Continuous Improvement Toolkit

WASTE ANALYSIS

Lean Concept of Waste

WASTE ANALYSIS

In a Lean culture, **waste** is anything that doesn't add value from the customer's perspective.

It includes activities that **consume resources** but contribute zero value to the customer.

WASTE ANALYSIS

Wastes according to Lean are **non-value-added** unnecessary activities which add cost to the product or service and therefore should be eliminated.

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WASTE ANALYSIS

Waste Analysis is one of the core principles of Lean thinking that involves identifying, quantifying, eliminating and preventing waste.

It is one of the **easiest ways** an organization can improve its operations.

WASTE ANALYSIS

Many Lean concepts and tools **focus** on continually identifying and eliminating waste.

In fact, one of the **main objectives** of Lean is to remove all forms of waste from the value stream.

For most companies, it is safe to stay focused on the elimination of waste in the early years of the Lean journey.

WASTE ANALYSIS

> Total elimination of waste is the basic principle of the Toyota system, and if one cannot understand the basics, correct understanding of the whole is impossible.

Shigeo Shingo

WASTE ANALYSIS

Much of the focus in Lean and Kaizen is on the identification and the removal of waste, and this waste may exist in the **value stream**, **process** or **facility**.

WASTE ANALYSIS

BENEFITS

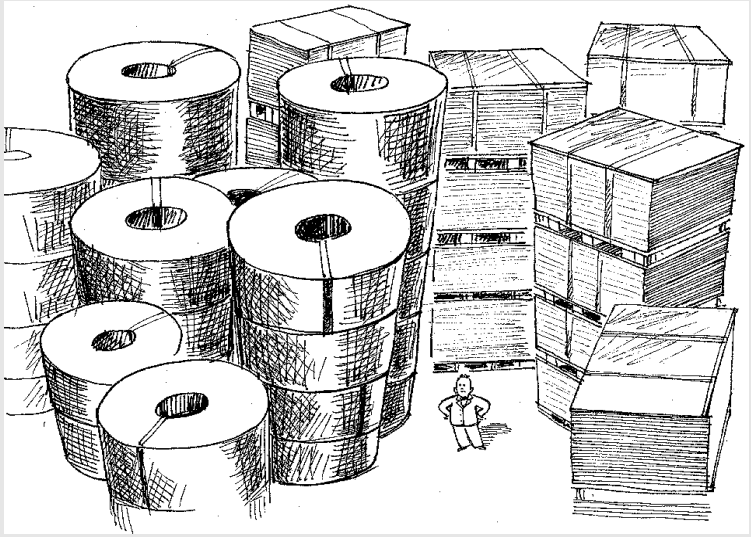
Saves money and gains a competitive advantage	Improves productivity, flexibility quality and safety
Improves morale and pride in the workplace	Brings efficiency and effectiveness to the existing processes
Reduces lead times and defect rates	As a result, products and services that will better meet customer expectations

WASTE ANALYSIS

The nice thing about focusing on waste is that the benefits are immediately **visible**, which will get people to invest in Lean intellectually and emotionally.

WASTE ANALYSIS

Waste analysis is **applicable** in manufacturing, service and office environments.

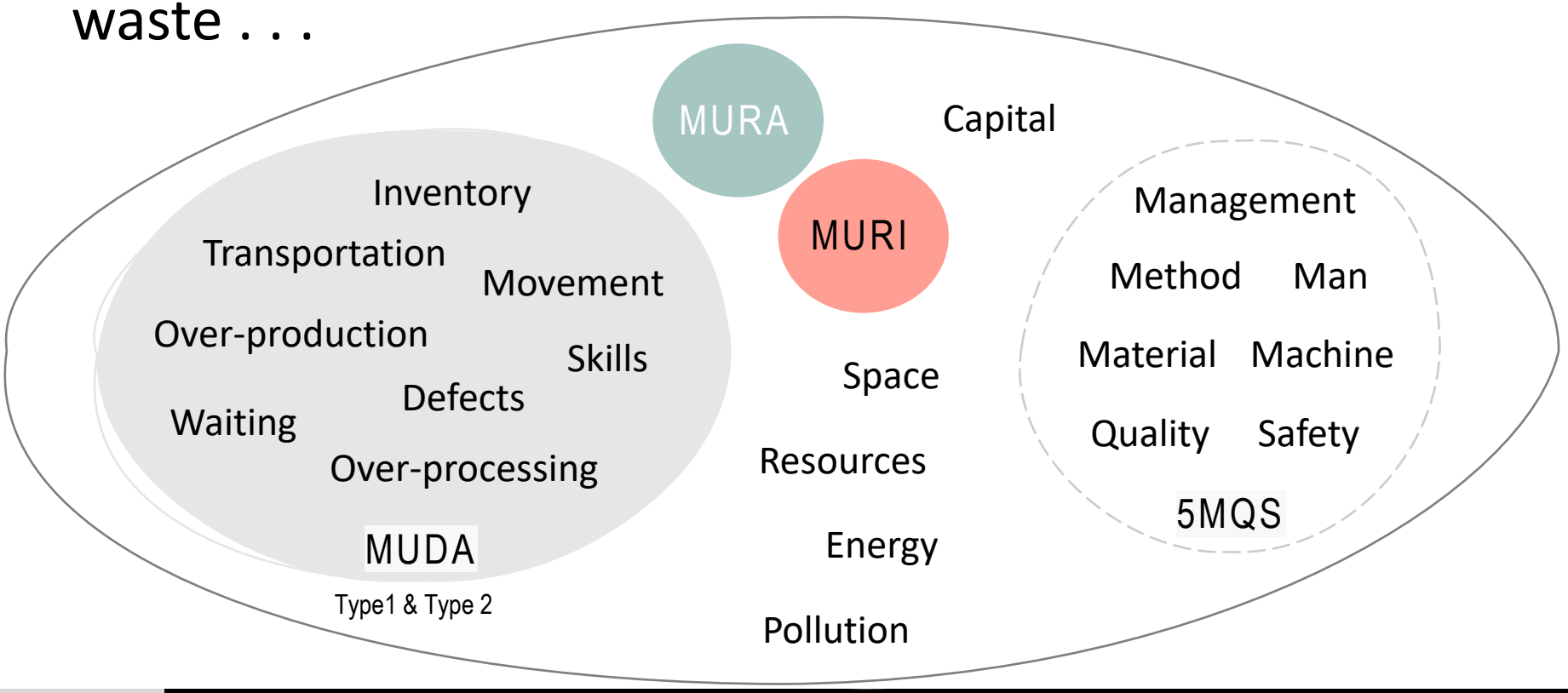


MANUFACTURING

OFFICES

WASTE ANALYSIS

Waste takes many forms and can be found at any time and in any place. There are many **classifications** of waste . . .



WASTE ANALYSIS

A waste can be described by the Japanese word **Muda**.

Muda is any activity that consumes resources without creating value to the customer.

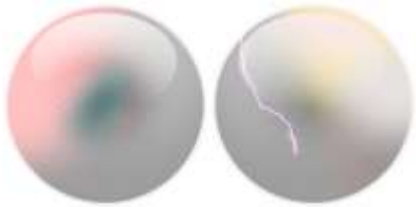
Many of these activities can be eliminated immediately thought Kaizen events.

WASTE ANALYSIS

Muda is closely related to other terms . . .

The Three MUs

WASTE ANALYSIS



Muda

Consuming resources without creating value to the customer

Examples include mistakes that require correction

Mura

Unevenness, fluctuating and variation in the operation

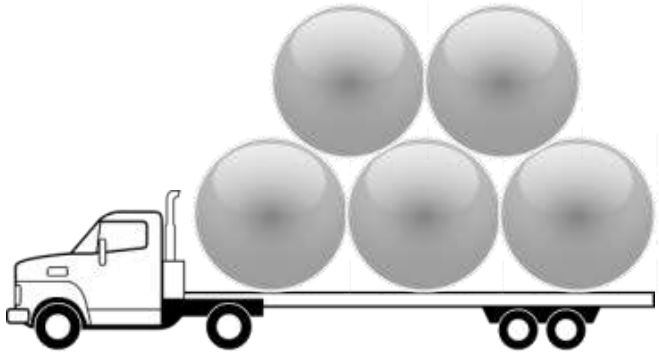
Examples include asking someone to do three tasks and another to do 10 tasks

Muri

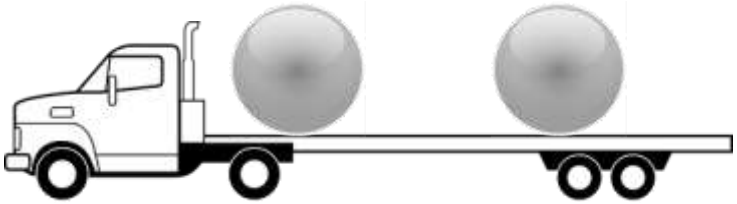
Overburden of people or equipment resulting in safety and quality problems

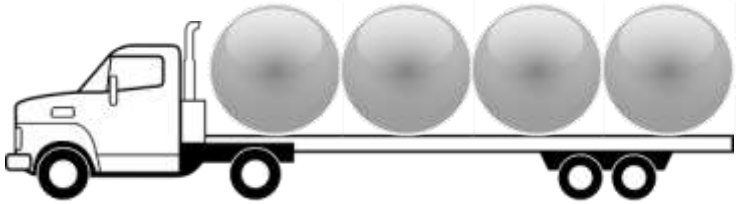
Examples include asking one to operate at 30% capacity

WASTE ANALYSIS

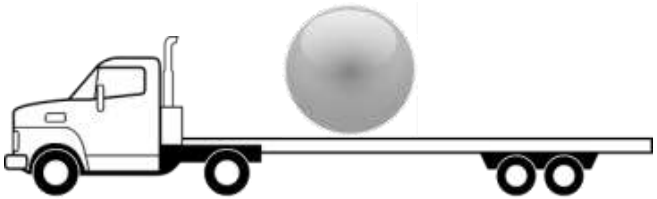


Muri

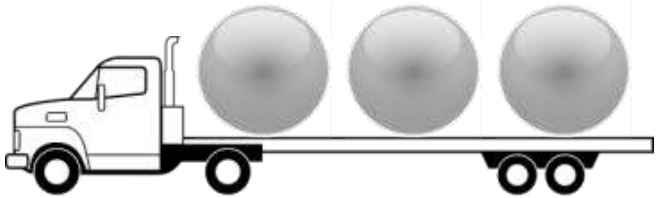


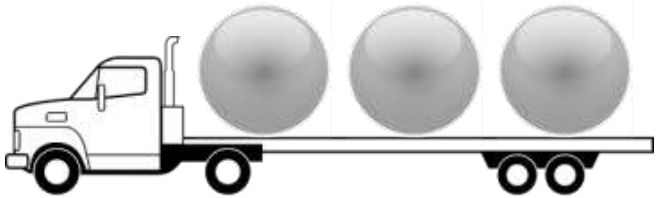


Mura



Muda

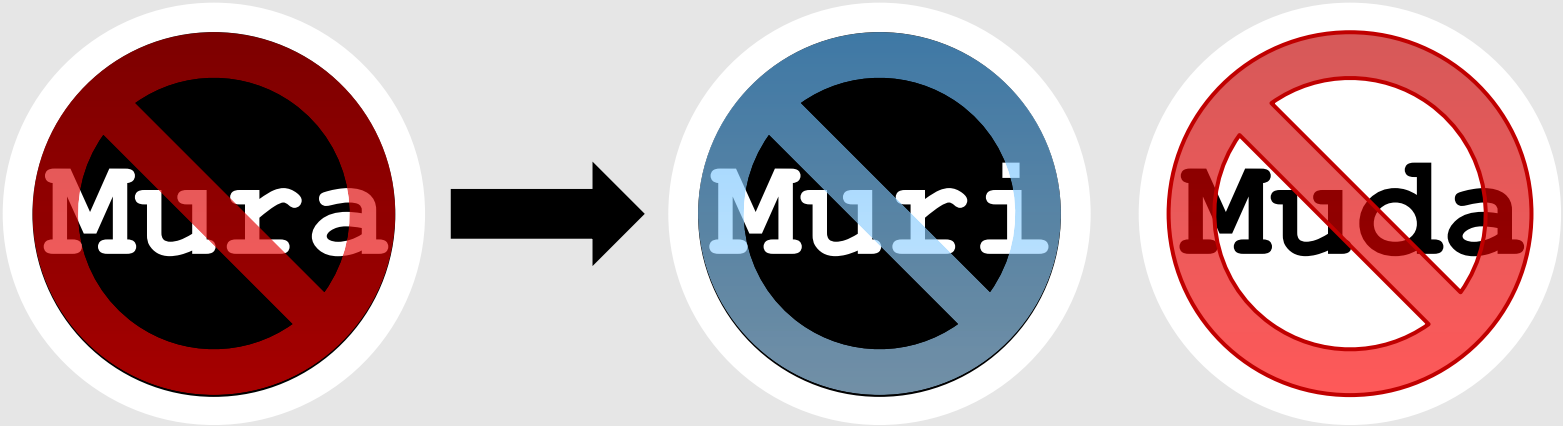




No waste

WASTE ANALYSIS

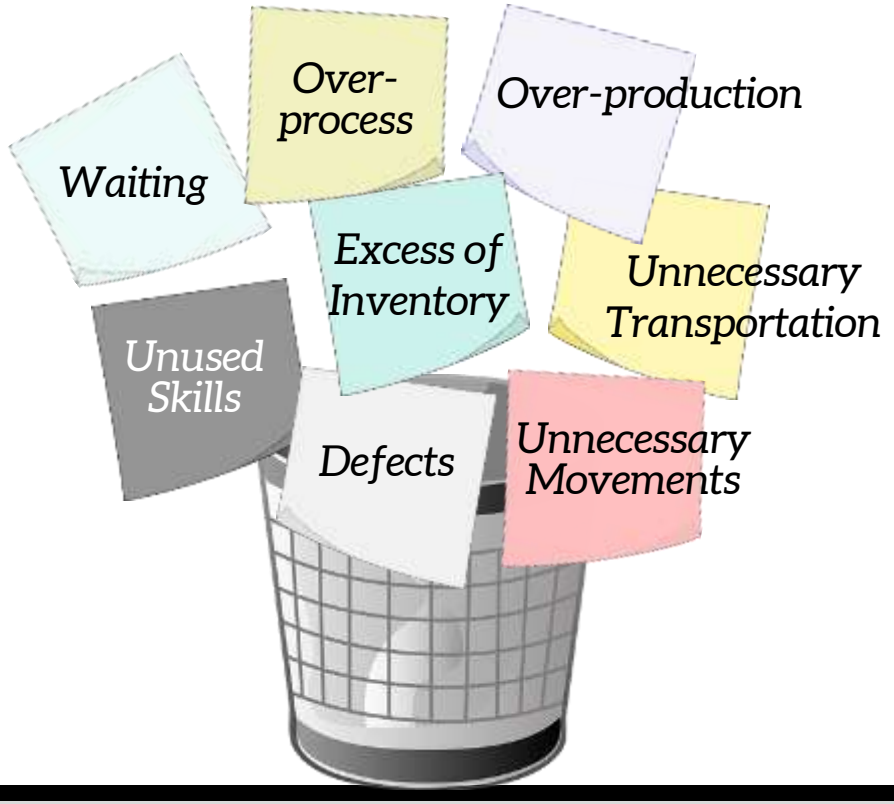
Practically, it is recommended to reduce process variation first (Mura), and then eliminate Muri and Muda forms of waste.



WASTE ANALYSIS

One of the most basic and widely used models across many industries around the world is the **eight wastes**.

Categorizing waste into these eight forms makes them easier to identify and helps identify priorities for action.



WASTE ANALYSIS

- The seven types of waste have been introduced by **Taiichi Ohno** who is one of the developers of TPS.
- In the 1990s, the seven wastes have been changed into eight wastes with the emergence of a new category of waste (unused skills).
- It can also be applied in many other areas and not just manufacturing.

WASTE ANALYSIS

> The most important objective of the Toyota system has been to increase production efficiency by consistently and thoroughly eliminating waste.

Taiichi Ohno

WASTE ANALYSIS

The Eight Wastes

Unnecessary transportation – The unnecessary movement of items or information from one place to another.

Unnecessary movement – Movement performed by people that is not required.

Waiting – Occurs any time a person or a product is waiting.

Excess of inventory – Having more materials or information than what is actually needed.

Over-production – Creating too much material or information.

Over-processing – Processing more than necessary to produce the desired output.

Defects, errors and mistakes – Causing the effort to be redone to correct the problem.

Unused Skills – Wasting human talent, creativity, enthusiasm.

WASTE ANALYSIS

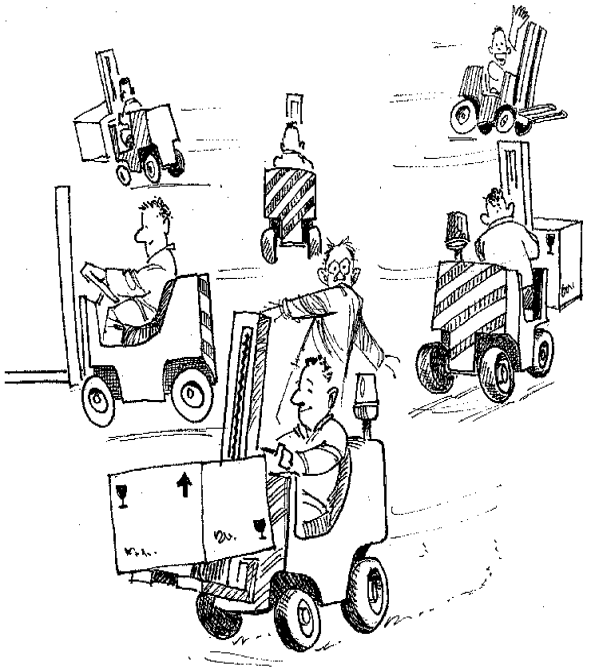
An easy way to **remember** these eight types of waste is with the following acronyms . . .

WASTE ANALYSIS

Unnecessary Transportation

The **unnecessary movement** of products, materials, supplies or information from one place to another.

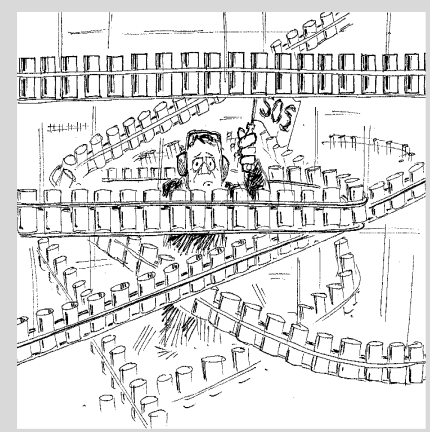
It is normally the result of a poor system design, ineffective layout, or multiple sources or destinations.



WASTE ANALYSIS

Unnecessary Transportation

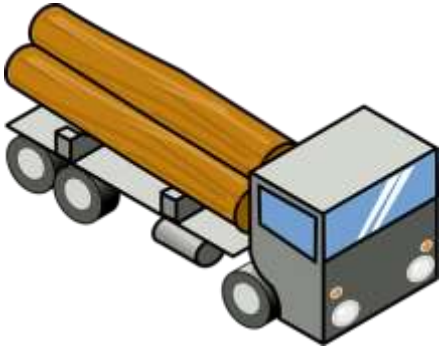
Moving things **costs money**, causes production and delivery delays, and may include the risk of loss or damage.



It is clearly visible in **old-fashioned production lines**, where work-in-process and finished goods are pushed from one area to another.

WASTE ANALYSIS

Unnecessary Transportation



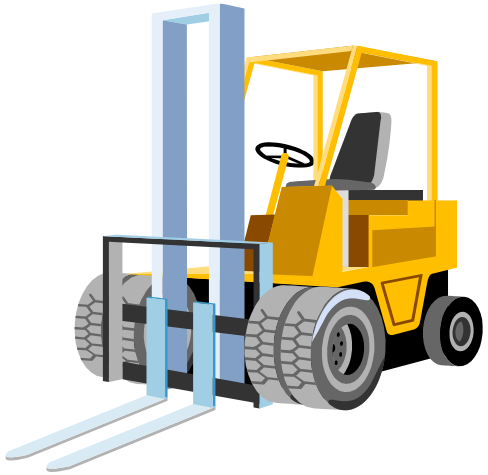
While a product is being transported, it is not being worked on and no value is being added to it.

Many companies now require their suppliers to be close in order to eliminate transportation costs.

WASTE ANALYSIS

Unnecessary Transportation Examples

- Storing raw materials far away from production lines.
- Having the raw material storage area and the loading area at opposite ends.
- Moving patients from department to department.



WASTE ANALYSIS

Unnecessary Transportation Examples

- Storing office supplies far away from the office area.
- Moving documents for approval or seeking authorization.
- Moving information through electronic medical record (EMR) in a medical center.

WASTE ANALYSIS

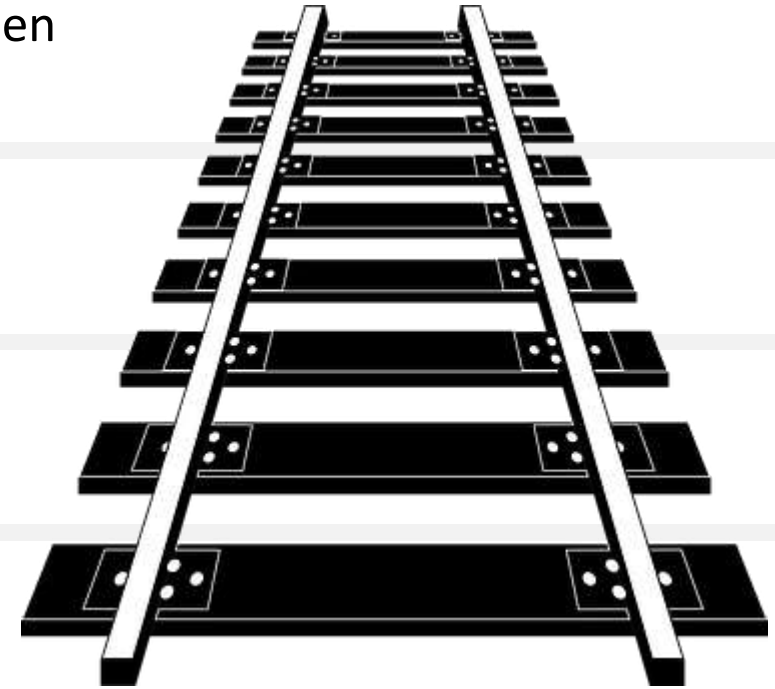
Ideas to reduce or eliminate unnecessary transportation . . .

Find ways to reduce the distance between work areas.

Try to transport in bulk and in both directions.

Relocate items to be closer to where the work is performed.

Introduce standard sequences for transportation.



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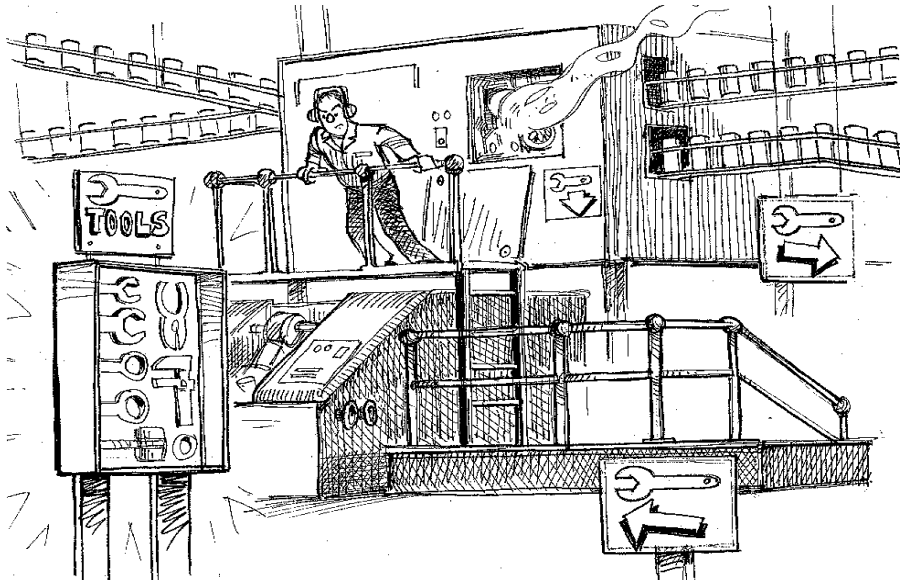
Unnecessary Movement

Wasted Motion or Excess of Motion

Refers to the movement performed **by people** that is not required and will not add value to the product or service.

This waste is normally the result of a poor workplace layout design or poor ergonomic design.



WASTE ANALYSIS

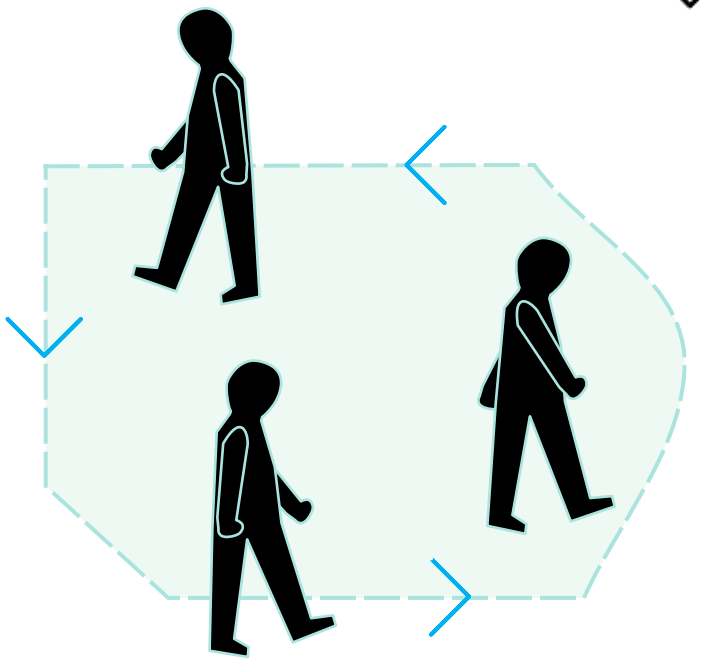
Unnecessary Movement

While moving materials and products from one location to another is a transportation waste, the unnecessary movement of **people** and **tools** during the production process is a movement waste.

WASTE ANALYSIS

Unnecessary Movement

Not only it consumes time and uses up energy, but it may also increase **health and safety issues** and can affect the reliability of operations.



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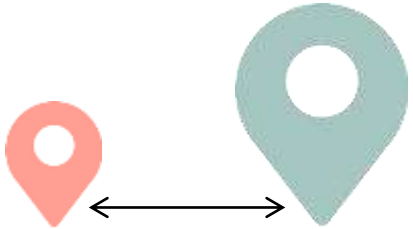
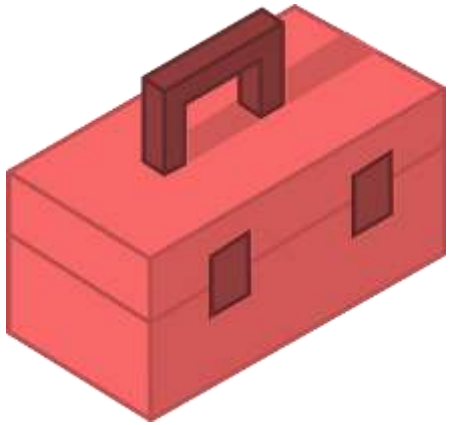
Unnecessary Movement Examples

- Moving too much or travelling farther than necessary to accomplish a task.
- Having to walk back and forth to get tools during maintenance.
- Having to bend or twist because of poor ergonomic design.
- Manual intervention to compensate for the lack of flow.

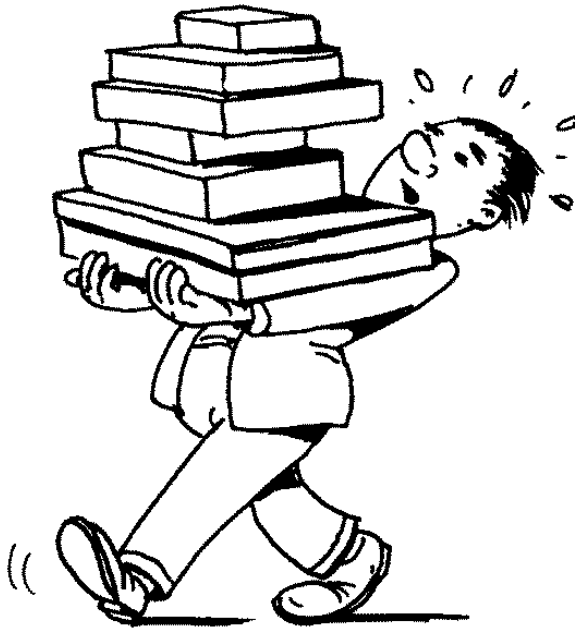




WASTE ANALYSIS

Unnecessary Movement Examples

- Carrying paperwork back and forth between two locations far away from each other.
- Placing printers and photocopiers far away from offices.
- Having many and unnecessary points of customer contact in a bank



WASTE ANALYSIS

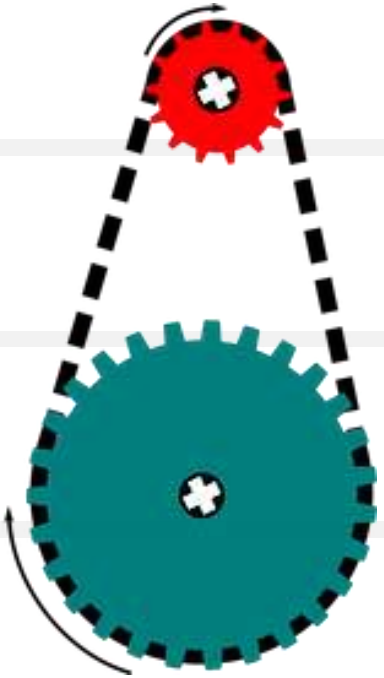
Ideas to reduce or eliminate wasted movement . . .

Evaluate the flow and layout to identify chances to **streamline** the process.

Relocate the required tools at the point of use.

Improve workplace ergonomics.

Implement time and motion principles.



WASTE ANALYSIS

Waiting

Refers to the **idle time** that occurs when there are unnecessary delays within the process.

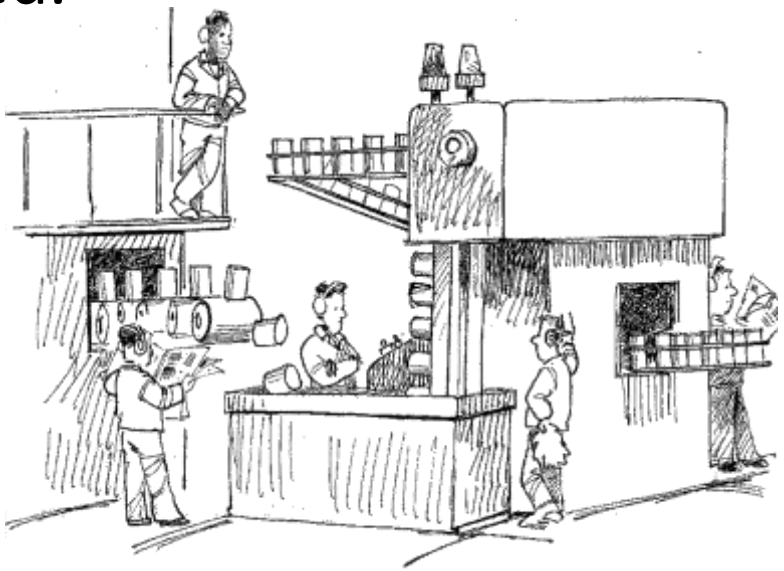
In a traditional process, a large part of a product's life is spent waiting to be worked on.

WASTE ANALYSIS

Waiting

Waiting occurs when a **product** is not in transport or being processed, or when a **person** is waiting for a work or service to get completed.

That costs time and money!



WASTE ANALYSIS

Waiting

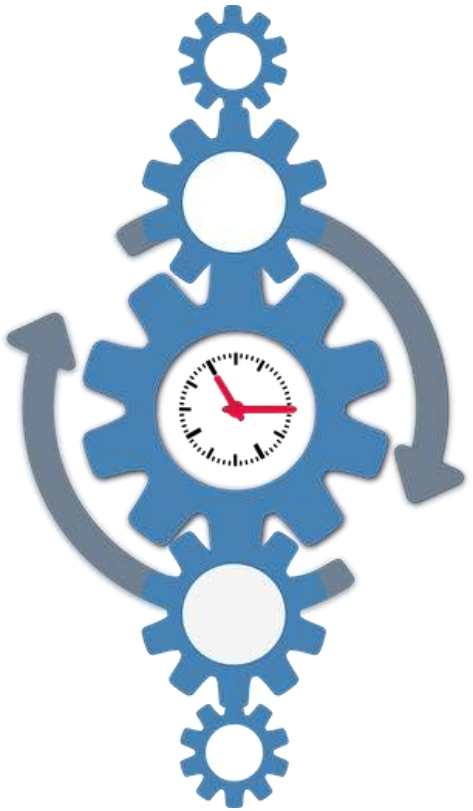
Any time a person or a product is waiting:

- There is no value being added.
- Lead times are increased.
- Wasted time is transferred to the customer through increased costs.

WASTE ANALYSIS

Waiting Examples

- Waiting for materials, parts, inspection, decision, approval or people.
- Waiting for the maintenance department to repair a breakdown.
- Waiting for the changeover to be completed.
- Waiting for a slow machine to operate.
- Waiting for a preceding operator to complete his/her work.



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Waiting Examples

- A customer waiting for a service.
- Waiting in line at a grocery store.
- Waiting for a meeting to start.
- Arriving an hour early for a meeting.
- Waiting for a return call when the person said he would call back immediately.
- Experiencing poor computer system performance.

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Waiting Examples

- Waiting in the doctor's waiting room.
- Waiting for lab results.
- Emergency department wait time.

WASTE ANALYSIS

Ideas to reduce or eliminate waiting . . .

Observe what keeps people waiting.

Measure waiting time and make it **visible**.

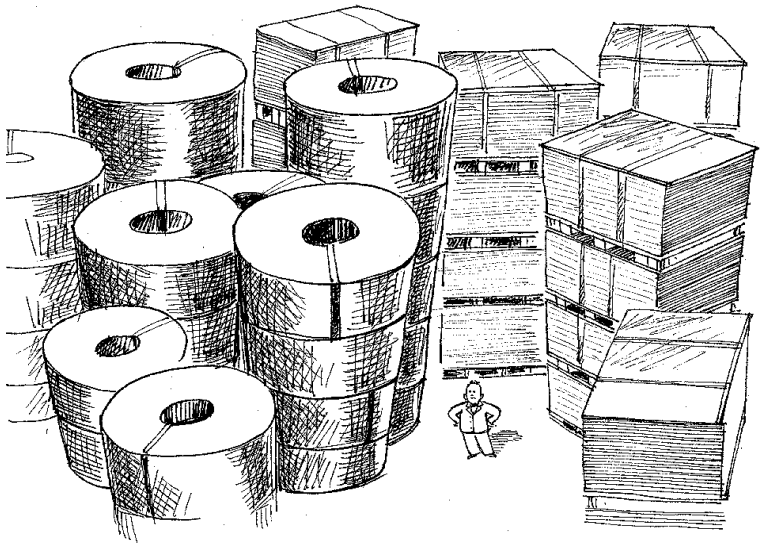
Allocate more resources at the **bottleneck areas** to increase their capacities.

Improve scheduling and coordination.

WASTE ANALYSIS

Excess of Inventory

Excess of inventory is having more materials or information than what is actually needed.

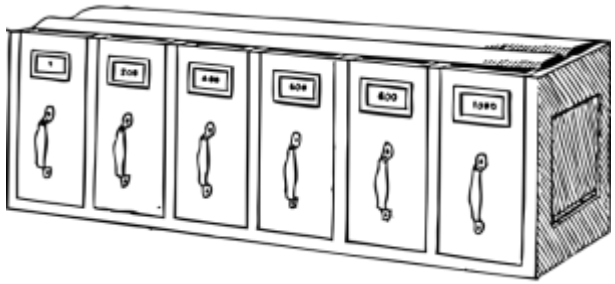


Some inventory is necessary, but most processes can be managed differently to **minimize inventory**.

WASTE ANALYSIS

Excess of Inventory

- Takes up valuable working space.
- Creates the need for more manpower and equipment.
- Ties up money that can be used elsewhere.
- Has a significant impact on working capital and operational costs.
- Slows down production.
- May hide problems such as line imbalance and quality defects.



WASTE ANALYSIS

Inventory can be . . .

- RAW MATERIALS
- WORK IN PROGRESS
- FINISHED GOODS
- MRO GOODS
- PACKAGING MATERIALS
- REPORTS & MANUALS
- OFFICE SUPPLIES
- MERCHANDISE INVENTORY

WASTE ANALYSIS

Inventory can be . . .

RAW MATERIALS

WORK IN PROGRESS

FINISHED GOODS

WASTE ANALYSIS

Inventory can be . . .

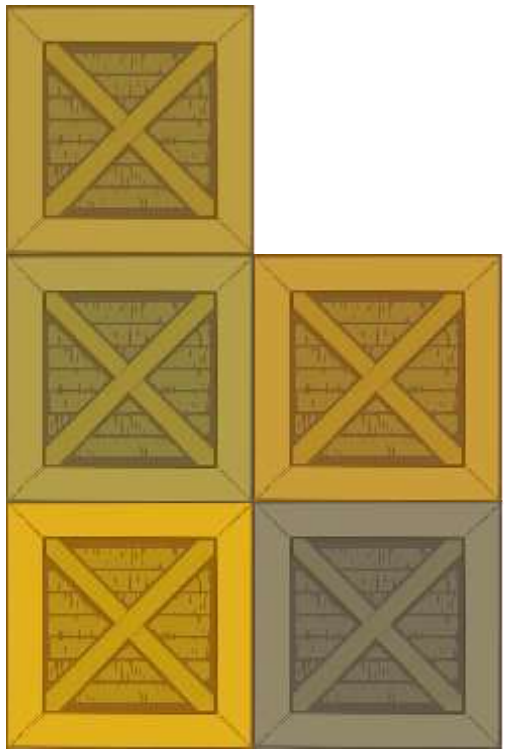
Inventory is **harder to see** in an office or transactional environment.

Inventory in offices can be office supplies, physical reports and manuals that are not immediately required.

WASTE ANALYSIS

Inventory Examples

- Keeping more materials than needed.
- Storing raw materials ahead of requirements.
- Expired and obsolete inventory.
- Held-for-inspection inventory.
- Poor workplace organization in a warehouse or office.



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Inventory Examples

- Archiving documents that are not required and will never be used in the future.
- Storing computer programs that will never be used on hard drives.
- Keeping outdated and duplicated files.
- Giving people documentation they will never need.
- Unread and spam emails.

WASTE ANALYSIS

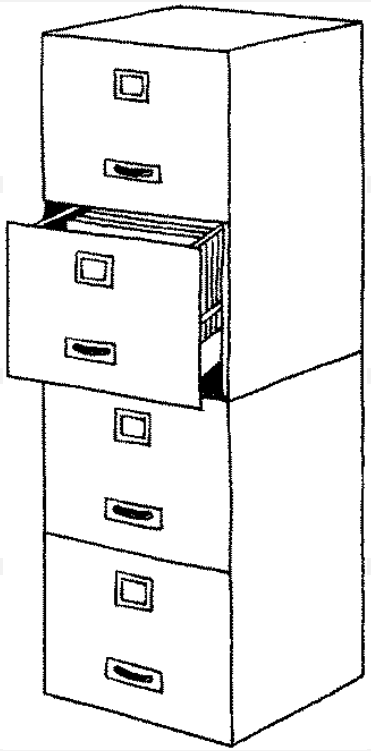
Ideas to reduce or eliminate inventory . . .

Keep track of inventory levels.

Reduce unnecessary **safety stocks**.

Avoid buying in bulk unless you are sure you will use all of it.

Apply **line balancing** and **Kanban**.

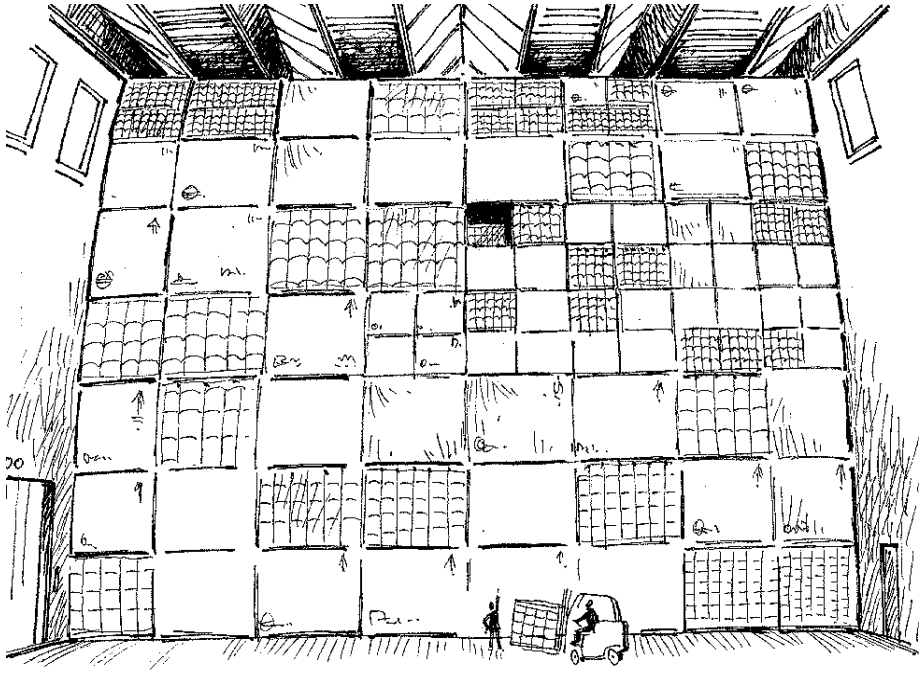


WASTE ANALYSIS

Over-Production

Producing greater quantities or making more of something than is required by the customer.

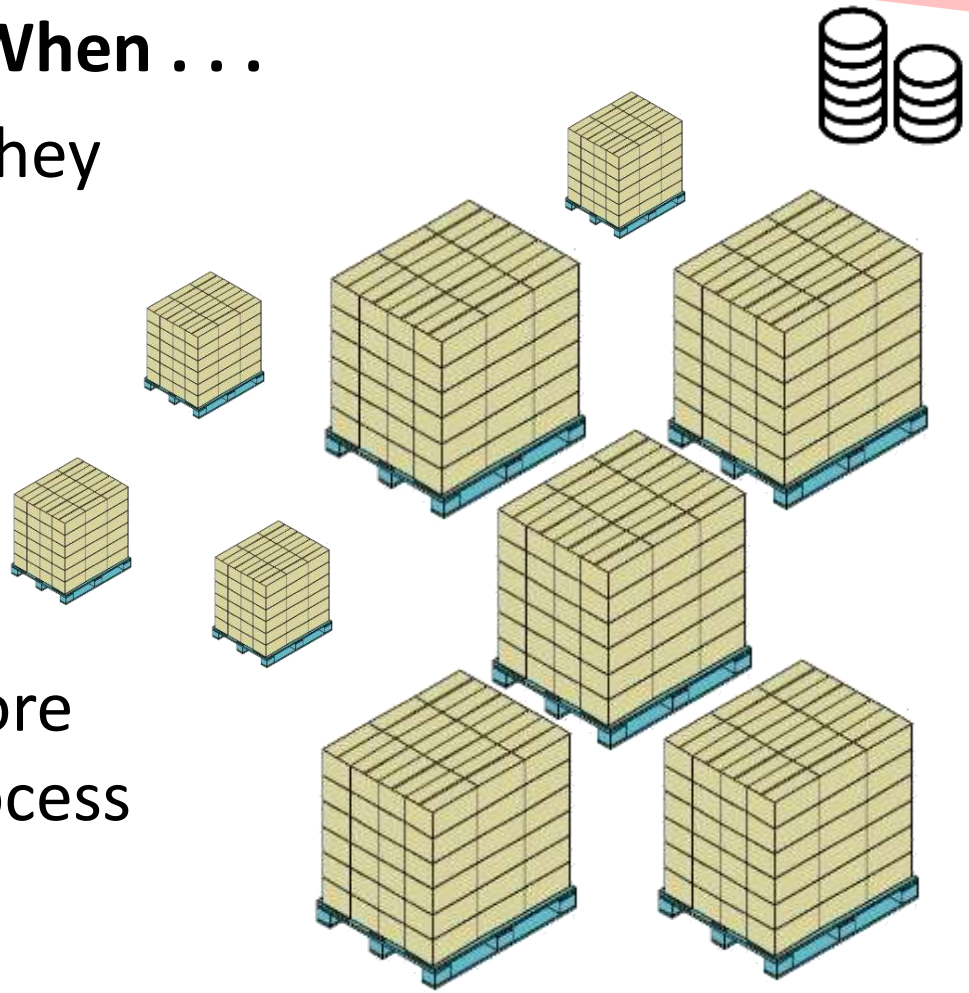
Over-production is thought to be the **worst** of the eight as it creates other types of wastes.



WASTE ANALYSIS

Over-Production Occurs When . . .

- Making things before they are required (early production).
- Producing greater quantities than what customers demand.
- A process produces more than what the next process can use right away.



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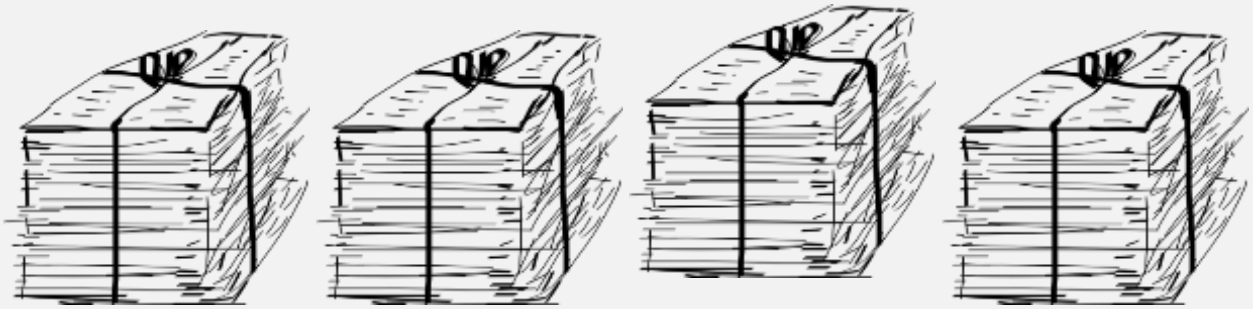
Over-Production . . .

- Increases lead times.
- Consumes more materials.
- Promotes a batch and queue system.
- Hides quality problems.
- May prevent other activities from taking place.



WASTE ANALYSIS

Over-Production Examples

- Creating parts or information not needed by the downstream process.
- Producing faster than the downstream process or customer demand.
- Pushing rather than pulling parts and information.
- Producing information that will never be used or sending reports that will never be looked at.

WASTE ANALYSIS

Over-Production Examples

- Printing multiple versions of the same publication hoping that you will distribute all.
- Making a meal that restaurant customers don't want.
- Buying vegetables for one month on your weekly shopping trip.
- Performing a work which is not needed or before it is needed.

WASTE ANALYSIS

Ideas to reduce or eliminate **over-production** . . .

Produce only what customers want and when they want it.

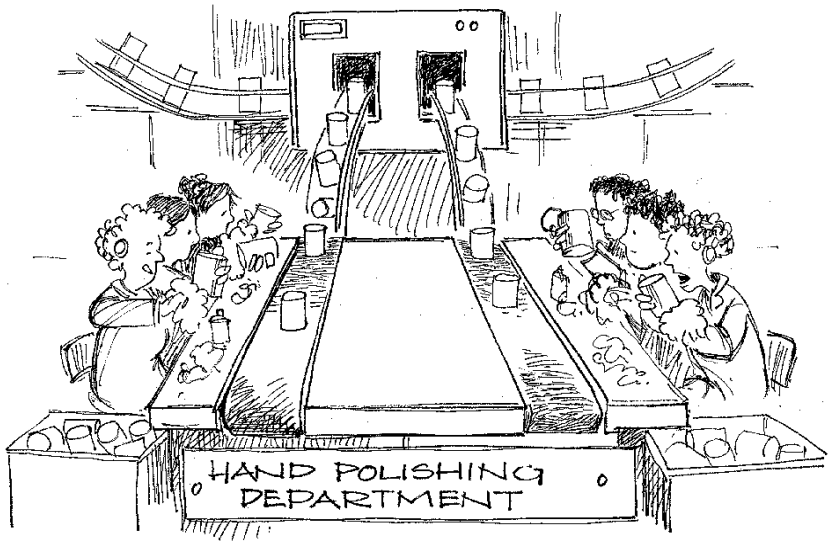
Produce as close to the **schedule** as possible.

Implement Pull and Kanban.

WASTE ANALYSIS

Over-Processing

Processing beyond what the customer requires and providing more value than what he or she is willing to pay for.



It occurs when you work on the process more than necessary.

WASTE ANALYSIS

Over-Processing

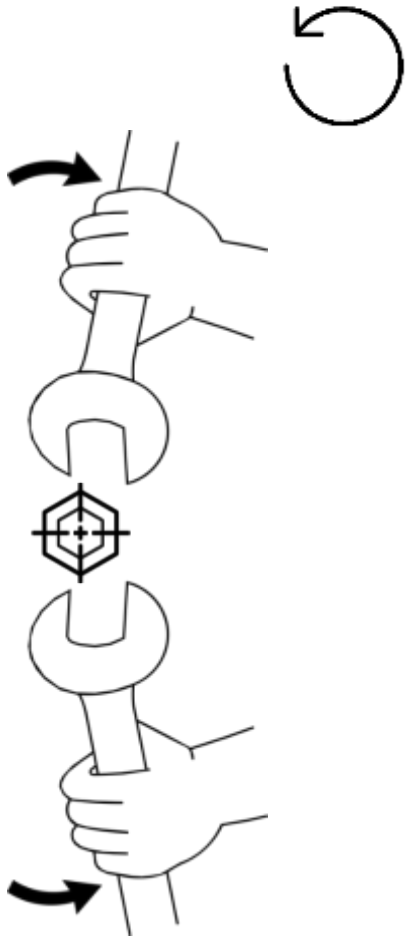
May result from . . .

- Complex processes.
- Poor product or service design.
- Unclear requirements and tolerances.
- Internal standards that do not reflect true customer requirements.

WASTE ANALYSIS

Over-Processing Examples

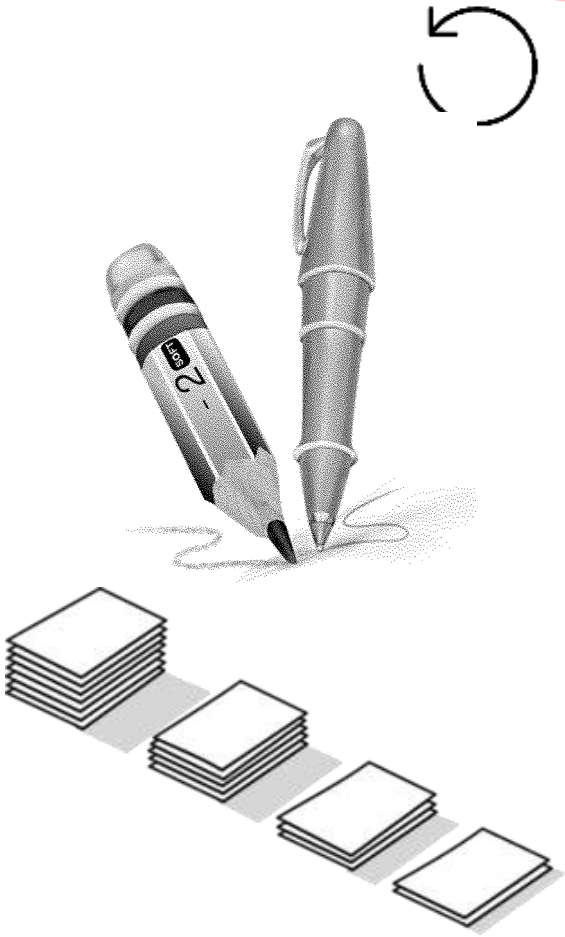
- Painting areas that will never be seen or that are exposed to dirt or corrosion.
- Using tools that are more precise.
- Using the wrong tool.
- Working on the wrong part.
- Completing reports in a level of detail that is not required.
- Stirring a mixed cup of coffee.



WASTE ANALYSIS

Over-Processing Examples

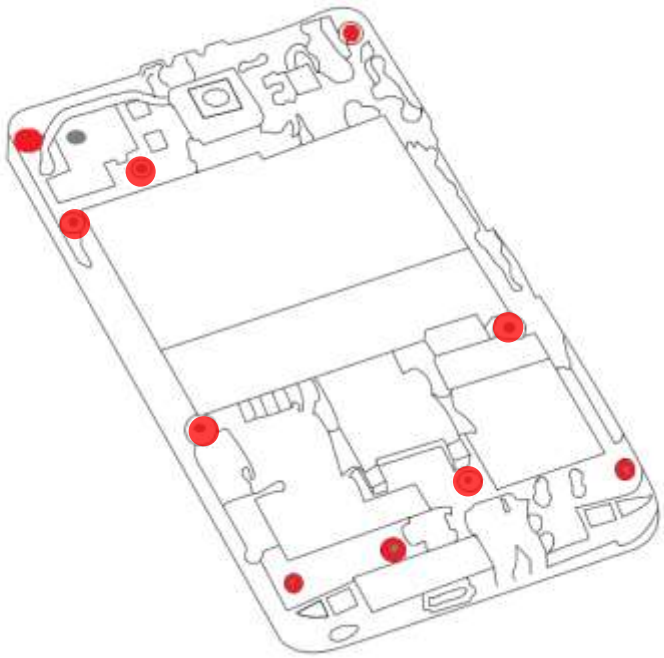
- Duplication of work and filling multiple forms with repeated data.
- Reinventing the wheel or repeating work which has already been done.
- Bureaucratic approval systems that requires multiple reviews and signatures.
- Unnecessary tests, diagnostics and therapies for a patient.



WASTE ANALYSIS

Over-Processing Examples

How many bolts are there?



WASTE ANALYSIS

Ideas to reduce or eliminate over-processing . . .

Find ways to do less and to use less.

With every task try just **do it once**.

With every document try to just **touch it once**.

Provide clear **standards** for every process.

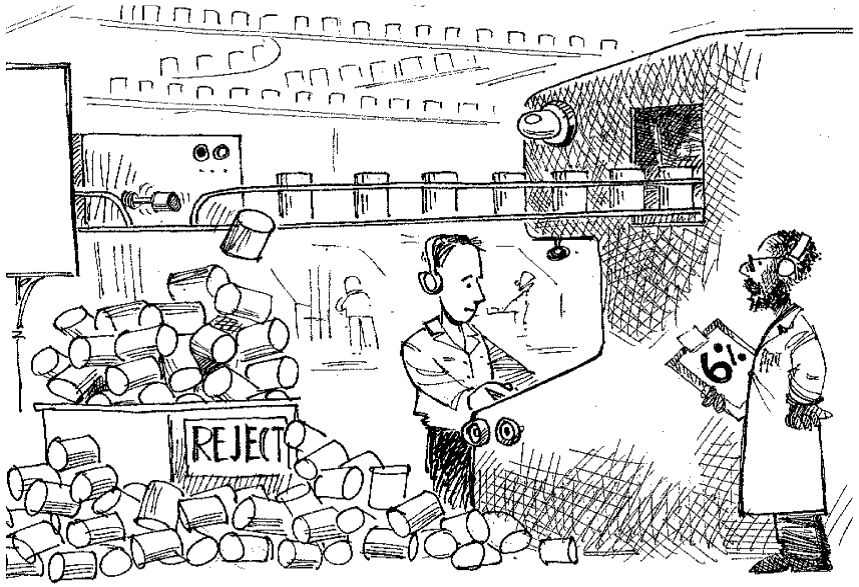
WASTE ANALYSIS

Defects and Errors

Defective Outputs

Occurs when the product or service does not serve the purpose it was created for.

Or when the process doesn't complete perfectly right the **first time**.

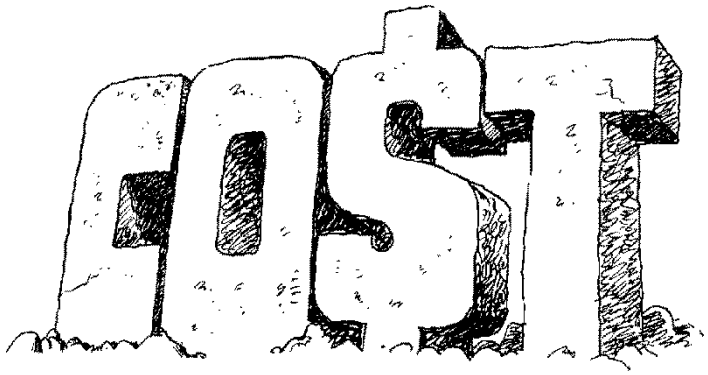


It is the most obvious waste and the easiest to relate

WASTE ANALYSIS

Defects and Errors

Whenever a defect occurs during a production process, extra costs are incurred as a result of **scrapping or reworking** the defective products.

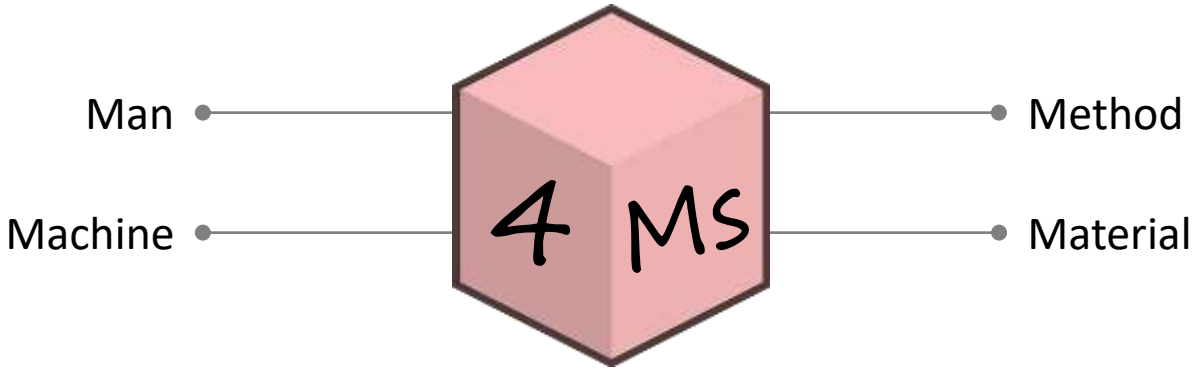


And if it passed on to the customer, **additional costs** are incurred as a result of customer returns and negative reputation.

WASTE ANALYSIS

Defects and Errors

Defects are caused by **errors in the process** which is normally caused by man, methods, materials and/or machines.



WASTE ANALYSIS

Defects and Errors Examples

- A manufacturing faulty part that requires rework or needs to be scrapped.
- Held-for-inspection products.
- Producing the wrong product.
- Delivering a product to the wrong destination.
- Not on time in full delivery.

WASTE ANALYSIS

Defects and Errors Examples

- Any rework activity including repair, recheck, return, reorder, replace.
- Misdiagnosis in the healthcare industry.
- Duplicate medical records numbers (MRN).
- Dealing with guest complaints in a hotels.

WASTE ANALYSIS

Defects and Errors Examples

- Typos and spelling mistakes in a cover letter or resume.
- Mislabeled envelops.
- Missing information or incorrectly completing an application.
- Customer receives the wrong service or nothing at all.

WASTE ANALYSIS

Ideas to reduce or eliminate **defects and errors . . .**

Find where the errors occur by collecting data.

Analyze root causes.

Solve the problem as early as possible.

Avoid multitasking and mind wandering.

WASTE ANALYSIS

Unused Human Skills

The **eighth waste** can be described in several ways . . .

- Unused creativity.
- Wasted ideas and talents.
- Untapped human potential.

Not using the potential and creativity of employees and not involving them **is a waste**.

WASTE ANALYSIS

Unused Human Skills

Organizations employ people for the specific skills they possess, and it is wasteful not taking advantage of their many other skills and capabilities.

Engage employees and exploit their skills to solve everyday problems.

WASTE ANALYSIS

Unused Human Skills

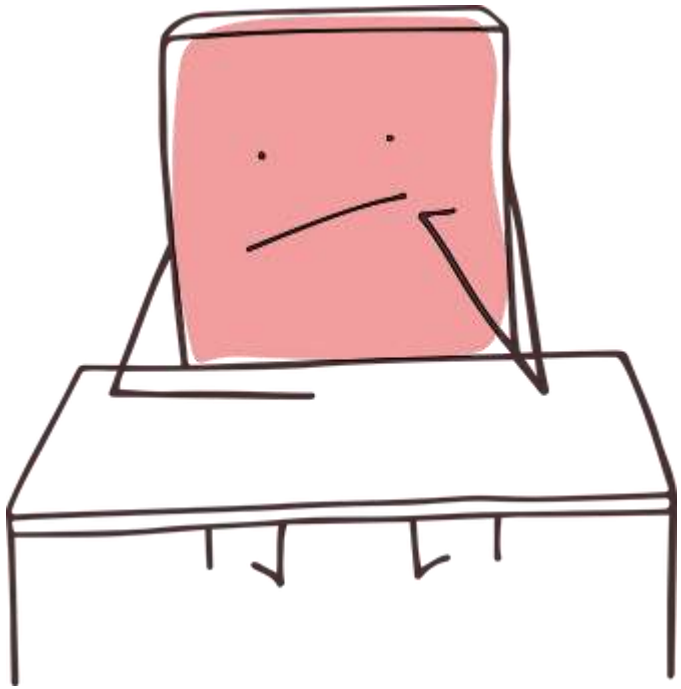
Many companies now realize that their **biggest assets** are their employees.

It is only by exploiting the ideas and skills of employees that companies can reduce the other types of waste and improve their performance.

WASTE ANALYSIS

Example of Unused Human Skills

- When employees are not effectively engaged in the process.
- When the right person is not available at the right place.
- When the person performing the work is overqualified.



WASTE ANALYSIS

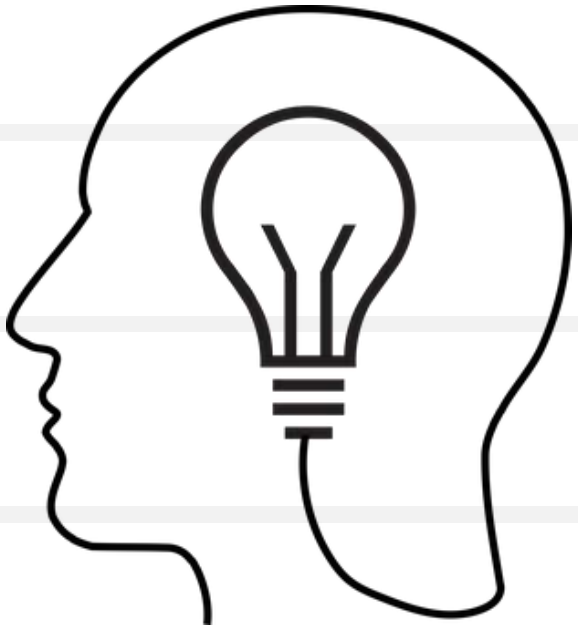
Ideas to Reduce or Eliminate Unused Human Skills . . .

Make the most of brainstorming and other idea gathering techniques.

Implement an **idea system** and encourage employees to make improvement suggestions.

Ensure that the ideas and suggestions are **well heard**.

Show respect and confidence for all by letting them solve their daily problems as owners.



WASTE ANALYSIS

All forms of waste can be present in the **service environment** and **offices** as well as in production areas.

Examples:

- Reentering data.
- Duplication.
- Manual checking.
- Data errors.
- Typos and misspelling.

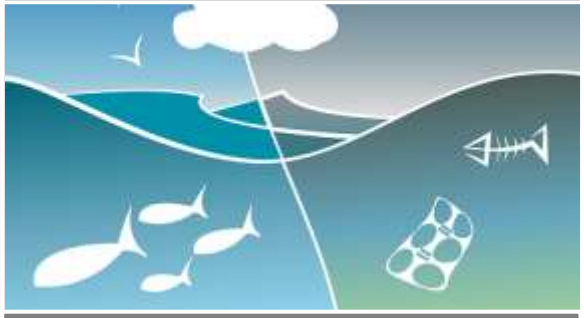
WASTE ANALYSIS

There are other forms of waste beyond the eight wastes:

Wasted space – as the customer will not pay for

Wasted energy – a hidden shared cost

Pollution – the producer is increasingly being made to pay for it



Capital waste – throwing money at problems instead of addressing the real root causes

Excessive resources – as they only increase costs and add no value

Unclear communication, roles, responsibilities, authority, and lack of training, motivation and empowerment

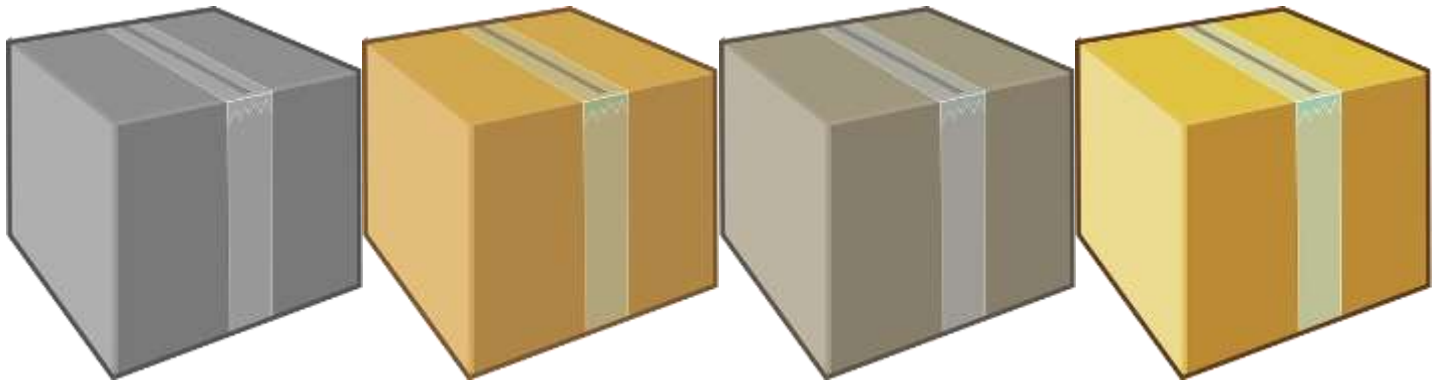
WASTE ANALYSIS

Capital Waste and Wasted Money Examples . . .

Renting a warehouse to store extra inventory

Hiring an inventory control clerk or an operator to repair damaged inventory

Buying a forklift for each forklift driver



WASTE ANALYSIS

The Eight Wastes is an analysis tool . . .

- It is not enough to just identify the wastes.
- Eliminating them is one of the fundamental objectives of Lean.
- The countermeasures planning and implementation should include the involvement from all relevant parties.

Identifying possible waste

Eliminating or reducing waste

WASTE ANALYSIS

Tools and Techniques to Identify and Eliminate Wastes

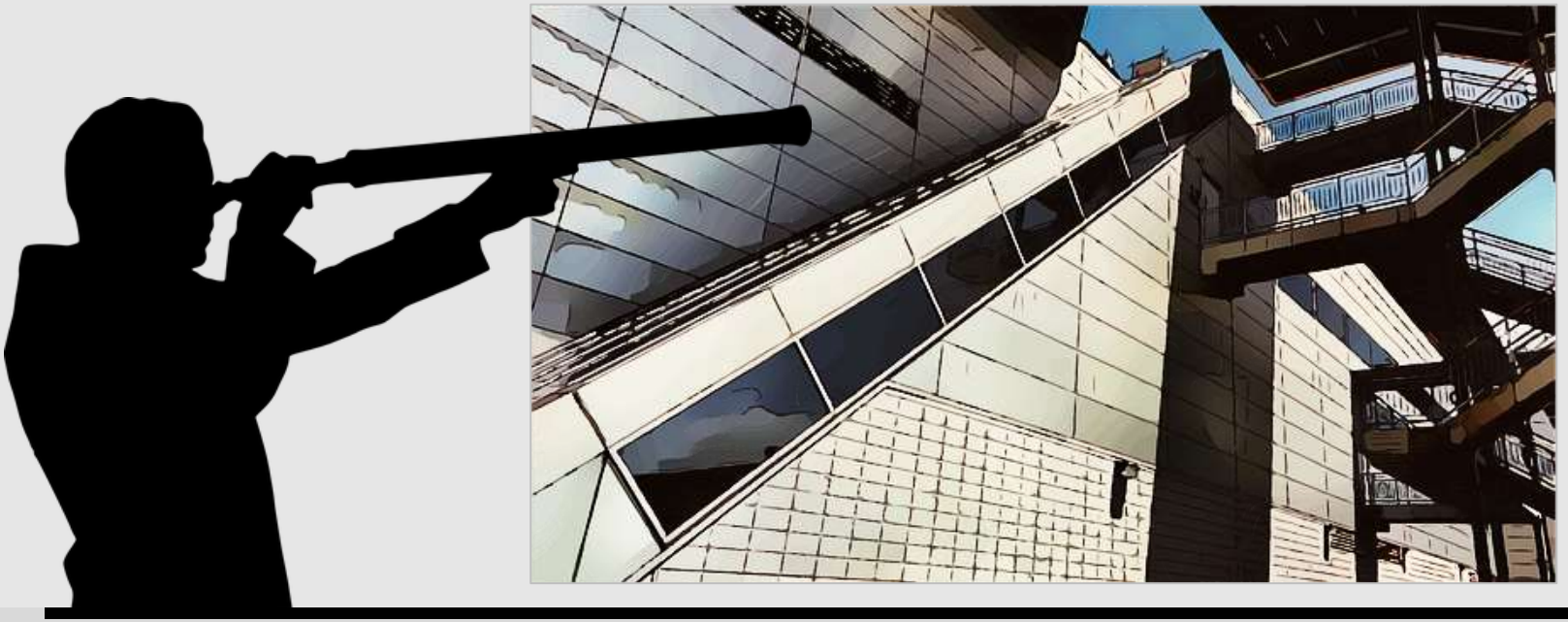
Lean provides the required methodology, tools and techniques . . .

Waste walks and Gemba walks					Team based problem solving
Opportunity process maps					Ownership by operators
Waste recording forms and waste logs	Regular improvement meetings	5S and visual management	Value matrix	Value stream mapping	Targeted Kaizen events

WASTE ANALYSIS

Waste Walks

Enables to understand how the processes work and helps to quickly identify waste and continuous improvement opportunities.



WASTE ANALYSIS

Waste Walks

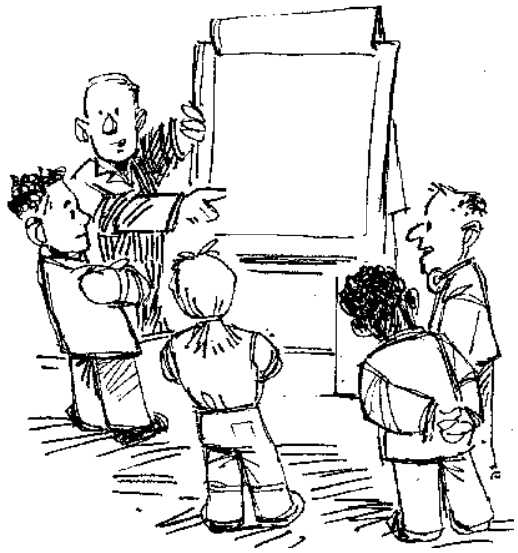
It is highly encouraged to regularly **walk the process** and look for opportunities to reduce waste and make improvements.

Observing the process with an eye towards waste

WASTE ANALYSIS

How to Conduct a Waste Walk?

1. Clearly describe the objective of conducting the waste walk.
2. Select the process or area and define the boundaries.
3. Prepare an observation form to collect the desired information.
4. Get permission from the process owner or supervisor to conduct the walks and talk to the people there.



WASTE ANALYSIS

How to Conduct a Waste Walk?

5. Walk the flow of the process and look for each of the eight types of waste.
6. Collect data, observe actual practices, interview people and ask questions.
7. Identify opportunities to eliminate waste.
8. Prioritize improvement actions as appropriate.

WASTE ANALYSIS

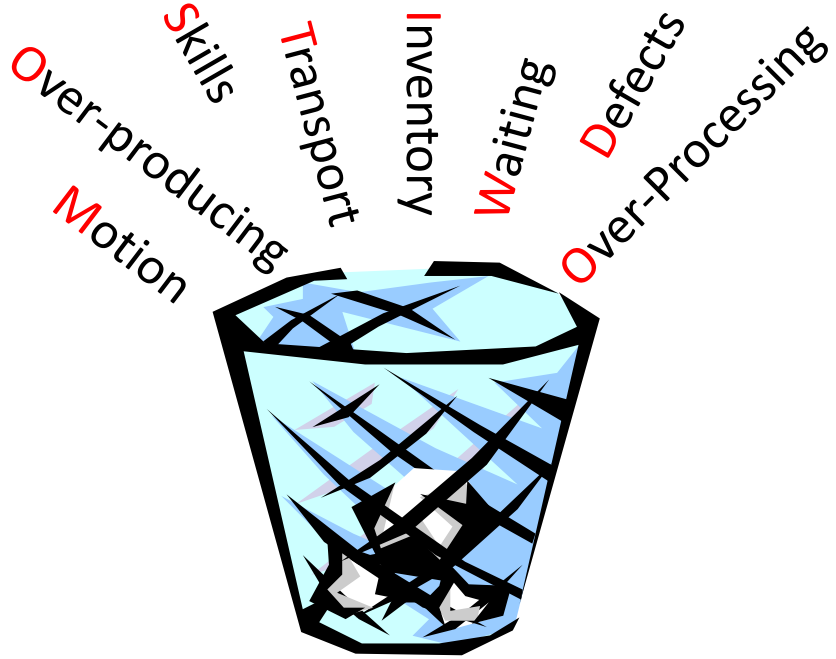
Waste Recording Forms and Waste Logs

- Helps identify and record wasteful activities.
- Usually contains a place to classify the waste according to the eight wastes.
- May also contain a place that encourages the team to propose priority areas for action.

Process step	Waste category	Description	Possible cause	Proposed action

WASTE ANALYSIS

Remember, eight kinds of waste at workplaces and offices.

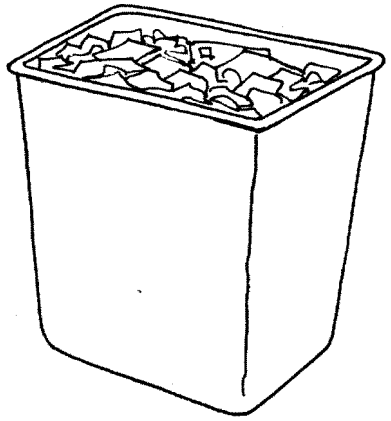


Waste creates no value and costs a lot of money

WASTE ANALYSIS

Further Information

- The more visual you make a process, the more visible the waste tends to become.
- Learning to see the wastes is an essential skill that you must develop within your team.



WASTE ANALYSIS

Further Information

Another method is using the 5MQS model which is useful to understand the root causes.

WASTE ANALYSIS

Further Information

It is good to think in terms of the eight wastes or the 5QMS, however, does it really matter which category to assign to?

Waste of materials and parts	Searching waste	Waste of large machines	Waste in management control & ISO standards	Waste in inspection and QC	Waste in meetings
Waste of Jigs and tools	Waste of unused space	Waste made by breakdowns	Waste of changeover	Waste of risk management methods	Waste in making errors and mistakes

WASTE ANALYSIS

Do you have any of the below issues in your area?

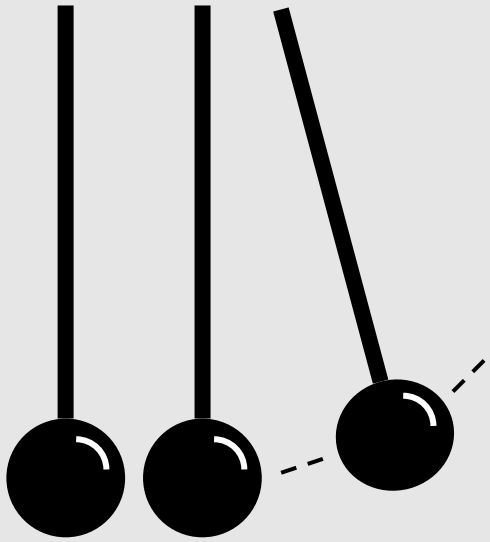
- Time wasted looking for things
- Poor safety record
- Rework
- Escalating operating costs
- Material shortages
- Incomplete information
- Incorrect information
- Underutilized employees
- Inconsistent employee performance
- Unreliable supplier performance
- High employee turnover
- Measures of performance are not clear
- Late or missed deliveries
- Quality is the responsibility of quality personnel
- Dissatisfied customers

WASTE ANALYSIS

Further Information

Common Causes of Waste . . .

- Misunderstanding of the customer's true needs
- **Variability** in processes or machinery
- **Pressure** to maximize production to justify expensive equipment and technology costs
- Outdated or inappropriate policies
- Lack of training
- Poor management staff relations



WASTE ANALYSIS

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