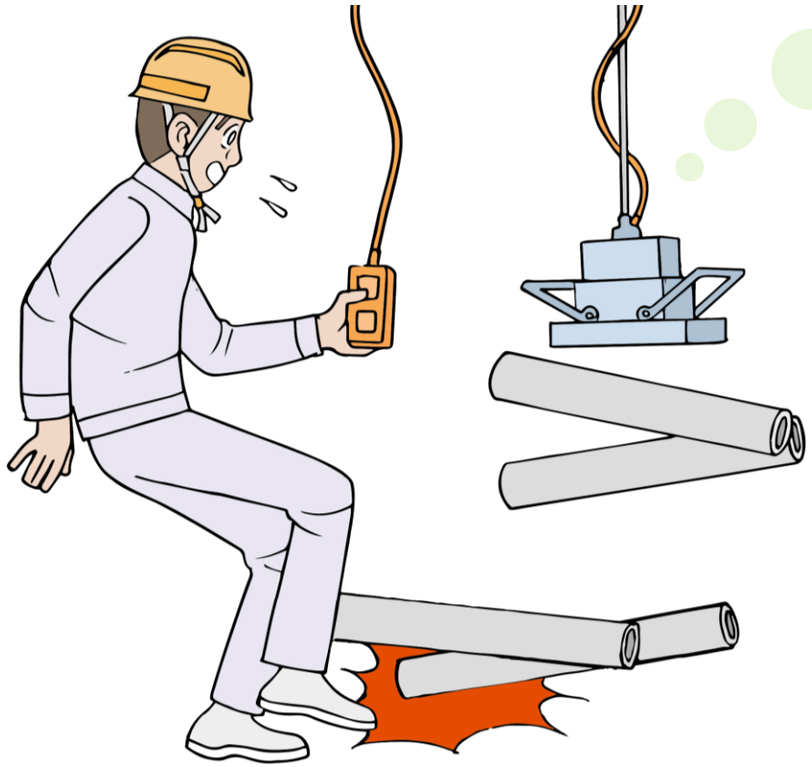
You may xxx !

Be pinched	Fall
Be caught	Be burned
Be hit	Be electrified
Stumble	Injure back
Be poisoned by gas	Be deprived of oxygen

Source: Manual of Safety Health Education for Unskilled labour in Manufacturing Sector, Compiled by labour Standard Office, Prefectural labour Offices and the Ministry of Health, labour and Welfare

KY Training by yourself

- Enhance your risk prediction ability by imagining latent risks that you might be involved in. Think of some cases using the sentence pattern “It may xxx.”



It may xxx !

Move	Burn
Revolve	Go down
Jump	Collapse
Fall	Explode
Drop	Leak

KY Training by team

- Four-Round-Method by 5-6 people is effective as a training method.

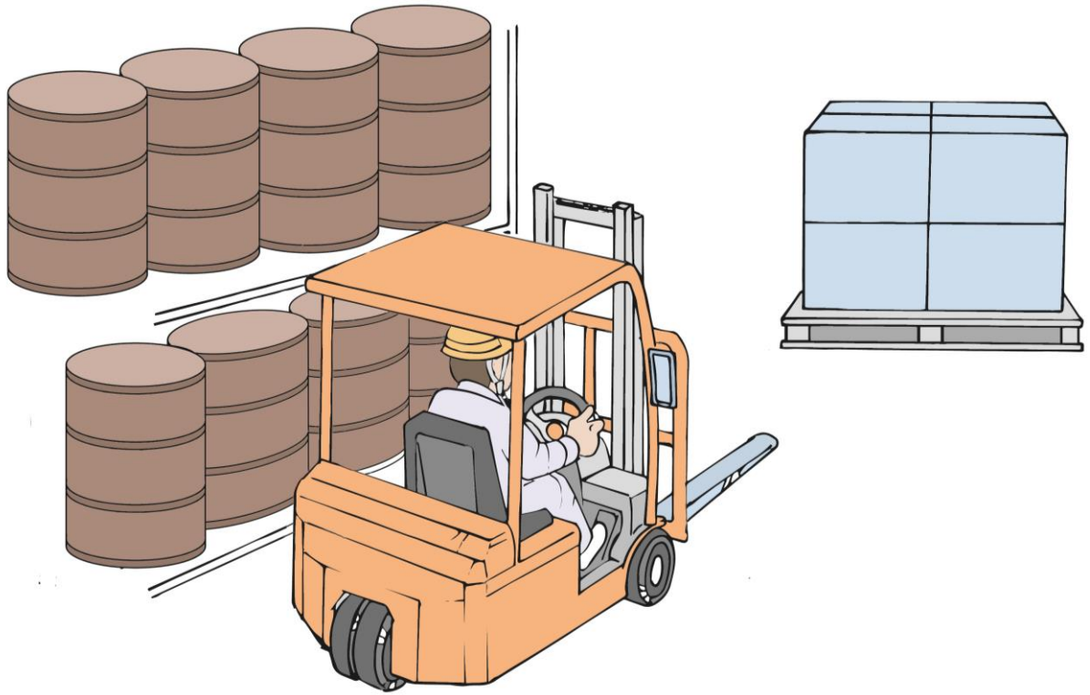
Round	KYT four round	How to do KYT
Round 1	Identify hidden risks (grasp the current circumstances).	Imagine and express potential risks of accidents that might be caused by an unsafe behaviour and/or condition.
Round 2	Narrow down the risks.	Select the most dangerous risk from the ones identified in Round 1.
Round 3	Think of the solutions.	Think how to prevent that selected risk as a team.
Round 4	Take an action according to the model.	Select the best solution as a model among the ones thought of in Round 3.

Try round 1 of KYT- 4R

Q What risks are hidden?

Case 1

You are now moving cargo inside a warehouse by a forklift.

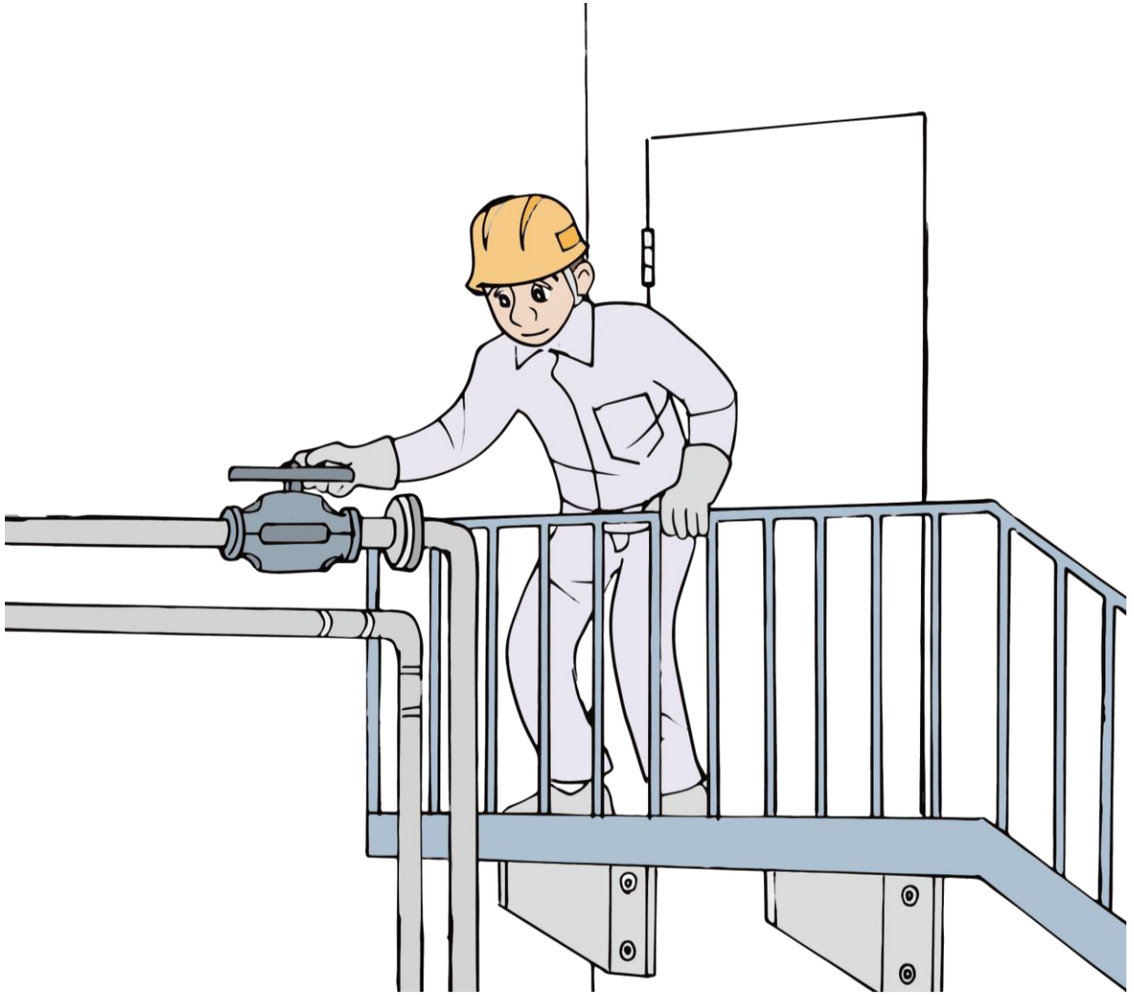


Try round 1 of KYT- 4R

Q What risks are hidden?

Case 2

You are trying to close a valve in a polyvinyl chloride pipe while standing on the second level of an outside staircase.

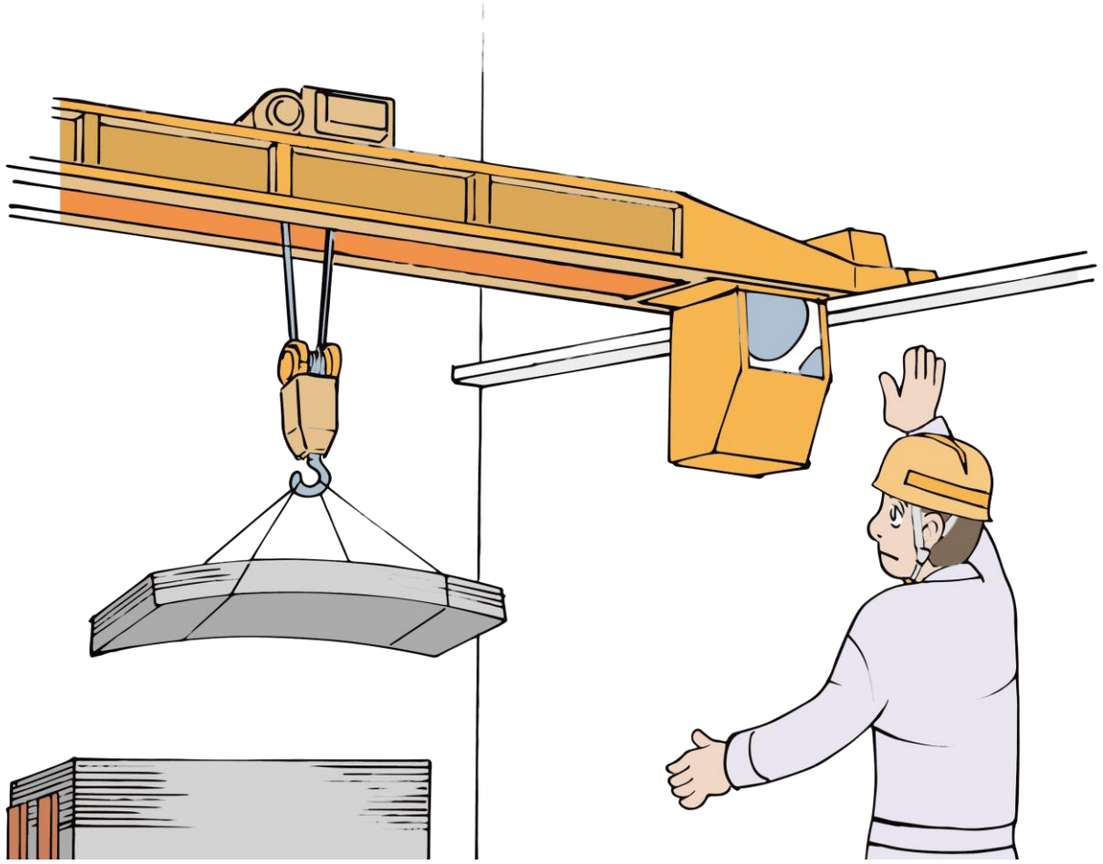


Try round 1 of KYT- 4R

Q What risks are hidden?

Case 3

You are guiding an operation to lift and move suspended steel sheets by an overhead crane.

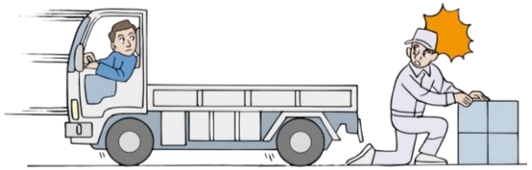


What is Hiyari-Hatto?

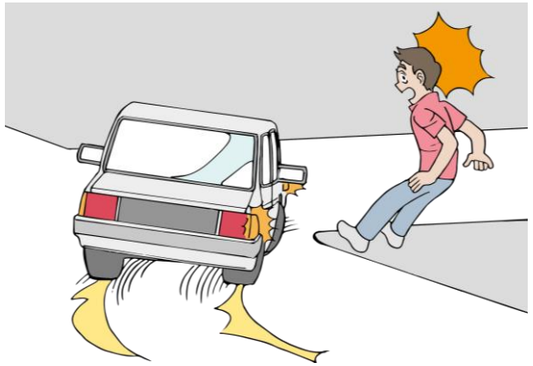
- Hiyari-Hatto (HH)

Haven’t you ever felt that you were nearly in an accident or a startling event during commuting or while working? It was dangerous but fortunately it did not lead to an accident. This is referred to as a serious incident that might have developed into a serious accident with just one single misstep.

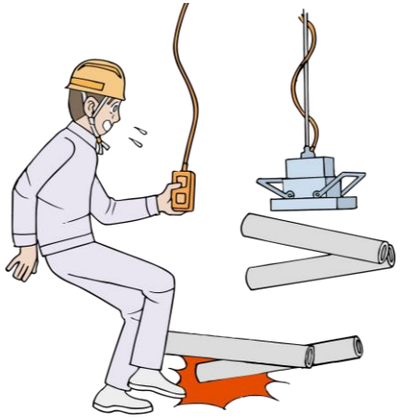
You were about to collide with a car dashing out of an alley.



You were about to get run over by a backward moving truck.



You were almost hit by a right-turning car.

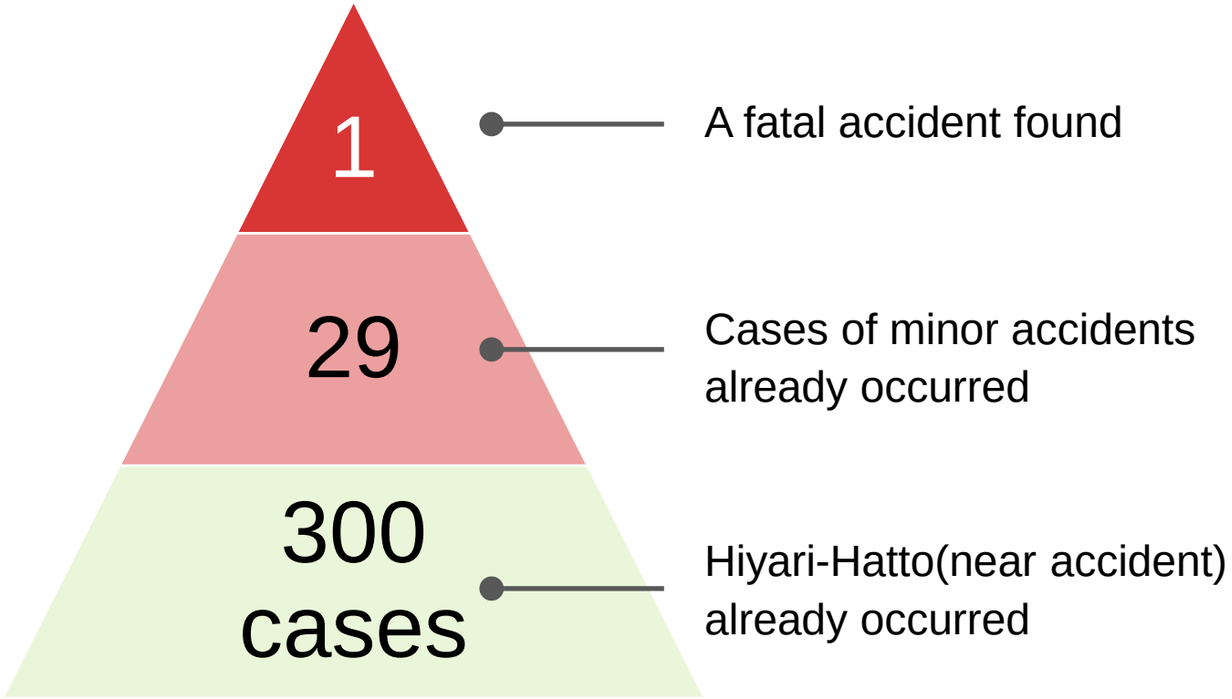


Falling steel pipes nearly hit your body.

Heinrich's Law

- No fatal accidents happen suddenly!

1:29:300 of Heinrich's Law



A Hiyari-Hatto (near accident) case is a precursor of a serious accidents.

Each occurrence of HH has a cause. → There are many risks and dangerous actions and conditions.

Risk prevention by Hiyari-Hatto

- Hiyari-Hatto always has a certain cause for something to happen.

Classification	Specific examples
Unsafe actions	• Negligence of inspection; deficient joint work • No safety gear/safety shoes/anti-dusk masks were put on • Operation standards and rules were not observed
Unsafe conditions	• Wrong ways to place/stack things; insufficient 3S • Things were not placed in designated areas • Wrong way to secure things

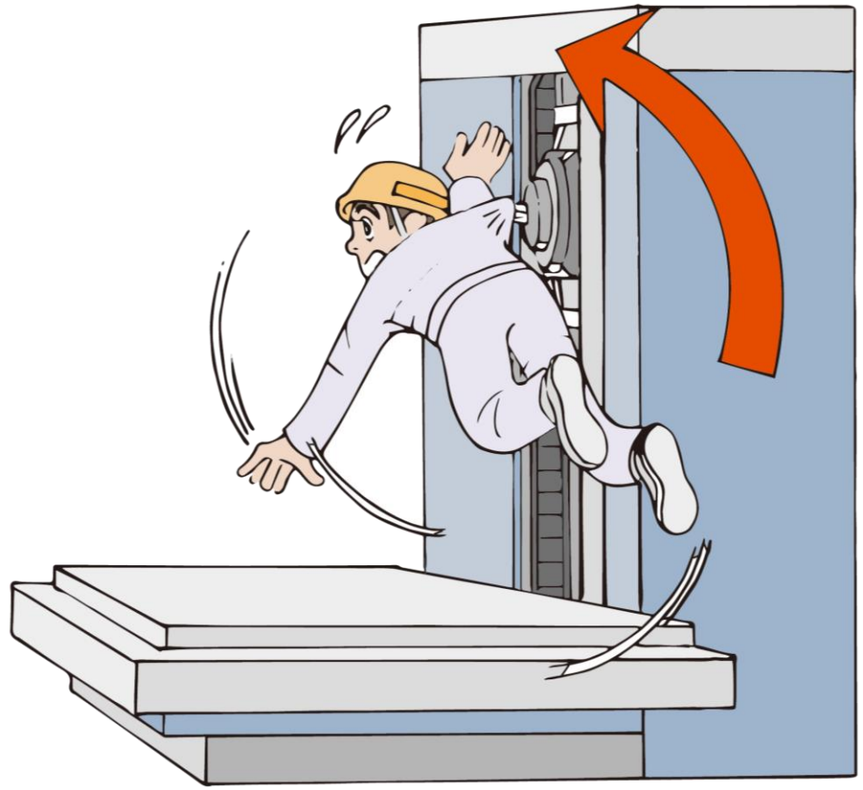
Identification and taking measures for the cause of HH can prevent serious accidents.

Cases of Hiyari-Hatto

Case 1

State of HH

While cleaning a milling machine work table, the rolled-up sleeve of the worker's uniform was about to get caught in the machine. The machine was operating for oil-refilling during a regular check-up.



'Get caught in' a machinery

Cause and Prevention

Improper uniform

Work procedure of oil-filling during regular checking

How to clean machinery while it is running

Cases of Hiyari-Hatto

Case 2

State of HH

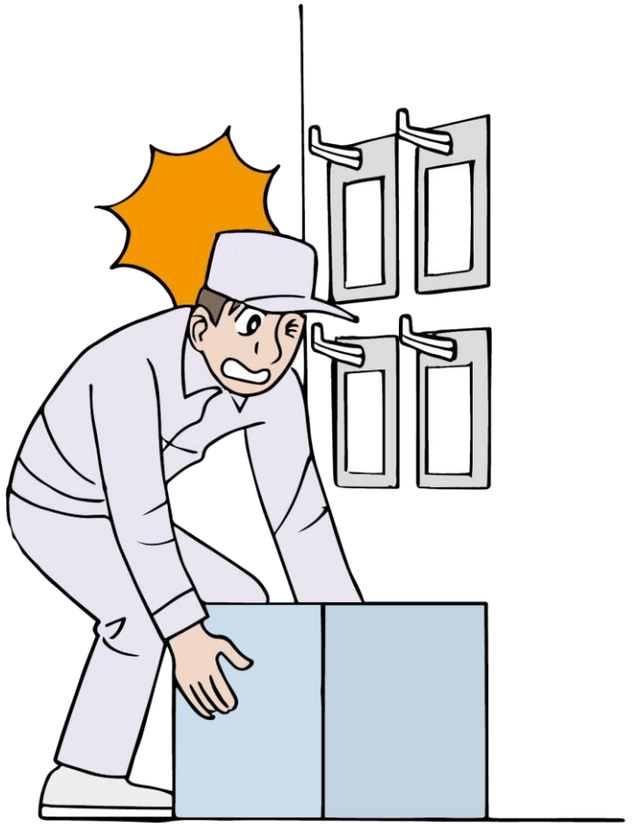
When trying to lift a product up from the floor in a warehouse, the worker's left eye was almost hit by a hook keeping merchandise on the wall.

Cause and Prevention

Change the position of the hook

Rules on where to keep products

Through practice of 3S: designation of storage places



'Contact' with dangerous object

Cases of Hiyari-Hatto

Case 3

State of HH

While doing welding work and moving about inside the workplace, the worker was about to fall by tripping over some cluttered arc welding cables on the floor.

‘Falling’ in a dangerous place

Cause and Prevention

Thorough practice of 3S; designation of storage places

Making rules when using them

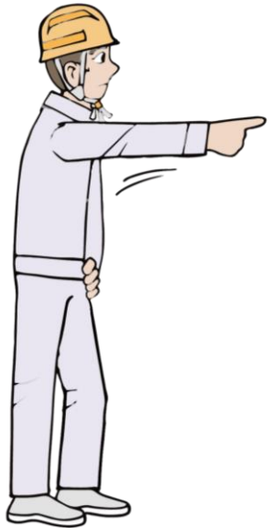
Appointing a person to be in-charge

The usefulness of Pointing and Calling

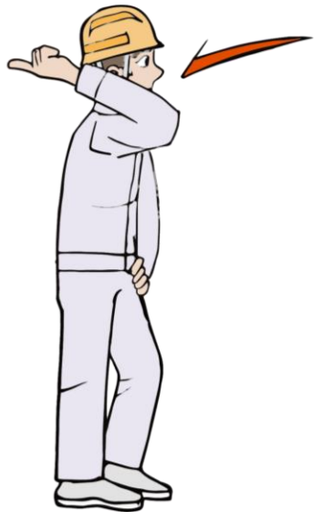
- Pointing and Calling is an effective method to prevent accidents

The result of an experiment indicates that people who practice pointing and calling become three times more accurate in their behaviour than people who do not practice.

Watch the object



Point at it with
your index finger



Raise your hand to
the level of your ear

Say OK! And
put your hand down

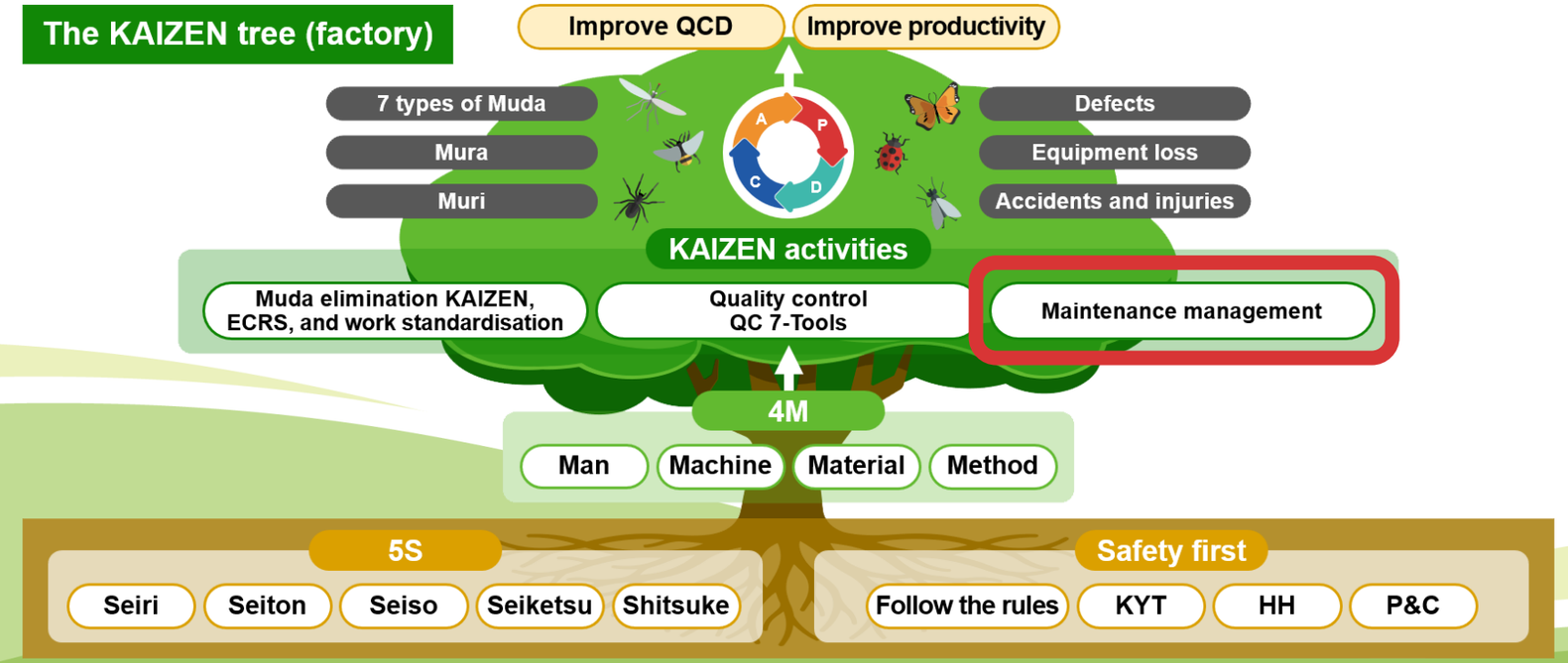
Section 10

Company-wide production management methods

Section 10 Company-wide production management methods

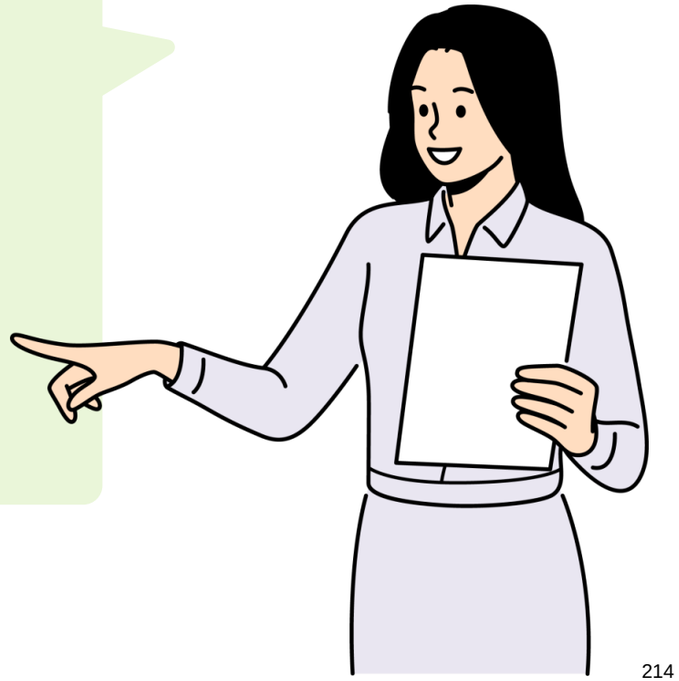
Contents

- **TQM（Total Quality Management）**
- **TPM（Total Productive Maintenance）**
- **TPS（TOYOTA Productive System)**
- **Six Sigma**



Key points of Section 10

- Here we will introduce four model production systems (TQM, TPM, TPS, and Six Sigma). It’s important to note that all of these are company-wide activities that involve all employees.
- It’s not enough to introduce just one of these production systems. Each production system has a different main purpose. For that reason, they are also implemented in combination with each other.



TQM
(Total Quality Management)

What is TQM?

- **TQM means Total Quality Management.**
- TQM is a comprehensive management approach focused on improving the quality of products and services through the involvement of all employees.
- The goal is to achieve long-term customer satisfaction by making continuous improvements across all levels of the organisation.
- **Key principle: “Quality is everyone's responsibility.”**

TQM vs QC Activities

- TQM is a company-wide management system, whereas QC activities are part of it, aimed specifically at improving quality.

TQM	Category	QC Activities
Improve quality, increase productivity, meet delivery deadlines, reduce costs, etc. Improve the overall level of production activities	Purpose	Focus on improving quality
Management team	Activity leading body	Manufacturing employees
Top down	Activity approach	Bottom up
Applicable to all employees	Activity members	Manufacturing sector is the main focus
Overall production management	Activity target	Solving quality problems

Advantages of TQM

- TQM seeks to improve not only quality but also productivity, cost, and delivery.

Effect	Details
Improved Customer Satisfaction:	High-quality products and services enhance customer trust.
Cost Reduction:	Elimination of waste and increased efficiency lead to cost savings.
Increased Employee Motivation:	Involving everyone in improvements boosts job engagement.
Enhanced Competitiveness:	Companies with high quality and continuous improvement gain a competitive edge in the market.

TQM Implementation Process Flowchart

Assessment of the Current Situation

1. Gather data to clearly identify issues at the operational level.
2. Ensure understanding and cooperation across the entire organisation.

Policy Formulation

1. Clearly define the objectives and goals for TQM introduction.
2. Secure support from top management and communicate it company-wide.

Education and Training

1. Conduct training to ensure all employees understand the TQM concepts and tools.
2. Confirm the level of understanding and ensure TQM can be practically applied at the shop floor level.

Implementation and Improvement

1. Focus on incremental improvements, aiming for significant results over time.
2. Continuously collect feedback from the shop floor and address issues promptly.

Evaluation and Feedback

1. Evaluate the results of improvements through data and share the outcomes company-wide.
2. Use the findings to feed into the next cycle of improvement activities.

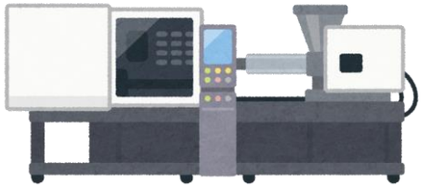
TPM
(Total Productive Maintenance)

What is TPM?

- **TPM means Total Productive Maintenance.**
- **TPM** is a management approach aimed at maximizing the overall efficiency of equipment and eliminating waste and breakdowns.
- Developed in Japan in the 1960s, it focuses on **total employee participation**, involving everyone in maintaining and improving equipment performance.
- **Key concept: “Zero Accidents, Zero Breakdowns, Zero Defects.”**

Fields Where TPM is Applied

- Widely used in **manufacturing industries**, as well as in **energy sectors** and **infrastructure businesses** where equipment plays a critical role.
- Particularly crucial in manufacturing where downtime directly impacts production.
- Expanding to non-manufacturing sectors like **logistics, IT, and service industries**.



Production equipment

Energy plant

Logistics related

IT related

Difference Between PM and TPM

- TPM encourages company-wide participation, from equipment operators to management.

TPM	Category	PM Activities
Improved productivity by eliminating losses such as equipment failure, equipment loss, and defects	Purpose	Maintenance and management of production equipment
Applicable to all employees	Activity members	Mainly the maintenance department
Machinery maintenance, autonomous maintenance, planned maintenance, training and education, etc.	Activity target	Mainly **machinery maintenance**

Key Elements of TPM

- TPM is **not just about Machinery Maintenance, but also about the following three elements**.

Key Elements	Details
Autonomous Maintenance	Operators perform regular inspections and maintenance to prevent breakdowns.
Planned Maintenance	Scheduled maintenance activities reduce unexpected equipment failures.
Training and Education	Enhancing workers' skills to ensure proper equipment usage and maintenance.

Autonomous Maintenance

Overview	Autonomous maintenance refers to the practice where operators themselves perform daily inspection, cleaning, and maintenance of equipment. This allows operators to take responsibility for the machines they use, monitor them closely, and detect issues or abnormalities early on.
Objective	The goal is for operators to have a deep understanding of the equipment’s condition, extend its lifespan, and reduce downtime. This system also allows for quick responses to problems without relying solely on specialised maintenance departments.
Key Point	Operators need to be trained in basic maintenance skills and perform routine cleaning and checks. This helps prevent deterioration and ensures smooth operation.

Planned Maintenance

Overview	Planned maintenance refers to carrying out regular equipment maintenance based on a pre-determined schedule. This process helps prevent sudden breakdowns and ensures stable production.
Objective	The aim is to prevent equipment failure and degradation through scheduled maintenance, leading to improved productivity. Additionally, it helps control costs associated with unplanned repairs or downtime.
Key Point	Effective planned maintenance requires accurate monitoring of equipment status and the ability to determine optimal maintenance timing. Early detection of wear and tear is essential for timely repairs and replacements.

Training and Education

Overview	Training and education programs are designed to equip operators with the knowledge and skills needed to efficiently and safely manage and maintain equipment. Especially in TPM, it is crucial for operators to understand basic maintenance techniques to ensure smooth operations.
Objective	The goal is to enhance operators' knowledge of equipment operation and maintenance to support efficient production. It also aims to improve their ability to respond quickly to equipment problems.
Key Point	Regular training sessions and on-the-job training (OJT) are essential for improving operators' skills. It's important to foster not only technical expertise but also problem-solving abilities and a continuous improvement mindset.

TPM Implementation Process

Top Management Commitment	Strong support from leadership is essential. Recognizing direct benefits to the shop floor.
Goal Setting and Shop Floor Analysis	Establishing goals (Zero accidents, Zero breakdowns, Zero defects) and conducting a thorough shop floor assessment.
Introduction of Autonomous Maintenance	Setting up a system where operators handle equipment inspections.
Start of Planned Maintenance	Creating and executing a scheduled maintenance plan.
Measurement and Improvement	Analysing results, identifying improvement areas, and setting higher targets.

TPS
（TOYOTA Productive System）

What is TPS?

- TPS stands for Toyota Production System. It is a production system that systematically incorporates the production methods that Toyota, a Japanese automobile manufacturer, has built up over the years.

Basic concept of TPS

Key word	Description
Timely	To provide customers with better quality, and lower priced products in a timely manner
Muda	To pursue thorough elimination of all kinds of Muda
Visualisation	A production system with mechanisms to visualise Muda when it occurs

TPS: How it works

- TPS consists of two mechanisms, that is the **JIT (just-in-time)** method and **Jidoka** (Autonomation; automation with a human touch).

2-Mechanisms	Method	Purpose
JIT	● **Kanban method** Levelled production Flow production line Reduction of changeover time Multi-skilled operators	To eliminate Muda (waste), Mura (unevenness) and Muri (unreasonableness)
Jidoka	● **Standardised operation** ● **Visual control** Manpower saving Making it foolproof Automatic stopping	To eliminate 7 types of Muda

→ **Higher Productivity**

TPS: How it works

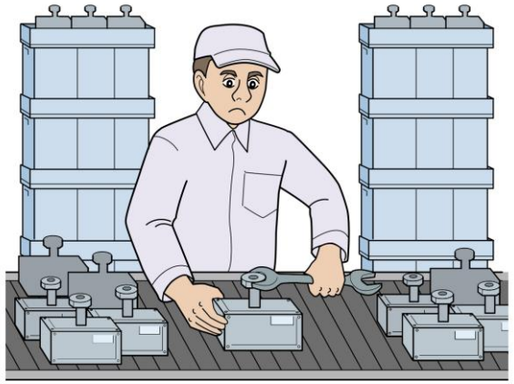
- Purpose and target of TPS

TPS

JIT

Jidoka

Jidoka; ‘autonomation’



Muda of over production

Muda of transportation

Muda of inventory

JIT and Kanban system

Production by JIT at-a-glance

Is there any good production method that meets customers' needs without Muda?

- Produce just the amount to sell
- Eliminate Muri, Mura and Muda
- Eliminate Muda by over production, inventory and transportation

To realise production by JIT (Just In Time)

- The underlying idea: Making 'what is needed, when it is needed and in the amount that is needed.'

JIT and Kanban system

What should we do to realise JIT production?

- Use the next-process-withdrawal method
- Define production time per unit product (tact time) according to the volume of sales
- Rearrange production processes so that products can flow in order

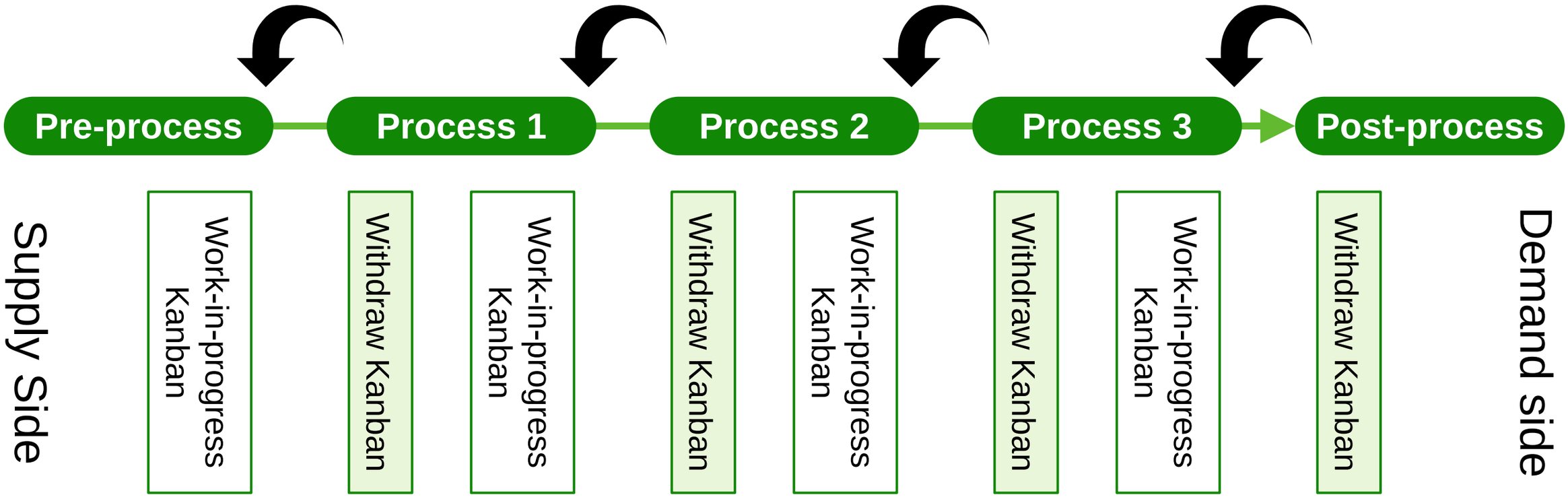
What tools and methods should be used to make it work?

- Use KANBAN for transfer of information
- Make production levelled (Not intermittent)
- Production by standardised operation
- Shorten production lead time
- All these and others should be practiced.

JIT and Kanban system

- How KANBAN works

  Production order information to pre-process by Kanban withdrawal



JIT and Kanban system

- What “Pull system” means:

  Withdrawing the amount that was just used at (on the demand side; in conjunction with that),

  Process 3 produces exact amount as used by post-process.

  Process 2 produces exact amount as process 3 used.

  Process 1 produces exact amount as process 2 used.

  This means that the production amount corresponds to the required amount from the demand side, while such a required amount can be transferred to previous processes by being withdrawn.

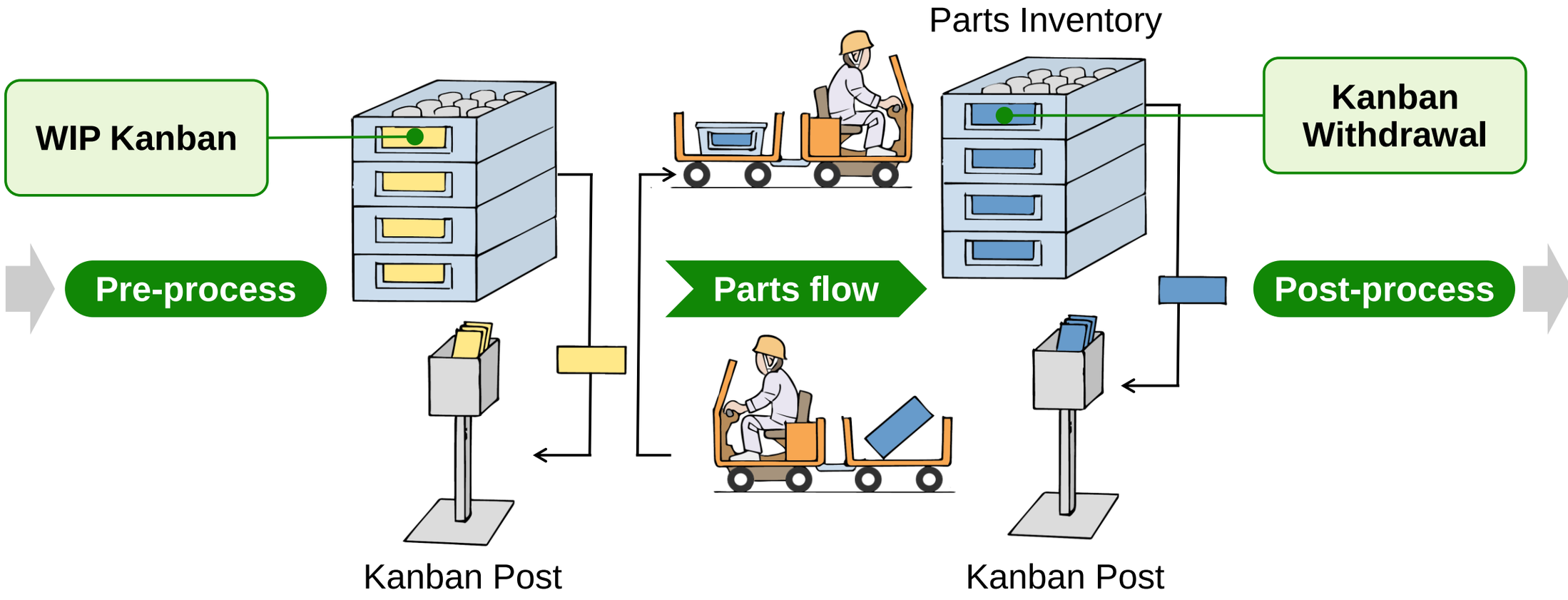
- Role of Kanban:

  Kanban Withdrawal: To instruct production to pre-processes

  WIP(Work-in-Progress) Kanban: To instruct production within its own process

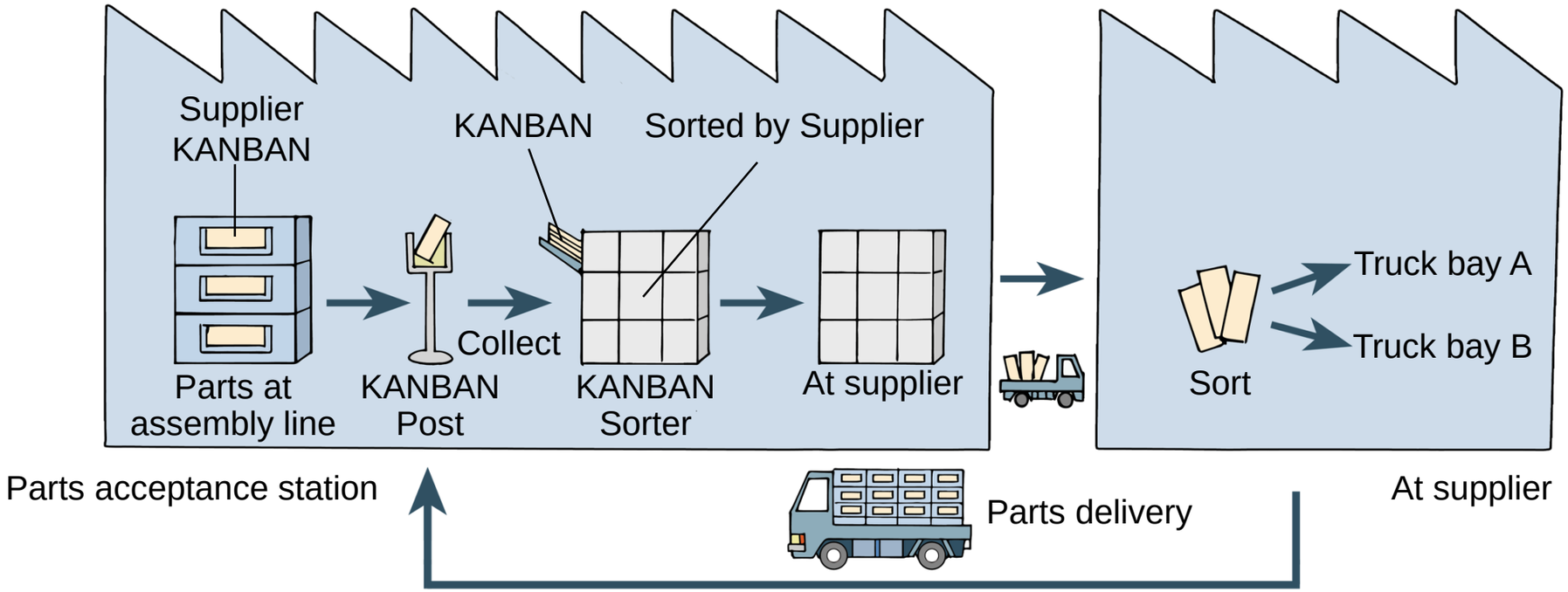
JIT and Kanban system

- How Kanban Withdrawal/WIP Kanban works



JIT and Kanban system

- A case of Supplier KANBAN (used between a factory and its suppliers)



From the number of KANBAN sheets in KANBAN post,
we can see production situations and inventory level of suppliers.

KANBAN will be explained in the session of TPS(Toyota Production System)

Jidoka (Autonomation)

- Is there any method to produce only non-defective item while eliminating Muda?
  - Muda to produce defective items
  - Muda to keep producing defective items by automation machine
  - Muda to watch machinery; Muda of waiting

- To make it Jidoka
  - Its underlying idea: It must stop itself when it detects a defect.
  - Don’t allow it to continue producing defectives.

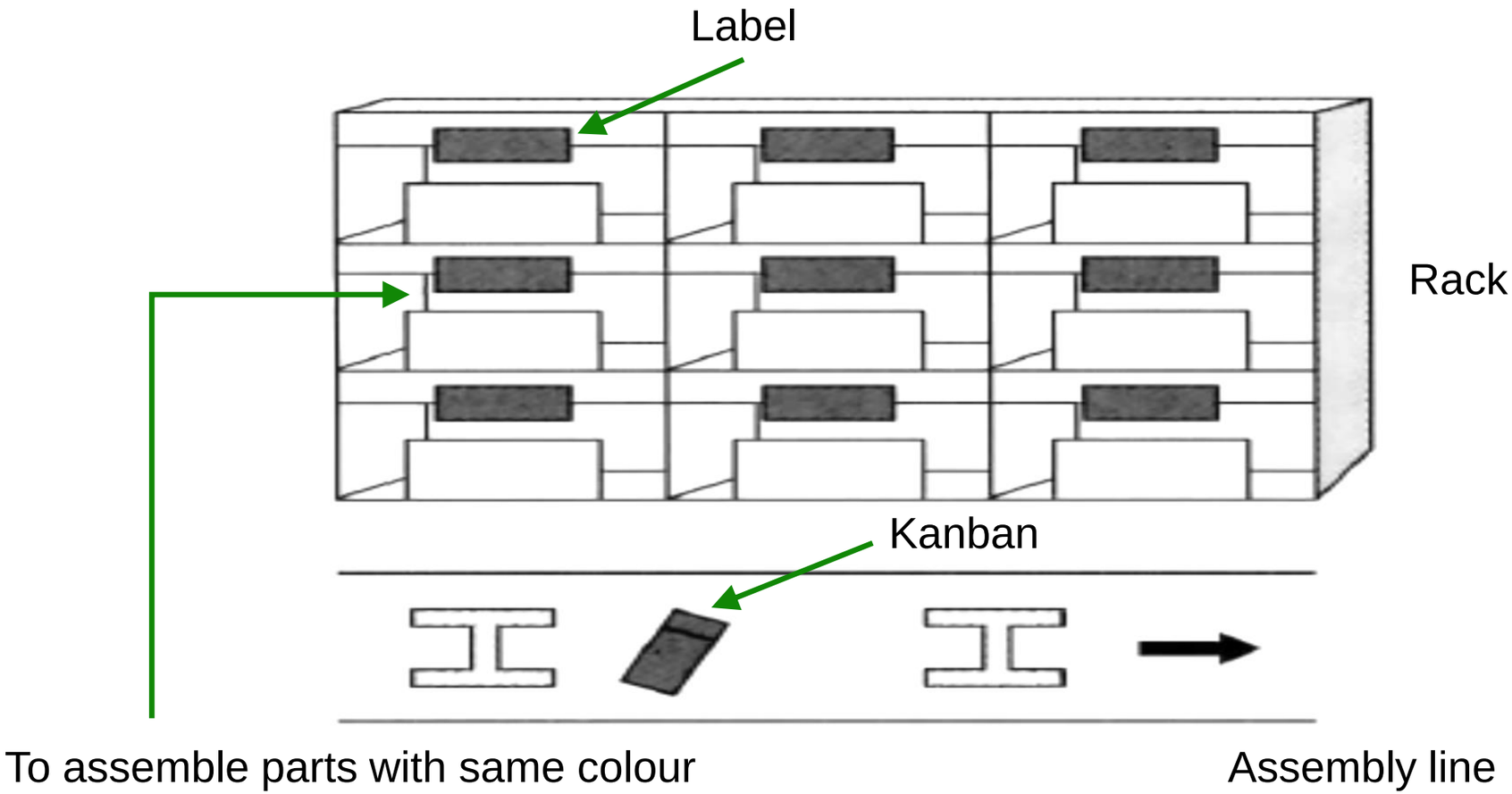
Jidoka (Autonomation)

How to realise ‘Jidoka’

1. To practice visual control
2. To deal with Muda caused by defects:
   - Automatic stopping at a time of abnormality occurrence
   - Use error-proof
3. To deal with Muda caused by waiting:
   - Abolish machine watchers: Divide jobs between humans and machinery
   - Develop multi-skilled operators who are able to operate multi-units, thereby reducing number of operators

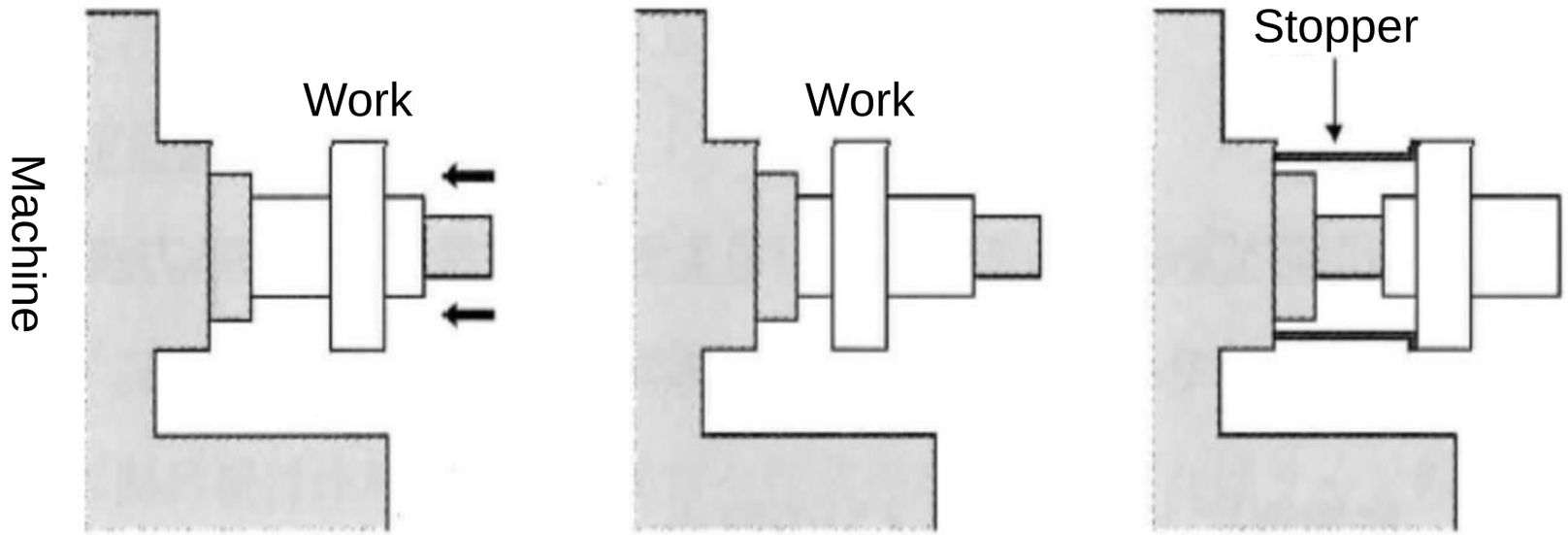
Jidoka (Autonomation)

Case 1 Instruction of parts to use by colour



Jidoka (Autonomation)

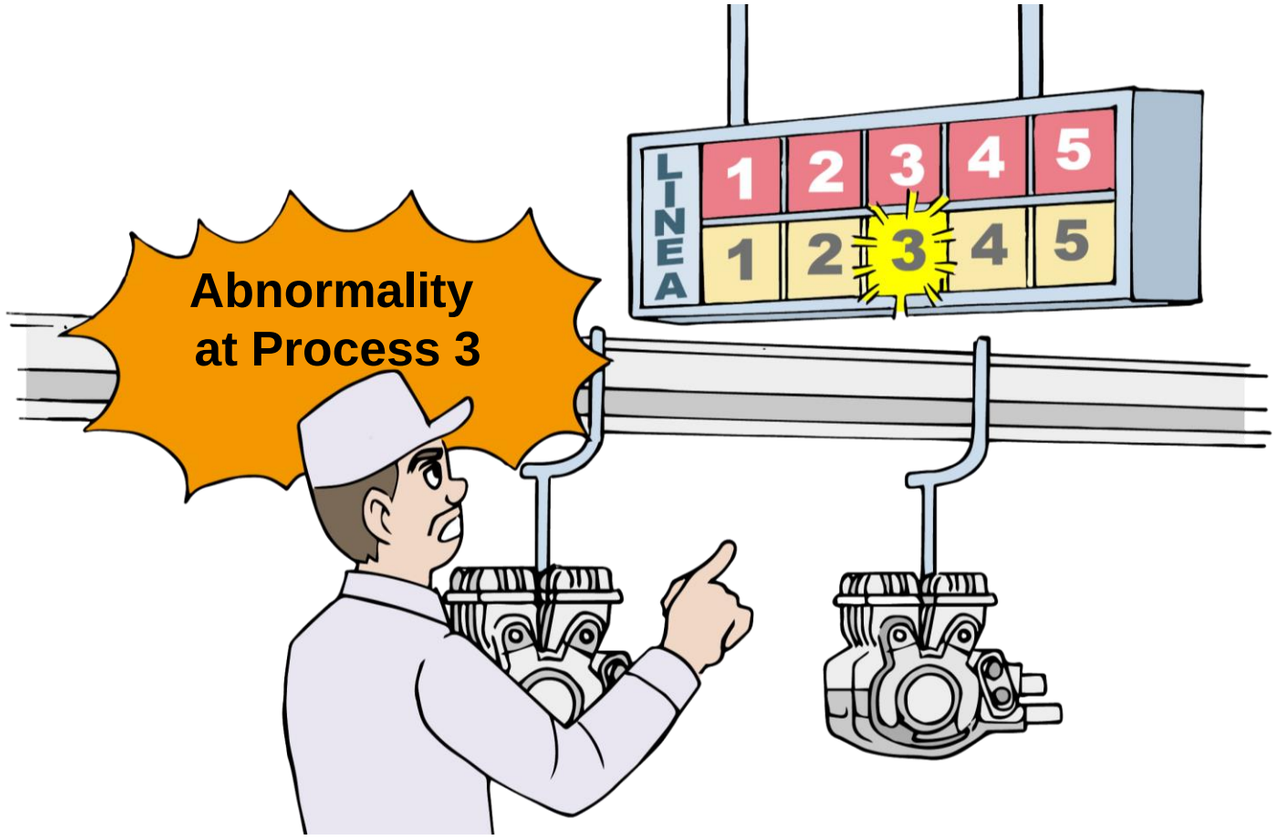
Case 2 Error-free idea in work attachment



Normal attach　　Reverse attach　　Stopper installed

Jidoka (Autonomation)

Case 3 ANDON at Assembly line: When the lamp turns yellow (in case of an abnormality), a supervisor rushes to help an operator



Six Sigma

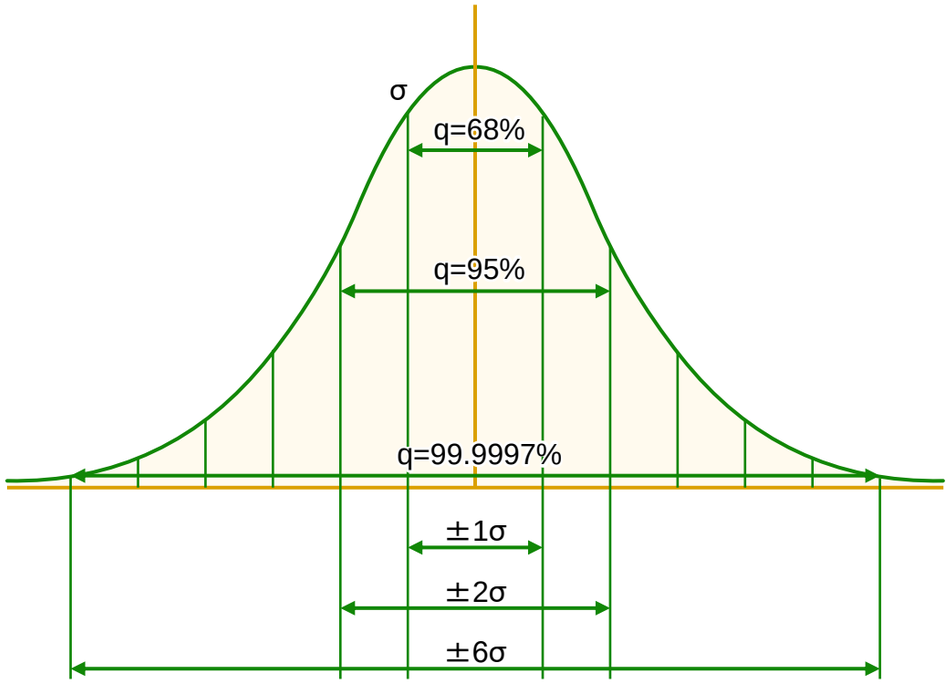
What is Six Sigma?

- Six Sigma is a business methodology aimed at improving quality by reducing errors and inefficiencies.
  - Focuses on reducing errors to near zero
  - Uses data and statistical analysis to identify and solve problems
  - 'Six Sigma' refers to achieving less than 3.4 defects per million opportunities

Sigma Levels

- Sigma Levels indicate the quality level in Six Sigma.

Multiple of the standard deviation, σ	Number of errors per million PPM (defects per million)
±1σ	691,462
± 2σ	308,537
± 3σ	66,807
± 4σ	6,210
± 5σ	233
± 6σ	3.4



Six Sigma is an activity that aims to reduce errors to as close to zero as possible.

Benefits of Six Sigma

- Implementing Six Sigma offers several advantages:
  - Improved product/service quality
  - Cost reduction
  - Increased customer satisfaction
  - Enhanced problem-solving skills
  - Greater efficiency and productivity

In what industries is Six Sigma used?

- Six Sigma is widely used in many industries. Specifically, it has been proven in the following areas
  - Manufacturing: many companies have implemented Six Sigma in the manufacture of automobiles and consumer electronics. Toyota Motor Corporation uses this approach to increase production efficiency and improve quality.
  - Service industry: Six Sigma has also been adopted in the financial services industry, including banks and insurance companies. Bank of America in the USA used Six Sigma to improve customer service.
  - Healthcare industry: Six Sigma has also been adopted by healthcare organisations. It has helped hospitals improve processes and patient safety. One example is a hospital in Chicago that has successfully improved its surgical processes.

  Six Sigma has been implemented in many industries to improve quality and efficiency.

Flow chart to Introduce Six Sigma

- Six Sigma implementation flowchart

1. preparatory phase

1-1 Confirm management commitment
1-2 Clarify implementation objectives
1-3 Organise implementation team

2. Education and training

2-1 Learn basic Six Sigma concepts
2-2 Conduct training on the DMAIC process
2-3 Gain a better understanding of the tools and methods

3. Project selection

3-1 Identify processes that need improvement
3-2 Set project goals
3-3 Constitute project teams

4. Implementing the DMAIC process

4-1 Define: clarify the problem and goals
4-2 Measure: collect current data
4-3 Analyse: identify root causes
4-4 Improve: Implement improvements and check effectiveness
4-5 Control: establish controls to sustain improvement

5. Evaluate results

5-1 Evaluating improvement outcomes
5-2 Organise lessons learnt and apply them to the next project

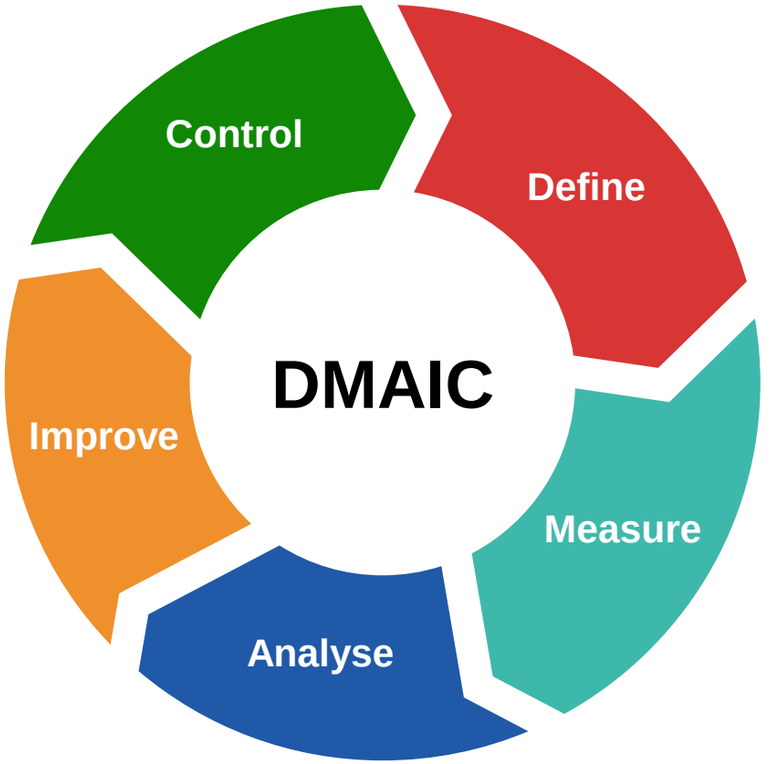
6. Continuous improvement

6-1 Review Six Sigma regularly and continue to improve
6-2 Embed a Six Sigma culture throughout the organisation

DMAIC Process (5 Steps)

- Six Sigma follows the DMAIC methodology for process improvement.

5 Steps	DMAIC Process
Define	Identify the problem and set goals
Measure	Collect data and measure the current process
Analyse	Analyse data to find the root cause of the problem
Improve	Implement solutions to address the root cause
Control	Maintain improvements by controlling the process



The DMAIC process also improves accuracy by going through a cycle like the PDCA cycle.

Companies implementing Six Sigma

- Some examples of companies that have successfully implemented Six Sigma;
  - GE (General Electric): fully implemented Six Sigma under the leadership of Jack Welch; GE has saved billions of dollars through Six Sigma implementation.
  - Motorola: the birthplace of Six Sigma and has successfully improved its manufacturing processes. It has provided high-quality telecommunications equipment and strengthened its competitiveness in the industry.
  - Samsung: has implemented Six Sigma to improve product quality and remain competitive in the global marketplace.
  - TOYOTA MOTOR: The company uses Six Sigma in conjunction with the Toyota Production System to improve quality and maintain high quality and efficiency in the global automotive market.

Is the introduction of Six Sigma worth it?

- The implementation of Six Sigma has been proven to produce benefits that are worth the cost, particularly in large manufacturing and accuracy-demanding industries.
- While the effort and cost of achieving Six Sigma may be significant in the short term, the long-term benefits of reduced defects, improved customer satisfaction and even enhanced competitive advantage outweigh them.
- However, Six Sigma is not suitable for all companies, and the benefits of implementation will vary depending on industry, company size and the importance of quality.
- Rather than blindly going for Six Sigma, it is better to have a clear understanding of the benefits of implementing it before proceeding with the plan.

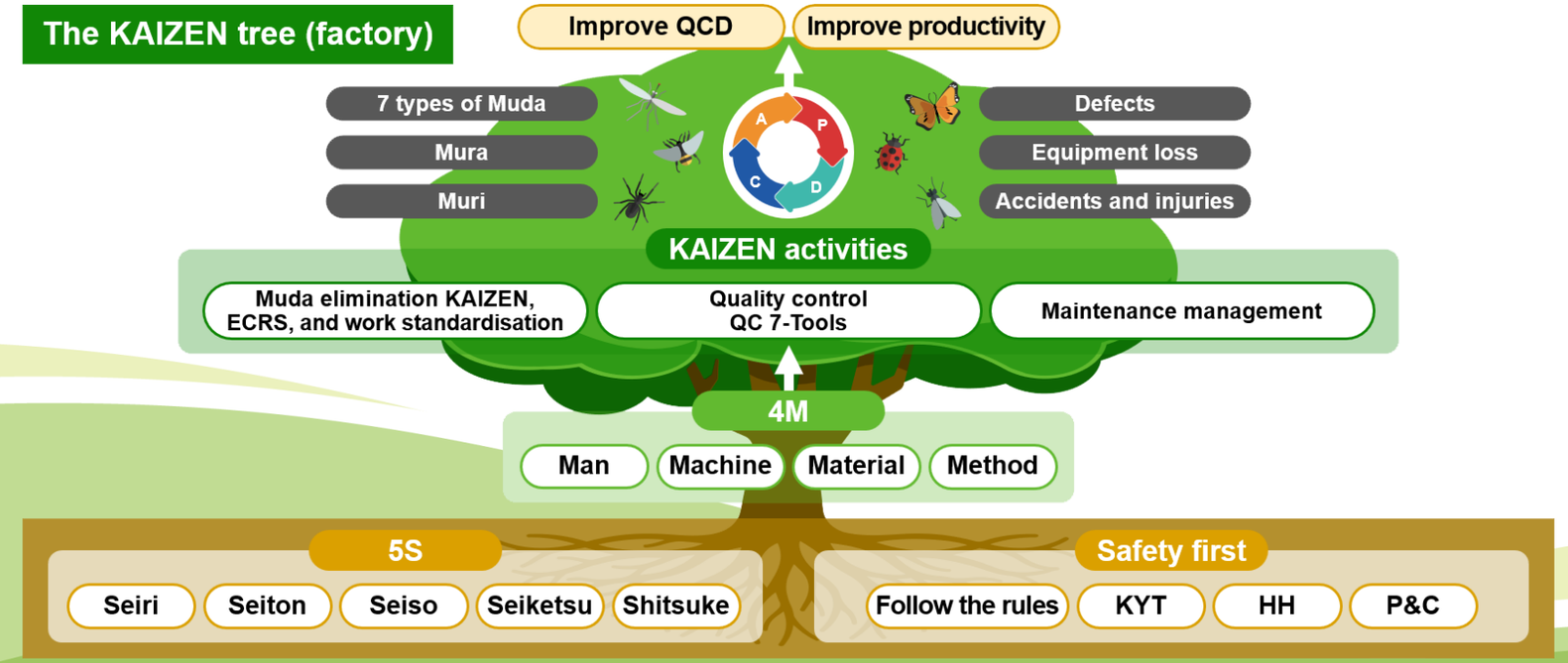
Section 11

Teamwork and KAIZEN Activities

Section 11 Teamwork and KAIZEN Activities

Contents

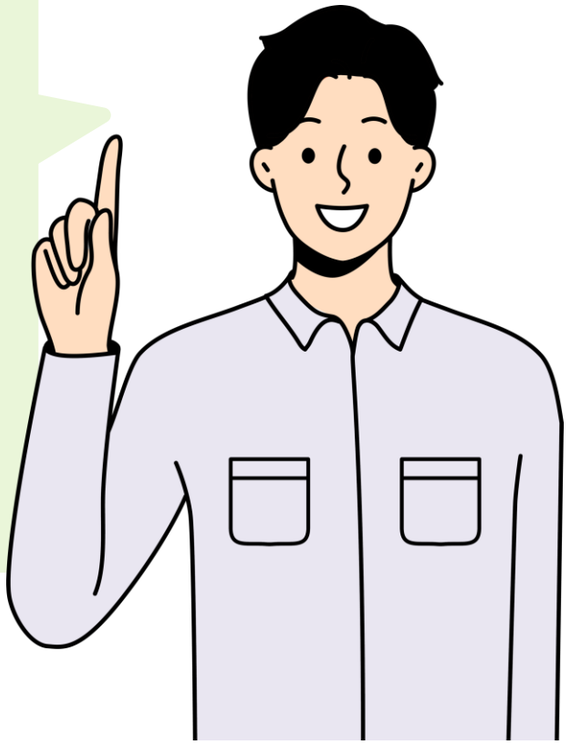
- **Manufacturing and teamwork**
- **The Importance of Reporting, Contacting, and Consulting - "Hou-Ren-Sou"**
- **Teamwork and QC Circle Activities (Small Group Activities)**



Key points of Section 11

- You can’t manufacture something by yourself, and if team members don't help and cooperate with each other, you can’t manufacture good products. In this chapter, you will learn about teamwork for manufacturing as a team.

- We will introduce Ho-Ren-So, a communication method for functioning teamwork, and QC Circle, which also aims to develop human resources. Understand them well and deploy them in your workplace.



Job and teamwork

A good product to satisfy a customer cannot be made by one person!

- No manufacturing can be completed by a single person.
- KAIZEN cannot be done by a single person, too.

A better product is produced by a better team.

A poor team cannot make better products.

A better way of manufacturing calls for better teamwork as a prime factor.

Job and teamwork

- Teamwork should mean:

To execute work by :

- Defining everyone’s role
- Sharing everyone’s wisdom
- Helping each other

A group in which team members don’t help each other, act selfishly and never cooperate, can’t exercise teamwork.

Job and teamwork

- What a good team means :

  - To be able to execute work as a team
  - To be autonomous and high-spirited
  - To be able to trust each other
  - To be able to communicate (Ho-Ren-So) with each other
  - To be able to maximise team power by drawing and gathering each member’s strengths
  - To have a leader who can take ownership and lead the team

Job and teamwork

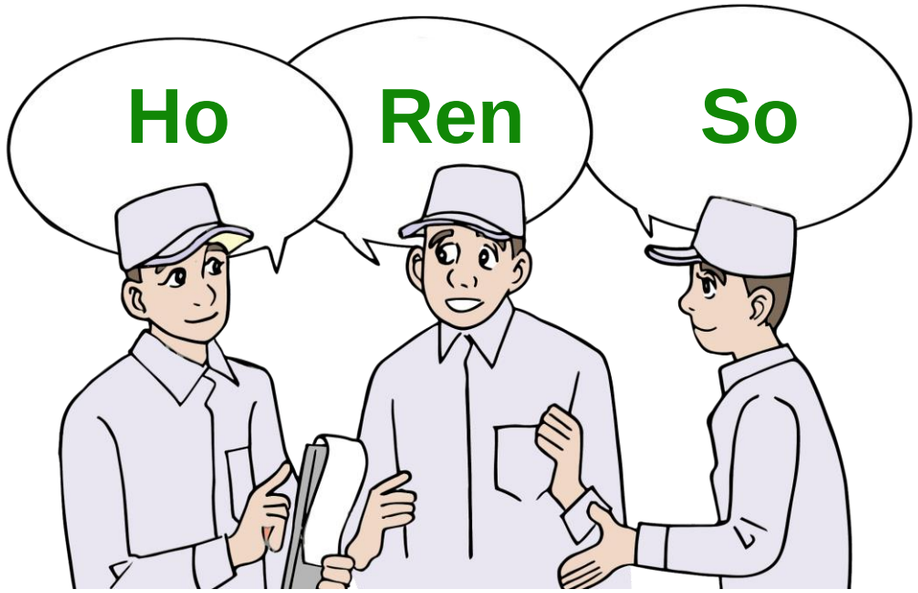
A better product is produced by a better team.

A group in which team members don’t help each other, act selfishly and never cooperate, cannot produce better quality products.

What is Ho-Ren-So?

- Manufacturing is never possible by one person’s work. It should be done by team work. It is very important to work by helping each other with mutual understanding of the situations.

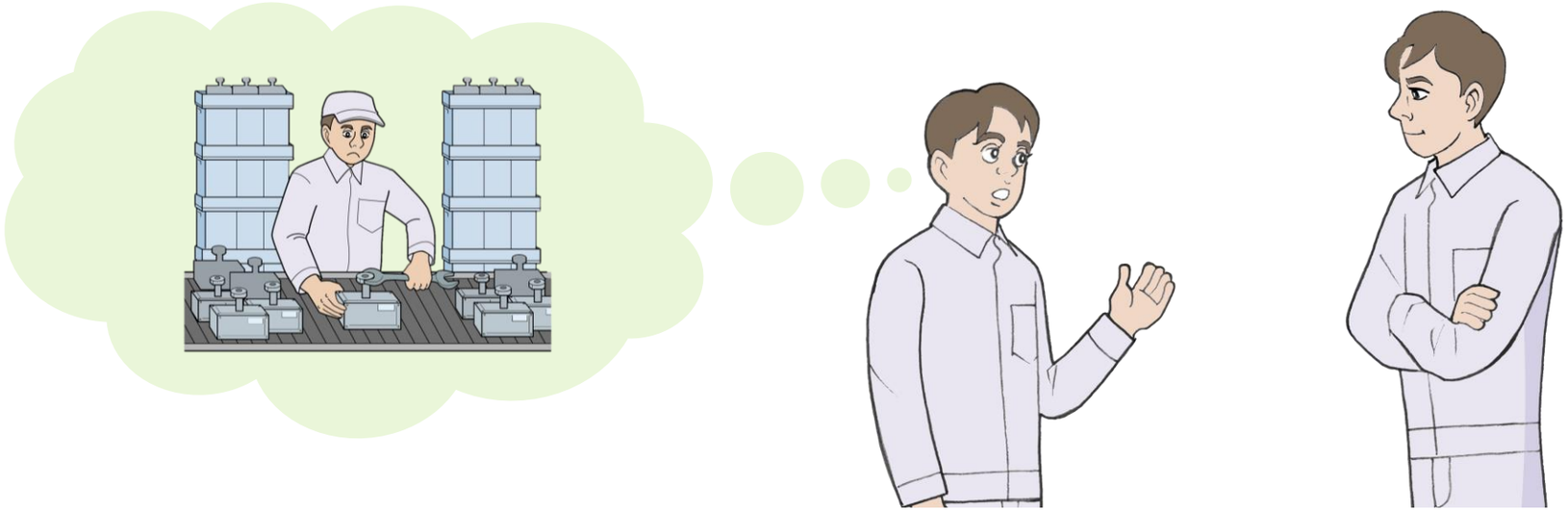
- Mutual communication is essential to complete the work successfully.
- **Ho-Ren-So** is the fundamental communication means for team work.



Purpose of Ho-Ren-So

- **Ho-Ren-So** has the following three meanings

Hokoku	To report to your supervisor
Renraku	To inform your supervisor and/or teammates
Sodan	To consult with your supervisor and/or teammates



Purpose of Ho-Ren-So

Specific purposes

- To prevent operations from stagnation
- To detect problems early and solve them in advance
- To prevent troubles
- To upgrade your work skills

Fundamental purposes

- To prevent any problem in advance so that work can proceed efficiently
- To create a strong team with the spirit of working together

How to implement Hokoku

■ **Hokoku:** to report to your supervisor

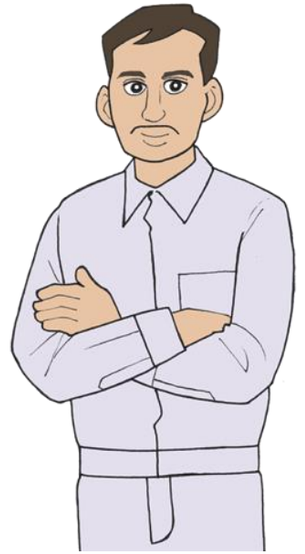
Fact
Situations
on the scene

Situations

You

Report

Instructions and directions



Supervisor

For any instructed or directed jobs, you are supposed to report the following things to your supervisor.

- Fact until now, progress and result
- Forecast of what may happen from now

How to implement Hokoku

Hokoku: How to report	Points
1. Report conclusion first	● Report consequences of what you have been instructed or directed to do. ● Report by adding supplementary remarks like background or progress relating to that conclusion.
2. Report by separating fact from speculation	● Report facts precisely, honestly and briefly. ● Don’t mix a fact with your opinion. → Prevent your superior from misjudgement.
3. Quick, honest and accurate report of bad news!	● Don’t work too much to solve a problem alone. ● Distressing cannot solve it; Report it openly and honestly. ● Sooner you report it, faster you can come out with better solutions. ● Report with your own opinion and judgement.
4. Keep reporting	● Start with reporting everything ● Don’t set priority by your own standard ● Report progress as well as result.

How to implement Renraku

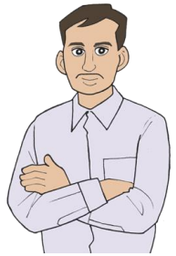
- **Renraku:** to inform your supervisor and/or teammates

Related information and events

Information

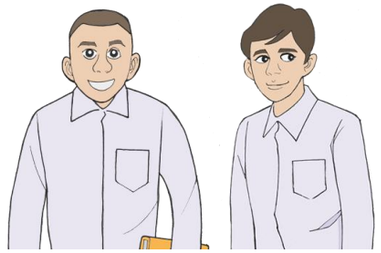
You

Renraku



Supervisor

Renraku



Teammates and related people

For any instructed or directed jobs, you are supposed to inform all the people concerned of any newly obtained information in a timely manner.

Note: The bad news and/or events that may cause trouble in your job should be informed quickly.

How to implement Renraku

Renraku: How to inform	Points
1. Organise what you should inform others	● Organise your information with 5W1H to prevent any omission. What: subject Who: who is in charge Why: reason or cause Where: place When: schedule How: methods ● Don’t give irrelevant information to confuse others
2. Comprehend the whole situation	● Comprehending the whole situation while judging importance and urgency, and select the information you need to give. ● Give the information in the order of priority.
3. Confirm if you’ve successfully informed others of the information	● Check if your important and urgent information was understood by others. ● Have the ability to distinguish between ‘just told’ and ‘informed.’ (just told: Your point of view after transmitting information informed: Receiver’s point of view of information)

How to implement Sodan

- **Sodan:** To consult with your supervisor and/or teammates

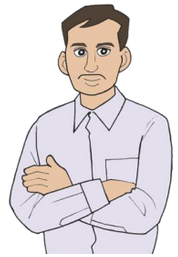
New challenges and/or difficult problems

Issues

You

Consultation

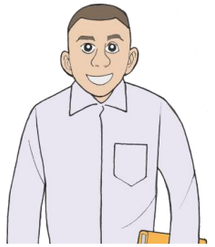
Advice and Instruction



Supervisor

Consultation

Advice and Instruction



Teammate

You are supposed to ask your superior and/or teammates for instruction, second opinion or advice. Or, whenever you have some issues and can’t make the decision yourself about things such as new challenges or difficult problems, etc.

How to implement Sodan

Sodan: How to consult	Points
1. Consultation should begin after having your own opinion	● What is the subject you are consulting about? Clarify issues and problems. (e.g.) Is it a problem about troubled equipment or poor quality or defective parts? ● Have your own opinion or plans for that problem. Just consulting does not mean to use your wisdom. ● Listen to the opinions of others after you share your opinion first.
2. Consultation needs relaxation and honesty	● Listen patiently when your opinion or assumption has been denied. Tell your opinion first. ● When instructed to examine again, you don't need to withdraw your opinion at once if you are confident of your own views. ● Confirm the intention of your superior and contemplate your plan all over again. ● Go to him again for consulting about revised plans.
3. Result of activity after consultation should be reported without fail	● The results of all advice you received in consultation should be reported. You should always give feedback as a sign of your confidence in your superior and teammates who advised you. ● Understand the difference between your opinion and their advice.

Quick Ho-Ren-So for bad information

- In order to prevent a latent problem from being realised and to promote a job efficiently, the information about unfavourable events, which may develop into a serious problem, including your error, should be subject to quick ‘Ho-Ren-So’. The possible damage should be limited to the minimum. The priority level of reporting is shown below :

Priority 1	Bad information requires more immediate Ho-Ren-So than others. ・When trouble has already been found and is expected to worsen.
Priority 2	When the situation is different from the normal condition, you should do Ho-Ren-So. (e.g.) ・Found strange noise in the equipment. ・Felt something strange with a part under assembly.
Priority 3	If you have some question at your workplace, you should do Ho-Ren-Sou.

Quick Ho-Ren-So for bad information

- If you hide a mistake, it can cause great harm to your company or team.

There are those who try to hide their job mistakes, fearing they will get a lower performance evaluation.

Think of this: Hiding your mistake to keep your assessment means you will be ‘temporarily’ protected but it will sacrifice your team and your workshop, leading to larger damage to the company you work for. That is why such behaviour is never positive for yourself or your organisation.

It's best to report it early so your team can address it quickly.

What are QC circle activities?

- A QC circle activity is a small group activity to set up a target and achieve it by members' cooperation.

Foundation of a QC circle

- Members at the workplace tackle the issues together as a team
- To continue working on the problem solving and KAIZEN at their workplace
- To execute an activity autonomously using each member's knowledge, skill, wisdom, etc.

Objectives and targets of a QC circle

- Improvement of Q (Quality), C (Cost) and D (Delivery)
- To establish a cooperative and friendly work environment and develop good human resources

Many companies in Japan have applied the QC circle activity method in their workplaces and have shown successful results.

Key points of QC circle activities

7 Points	What it means
1. Priority on quality	Quality always comes first. Anything can be the subject of quality improvement including working methods, etc.
2. Your next process is your customer	This is the most important idea.
3. PDCA cycle	Use the cycle of Plan/Do/Check/Act for betterment.
4. Fact-based management	Evaluate things by numeric values not by feeling.
5. Prioritising	Select prioritised themes for prioritised execution.
6. Process control	Improve work procedures and systems.
7. Standardisation and preventive measures	Make a mechanism that doesn't allow the situation to go back to the one before KAIZEN.

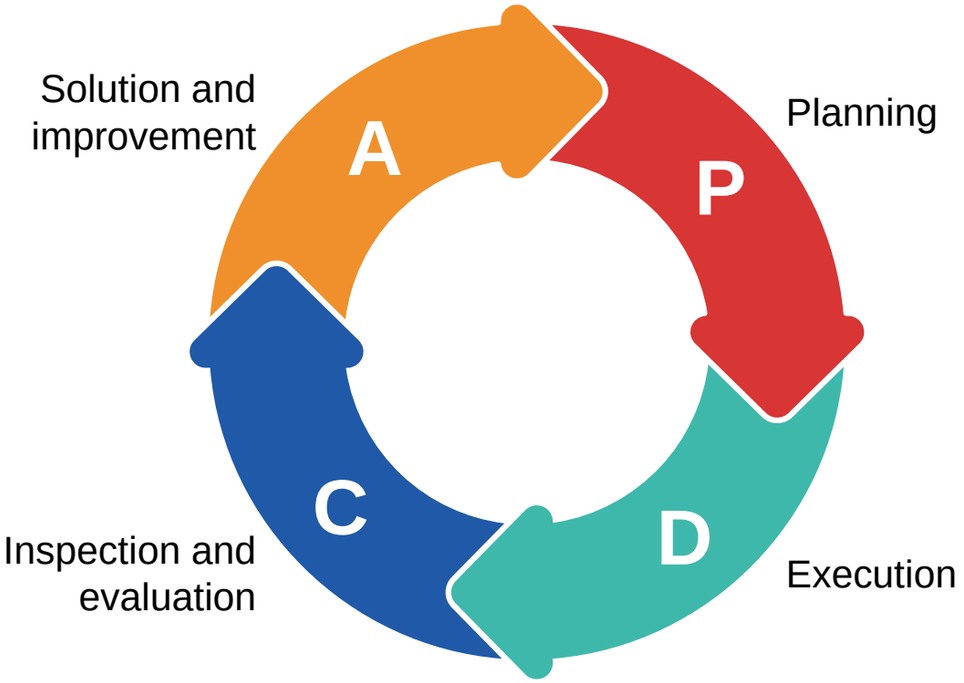
Key points of QC circle activities

2. Your next process is your customer

This indicates that you should always deliver the parts/products with perfect quality down to the next process and satisfy people working there, like you do for your customers.

Previous process | Your process | Next process

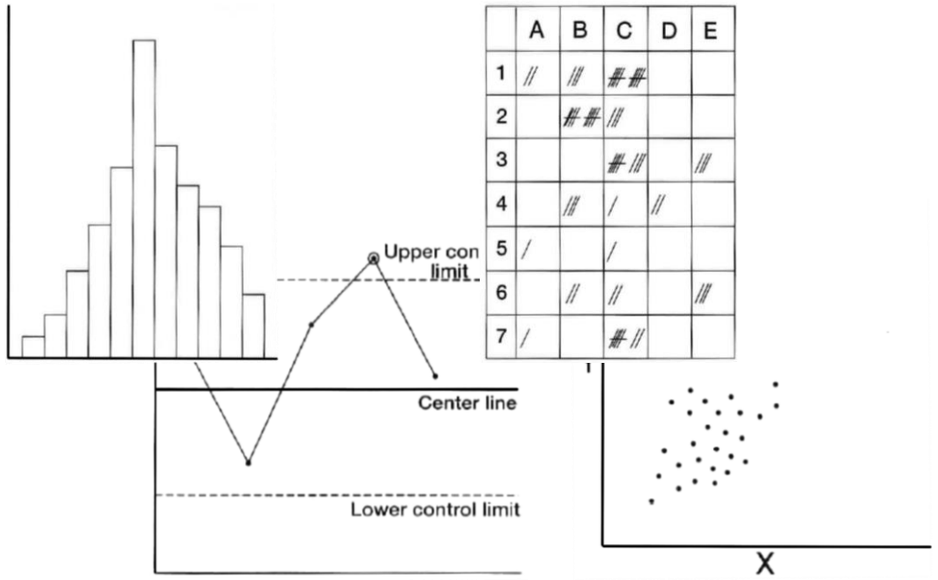
3. PDCA Cycle



Progress of any quality improvement and KAIZEN should be based on **PDCA cycle** methodology.

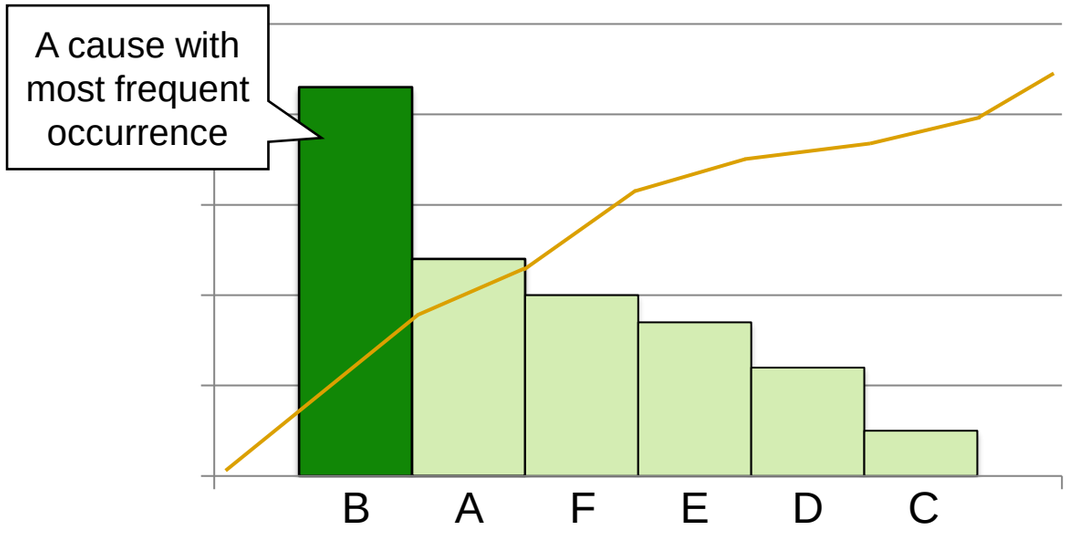
Key points of QC circle activities

4. Fact-based management



Problems as well as achievements should be assessed by numerical values and they are visualised. Don’t assess them by feeling.

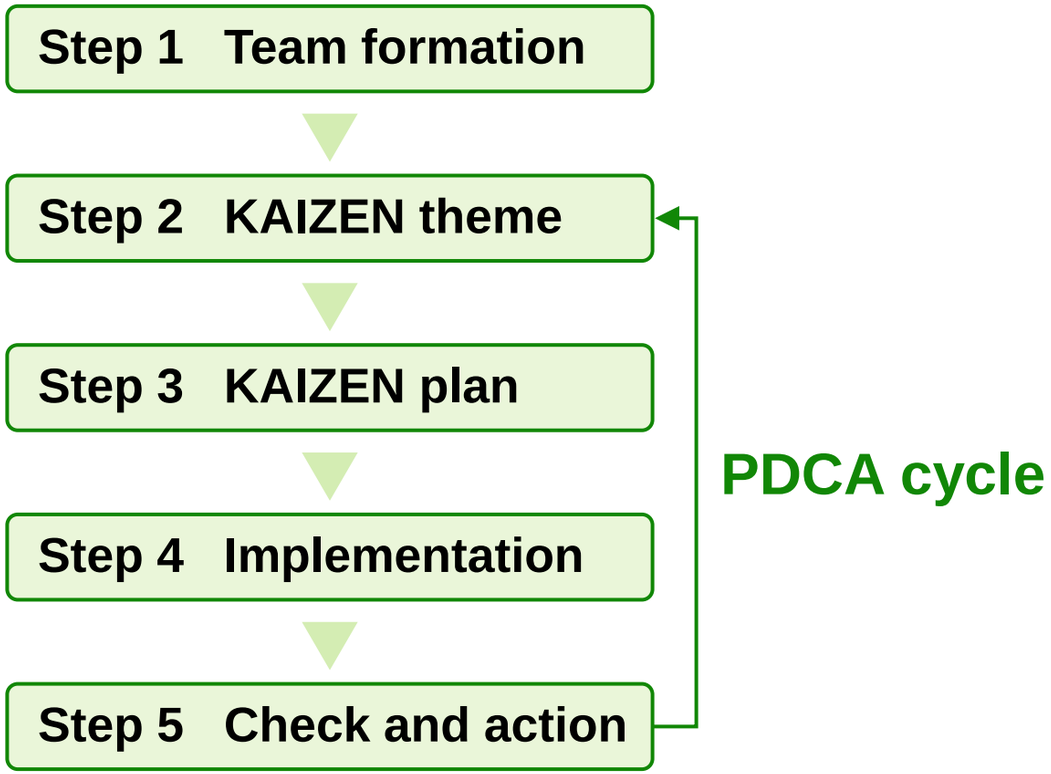
5. Prioritising



For the problem solving, prioritise problems first. Then start working on the ones with higher frequency or number of occurrence.

How to promote QC circles

Basic procedure



Team management

- A QC circle should consist of front line members of a workplace. A QC activity should be promoted by teamwork.
- Establish good relations among team members to understand and help each other.
- A good team opens the way for success.

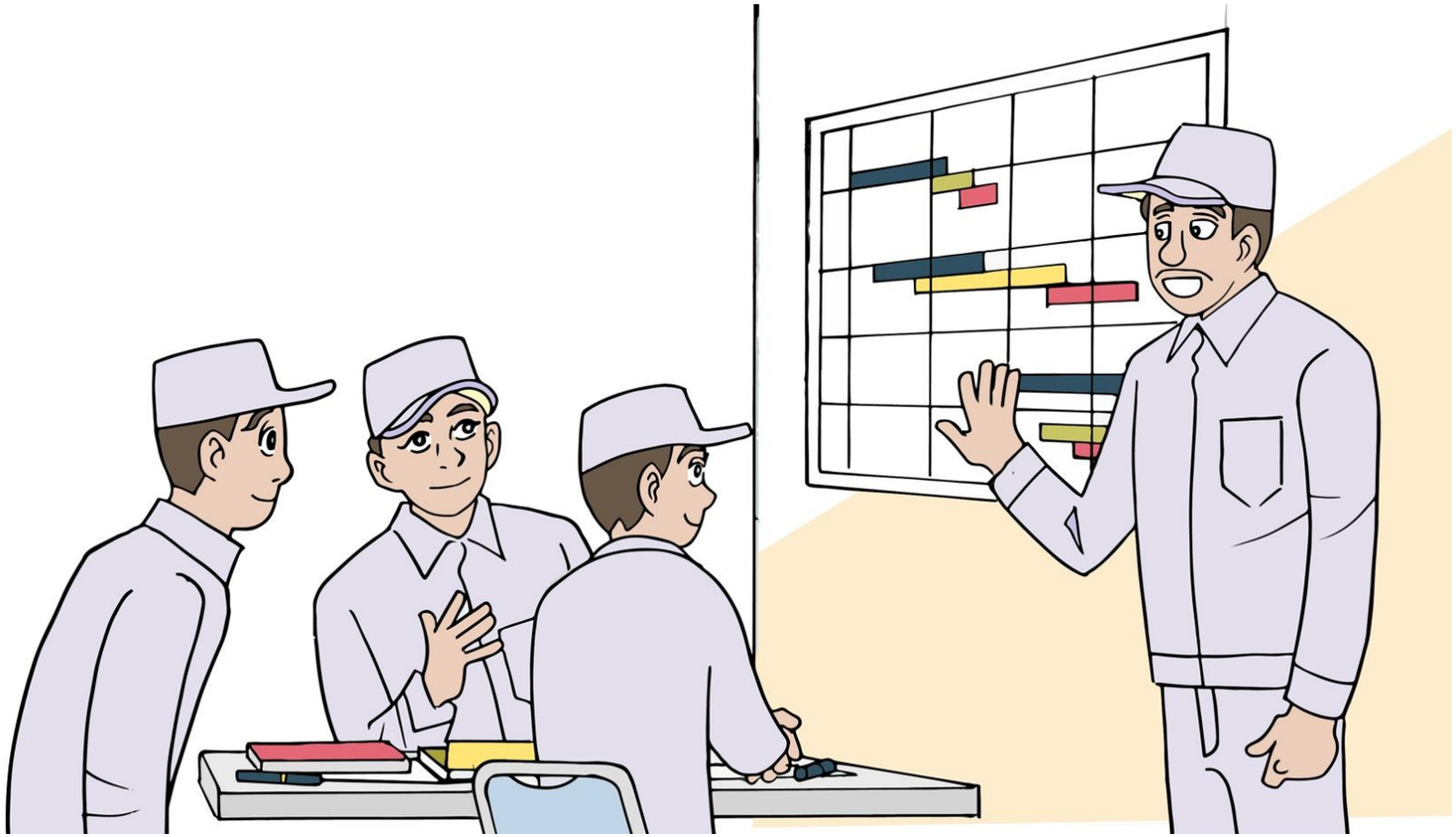
(NOTE) If it's like a team with a poor teamwork spirit, it can't win in sport.

How to promote QC circles

Basic procedures	
Step 1	Organise QC circles and decide members and a leader. Note: Members should be front line operators.
Step 2	Decide a theme of KAIZEN and organise problems and issues.
Step 3	Make a plan of KAIZEN with a definition of roles and procedures. (Plan)
Step 4	Implement KAIZEN and manage the progress. (Do)
Step 5	Check the results and take a necessary action for the next cycle. Standardise activities. Use 7 QC tools.（Check & Action)

How to promote QC circles

- In the progress management of the PDCA cycle, PLAN is especially important.



QC circle activities call for teamwork led by a team leader.

How to promote QC circles

- (e.g.) QC Circle activity for reducing defect rate

Implement KAIZEN by teamwork.

Find the problems and issues.

Make an improvement plan by looking at the actual worksite.

Analyse causes using QC tools.

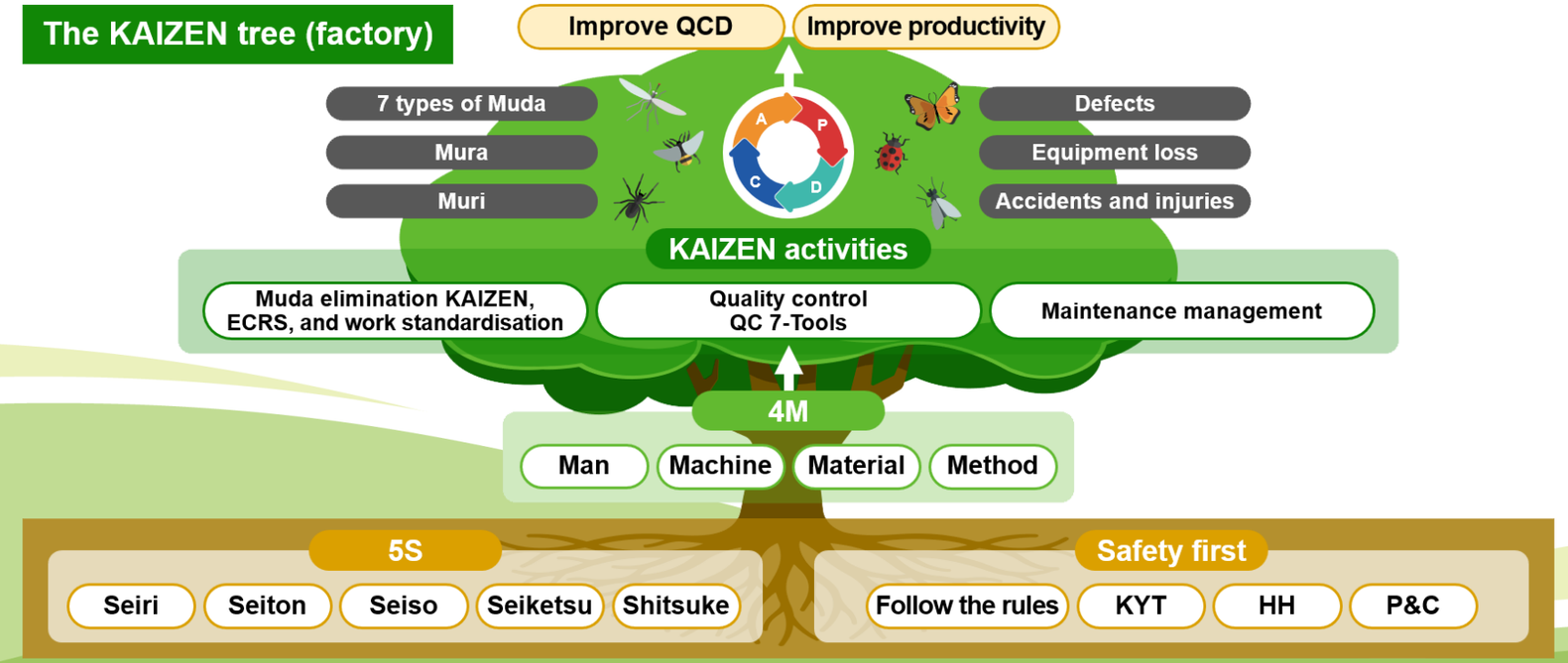
Section 12

Your growth and career paths on the shop floor

Section 12 Your growth and career paths on the shop floor

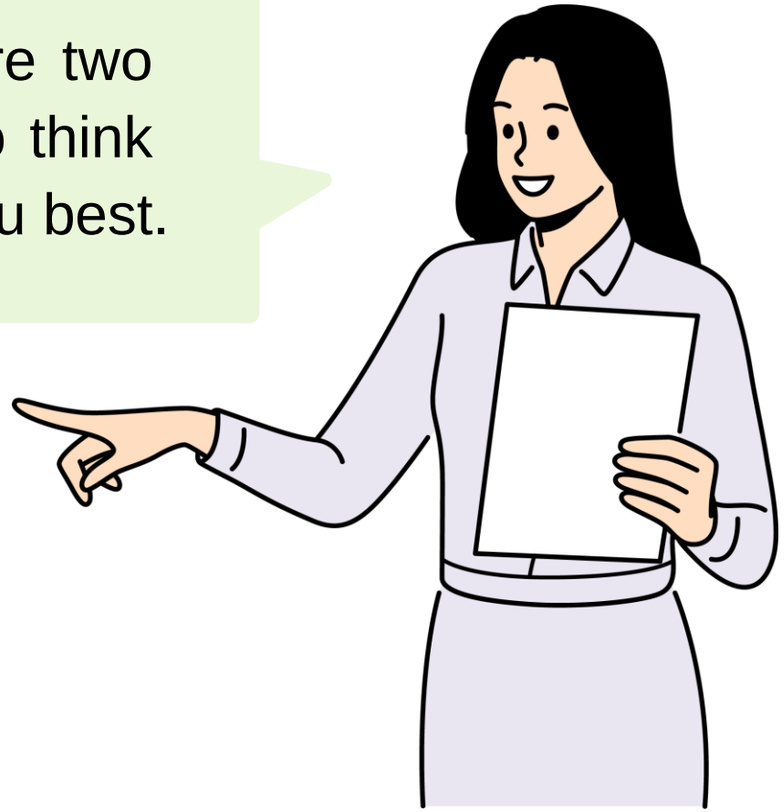
Contents

- **How to Gain Experience on the Shop Floor**
- **Future Career Paths (Becoming a Technical Expert or Leader of Shopfloor)**
- **In working for a Japanese company**



Key points of Section 12

- In the final section, you will think about your career path.
- After gaining experience on the shop floor, there are two possible career paths. Use this as an opportunity to think about your own future and which career path suits you best.



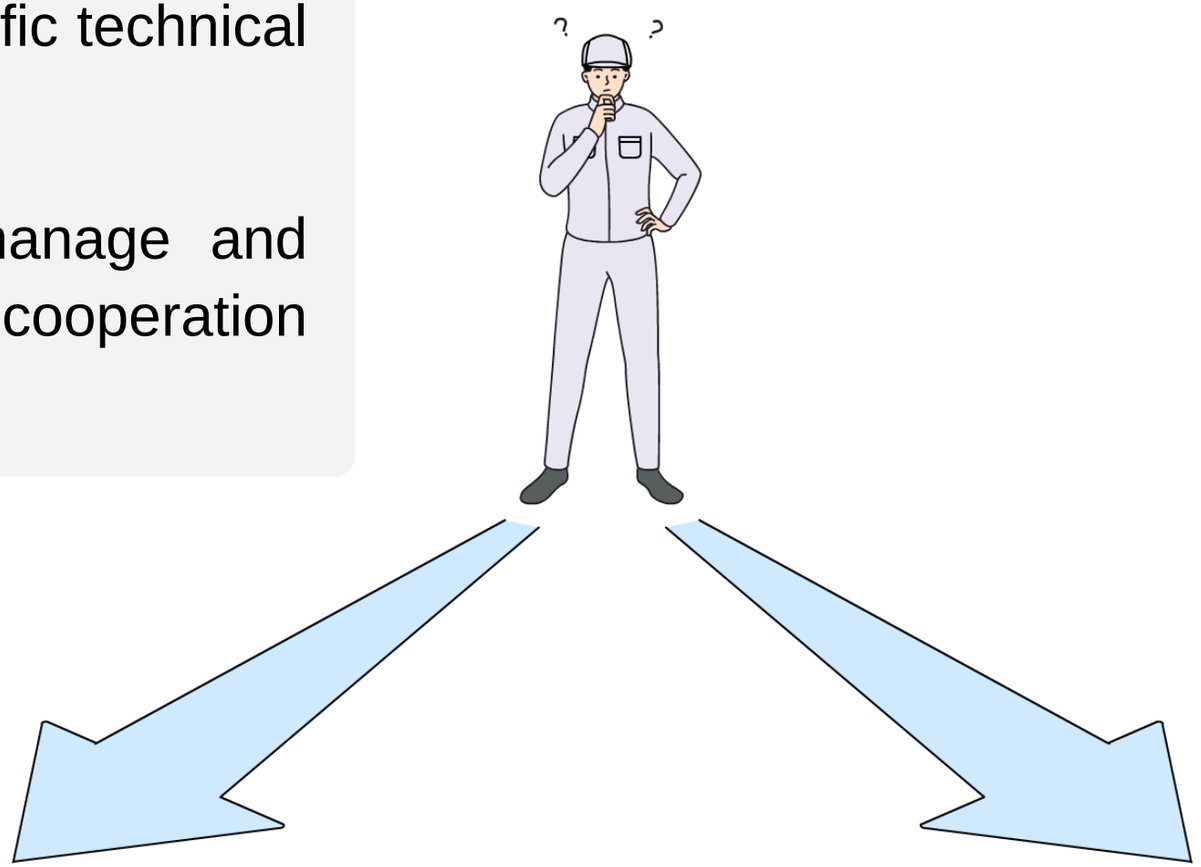
How to Gain Experience on the Shop Floor

- At the very beginning, learn the rules on the job site.
- Your first goal should be to be able to complete the tasks assigned to you without being late or absent without notice.
- Many of the jobs you are assigned are simple tasks at first. As you learn these tasks, be aware of which part of the overall process they are.
- Think carefully about the meaning of the tasks themselves.
- **Then think about how you can Kaizen it.**

Career paths on the production floor

- There are two main career paths in production.

1. As a technical expert, enhancing specific technical skills and broadening your skill set.
2. As a production site leader, you manage and supervise the production process in cooperation with managers.



Become an expert in the technical profession

- What is needed to master a techniques and become an expert is to gain knowledge and experience.
- In metalworking, there are various technical fields such as cutting, casting, forging, pressing and welding.
- Electrical technology includes electrical circuit design, knowledge of various motors and sensors, power distribution and safety technology.
- In component assembly, long experience is required to understand the features of each product and to assemble them in the right operation.

Become an expert in the technical profession

- The knowledge and experience gained from day-to-day work is important for these skills. To gain a high degree of specialisation, knowledge gained at educational and vocational training institutions is also necessary.
- Developing your specialisation at vocational schools, universities or other educational institutions is a major step towards career advancement.
- Specialisation cannot be acquired in one or two years. Knowledge and skills acquired over several years will be highly valued by the company.

Become Production site leaders

- Supervising a production site also requires many years of knowledge and experience.
- Extensive knowledge of each operation
- Understanding of each worker’s capabilities
- Adjusting the workload and allocating it to each worker
- Securing, coordinating and training the workforce
- Parts procurement
- Maintenance of machinery
- Negotiations with other departments within the company, suppliers and customers
- Dealing with defects and emergencies
- Guidance on kaizen activities

You have to change your response to the ever-changing external environment.

Become Production site leaders

- Aspiring production site leaders should be actively involved in kaizen activities in addition to their daily work.
- Through kaizen activities, communication with others on the same site will increase, knowledge of the entire workplace will be gained and leadership will be needed to drive improvements.
- In order to develop measures to reduce defect rates, prevent machine breakdowns and ensure proper delivery of parts, you will acquire a broad knowledge of other departments, an observant eye to spot problems and logical thinking to come up with solutions.
- Kaizen activities are not limited to your own department, but may also involve other departments, suppliers and customers. The experience of coordinating with many stakeholders will broaden your perspective.

In working for a Japanese company

- A production site cannot run well without both technical experts and production site leaders.
- It is up to you to choose which direction you are interested in and work towards.
- Japanese companies want their employees to work for a long period of time to develop their expertise and skills. The company supports you by giving you the opportunity to do so.

We hope you will learn a lot, gain experience and contribute to the company, while at the same time leading a useful and rewarding professional life for yourself

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