

LEAN GLOSSARY

ENGLISH

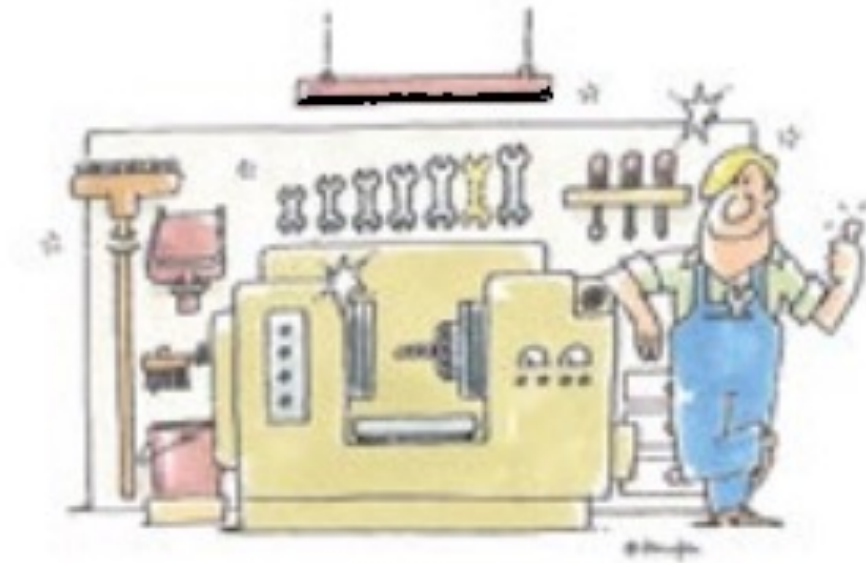
12/06/2024

5-S-METHOD

The 5-S method is the foundation of continuous improvement. The abbreviation "5-S" stands for the five steps in which order and cleanliness at the workplace are achieved:

- 1.Sort, jap. seiri (creating order)
- 2.Set in order, jap. seiton (love of order)
- 3.Shine, jap. seiso (cleanliness)
- 4.Standardize, jap. seiketsu (personal sense of order)
- 5.Sustain, jap. shitsuke (discipline)

Clean and orderly workplaces reduce waste of "searching" (movement) and enable visual management. Deviations from standards can be more easily recognized and corrected.



5-WHY-METHOD

The 5-W method is a problem-solving technique. For problems, the cause is narrowed down by asking "why" five times. Other questions e.g. "How?" "Where", "When" are also allowed.

8-D REPORT

The 8-D report is a document exchanged between supplier and customer in the context of quality management during a complaint. "8-D" stands for the eight mandatory process steps required to solve the underlying problem during complaint handling. The report includes the type of complaint, responsibilities, and corrective actions:

- D1: Forming a problem-solving team
- D2: Describing the problem
- D3: Defining immediate actions
- D4: Identifying the root cause(s)
- D5: Planning corrective actions
- D6: Implementing corrective actions
- D7: Preventing recurrence
- D8: Recognizing the team's effort

A3 REPORT

The A3 report is named after the size of the paper sheet on which it is created. Its structure is influenced by the PDCA method (Plan-Do-Check-Act cycle). The most well-known A3 report is the problem-solving report. It guides the user through a system that allows the description of the occurring symptom. It supports the user with text fields through the process from symptom description to cause investigation to planning and implementing solutions.

The text fields are:

- Title
- Background explanation for the problem
- Problem description
- Target condition description
- Immediate action
- Cause-effect relationship
- Root cause investigation
- Definition of countermeasures
- Information to adjacent areas
- Final activities.

A > mentor should promote the editing and develop the > mentee by targeted questions. Therefore, the A3 report is not suitable for "firefighting" actions.

ANDON

JAP. FOR "LANTERN"

Andon is a visual signal that draws attention to problems.

The signal can be triggered by a "pull cord".

> Machine stop authorization.



AUDIT

An audit examines whether processes, requirements, and guidelines meet the required standards. The examination procedure originally comes from quality management but has been extended to many other management areas (e.g., environmental management, value stream system, ...). Audits are conducted by a specially trained auditor.

AUTO UNLOADING

JAP. HANEDASHI

The term auto unloading means that each machine should automatically eject the workpiece so that the operator only has to load it.

> Chaku-Chaku line

AUTONOMATION

JAP. JIDOKA

Autonomation is an artificial word made up of the terms "automation" and "autonomous" and stands for "automation with a human touch".

Every machine in the work process should produce without the constant observation of an operator and should switch off automatically in the event of an abnormality such as a tool breakage, so that no defective parts are passed on to the subsequent process.

Autonomation is one of the two cornerstones of the Toyota production system and is also referred to as "intelligent", simple or semi-automation because, in contrast to full automation, the employee is involved in the introduction of automation. The goal is broad qualification beyond the operation of the system, i.e. the operating, repairing, testing and improving employee. Autonomation supports the qualification process.

BUILDING INFORMATION MODELING

BIM

Building Information Modeling (BIM) is a method of optimizing the planning, execution and management of buildings with the help of software. All relevant building data is digitally recorded, combined and networked. The result is a geometrically visualized virtual building model (computer model). BIM is used both in the construction industry (construction planning and execution) and in facility management.

BLUE SKY

In the so-called Blue Sky Workshop, a team develops the ideal image transferred to its value streams. Symbolically, the team "looks into the blue, cloudless sky" and dreams of the ideal, waste-free value stream. Based on this, the next possible target state is derived (real picture) and the project map is created.

BOTTLENECK

A bottleneck is a workstation where the $>$ cycle time is greater than the $>$ takt time. The time actually required exceeds the time available.

CARDBOARD ENGINEERING

Cardboard Engineering is used to optimize and simulate work systems in a team.

Using cardboard engineering, work systems are redesigned in the form of a "cardboard model" in teamwork, the work processes are simulated and checked together.

In an intensive 3- to 5-day workshop, the creativity of all participants is used to achieve a quantum leap in terms of workplace design, ergonomics and best-point provision of materials and tools.

CHAKU-CHAKU LINE

Chaku-Chaku literally means "insertion-insertion" and is used as a fixed term for a lean manufacturing cell that has several characteristics. The most important of these are multi-machine operation and highly standardized body and hand movements to achieve steady and safe work. Each machine in the cell has an ejector, Hanedashi, in the manner of the > LCIA, so that the employee can insert the workpiece directly when standing in front of / walking past the machine.

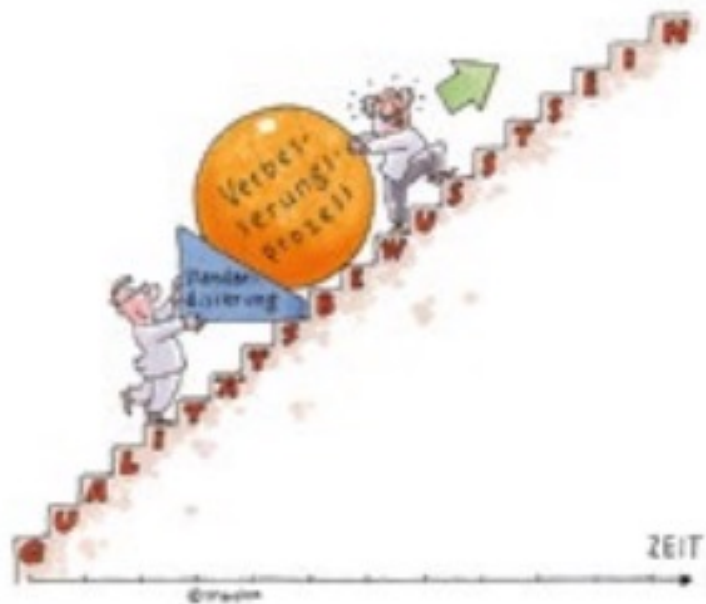
CHANGE AGENT

The change agent is the person who leads the cultural change in the company.

CIP

CONTINUOUS IMPROVEMENT PROCESS

Continuous improvement in the company can take place at different levels and therefore requires different platforms.



We differentiate here:

➤ the employee CIP

for the small, everyday problems and ideas,

➤ the 12-week project

for "medium-sized" improvements (which can be realized in a maximum of 12 weeks), which are developed and implemented in one or more workshops, and

➤ the major projects

for "major" changes in the company that take more than 6 months and require appropriate cost, schedule and resource management.

COACHING

Coaching improves the learning and performance capabilities of the coachee by encouraging them to develop their own solutions to their problems. The coach is not a specialist advisor but is often seen as a professional contact person for specific concerns and is asked for advice or a personal opinion.

CREATION OF VALUE

In contrast to > waste, value creation refers to all activities that add "value" to the product from the customer's perspective.

CYCLE TIME

The cycle time is the time that is actually required to carry out a work process. If production is optimally synchronized, the cycle time of the worker corresponds to the > takt time.

DEVIATION MANAGEMENT

Deviation management is the ability to recognize and rectify a deviation (= disruption) from a standard work process in good time.

DOCTOR NURSE PRINCIPLE

The value-adding employee (doctor) is supplied with the necessary materials and tools by the logistician (nurse) so that he does not have to interrupt his main work with secondary activities.

DRAIN

The place where materials are used is called the drain. The place of origin / production site is called > source.

ECRS-METHOD

The ECRS-method takes a systematic look at the setup process, but also at work processes in general, with the aim of minimizing work steps.

to be eliminated,

to combine,

convert

and / or to simplify them.

EMIPS METHOD

EMIPS = "Eliminate, Minimize, Integrate, Parallelize, Synchronize"

The EMIPS method is used to improve processes. It is used to examine processes or individual process steps for optimization approaches in a structured manner.

EPEI

EVERY PART EVERY INTERVAL

The EPEI is the period in which a so-called production pattern is run through once. All items are produced once on a resource.

ERGONOMIC WORK PLACE

An ergonomic work place is a work system that takes into account ergonomic aspects such as the height of the employee, the reach and the movement sequence (preferably no body rotation or bending).

EXTENDED SIGNAL KANBAN

SIGNAL KANBAN

Each container has a Kanban card. When material is withdrawn, the > Kanban is sent to the > source and inserted into the Kanban board.

The Kanban board reflects the exact circulating stock and thus visualizes the level of > overproduction at the > source and the > drain. The distribution of the cards in the color areas can be used to draw direct conclusions about the need for the next required setup process.

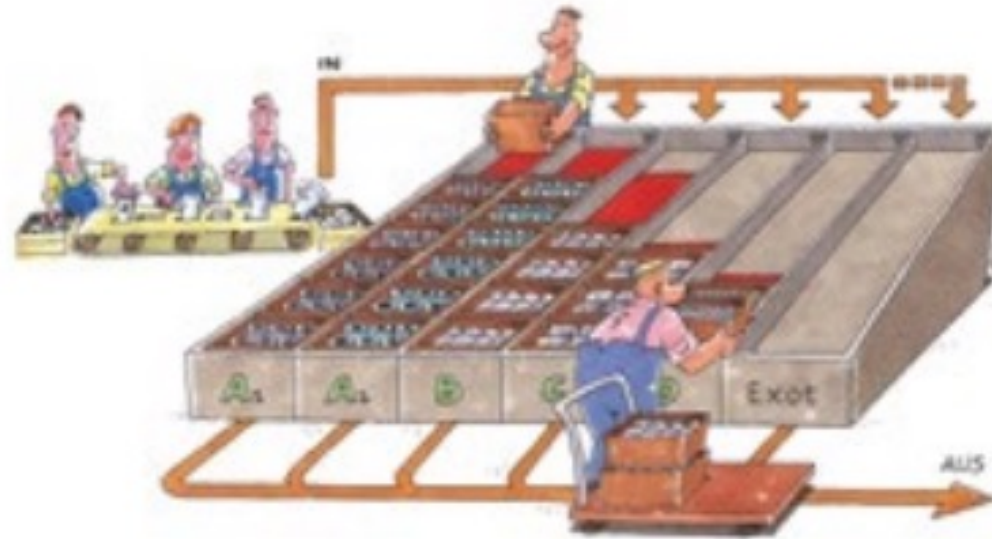
EXTERNAL SET-UP

External set-up is the tool change process that can be prepared or reworked under safe conditions during the machine cycle.

FIFO

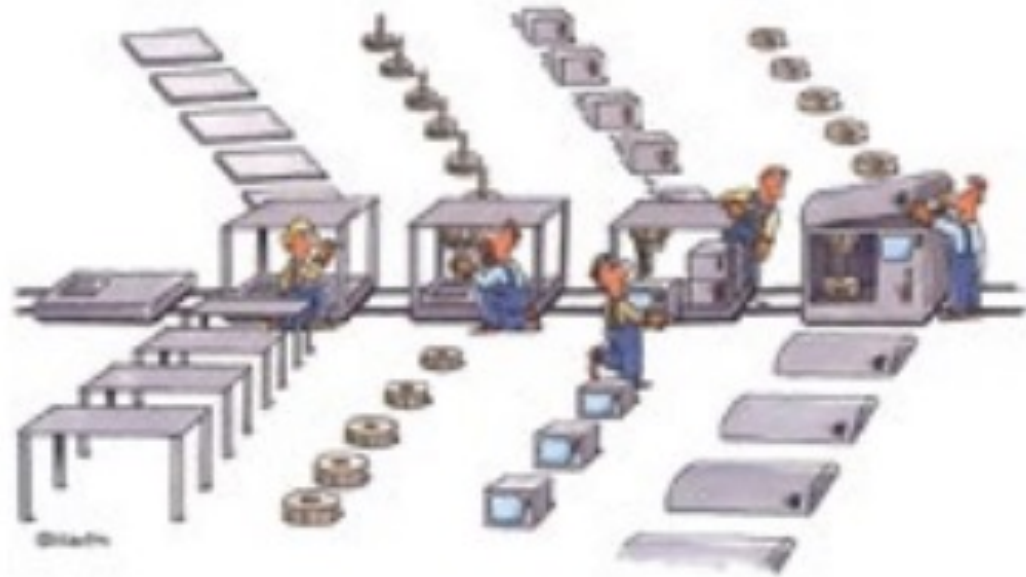
FIRST IN FIRST OUT

FIFO is a storage and retrieval principle. The parts that were stored first are the first to be removed.



FISHBONE PRINCIPLE

The fishbone principle means that several process chains are connected to the main flow and supply it synchronously.



FMEA

FAILURE MODE & EFFECTS ANALYSIS

FMEA is an analytical method of reliability engineering to find potential weak points. As part of quality and safety management, FMEA is used preventively to avoid errors and increase technical reliability.

It is used in particular in the development phase of new products or processes and is required by the supplier of series parts.

GEMBA

JAP. FOR "PLACE OF ACTION"

Gemba refers to the "place of action" in the workshop / production.

HANCHO

JAP. FOR "GROUP LEADER"

The hanchō is the first management level in the lean organization. He is the technical leader (jap. chō) in a part of the process chain (jap. han), which typically consists of five to seven employees. He masters all processes in his area, receives a slightly higher salary (5 to 10 %) than the normal production employees and is selected and deployed by the company. Their range of tasks includes responding to abnormalities, ensuring production capability, promoting standardized work and continuous process improvement.

HANEDASHI

JAP. FOR "CAR UNLOADING"

see > Auto unloading

HEIJUNKA

JAP. FOR "LEVELING AND SMOOTHING", PRODUCTION LEVELING

The leveled and smoothed utilization of production requirements creates regular processes and thus less > waste. Leveling transforms uneven incoming orders into even production quantities.

A production pattern with a consistent sequence and the smallest possible batch sizes is determined on the basis of the leveled production quantities (smoothing). The Heijunka board visualizes the production pattern defined for the production process. Heijunka enables smooth and synchronized production with minimal control effort.

HOSHIN KANRI

JAP. FOR "COMPASS MANAGEMENT"

Hoshin Kanri focuses on the management and development of employees in the direction of the vision. It establishes the connection between vision, goals, projects and success factors using tools and forms. The X-Matrix is the tool for linking breakthrough targets, annual targets, improvement projects and success factors.

The involvement of all management levels across all corporate functions serves to align the company and is a central component of Hoshin Kanri.

The management agrees on the goal and the common path (horizontal alignment) and speaks to the organization with "one voice". Hoshin Kanri only unfolds its full effect in the organization with conflict-free messages in the strategy (vertical alignment).

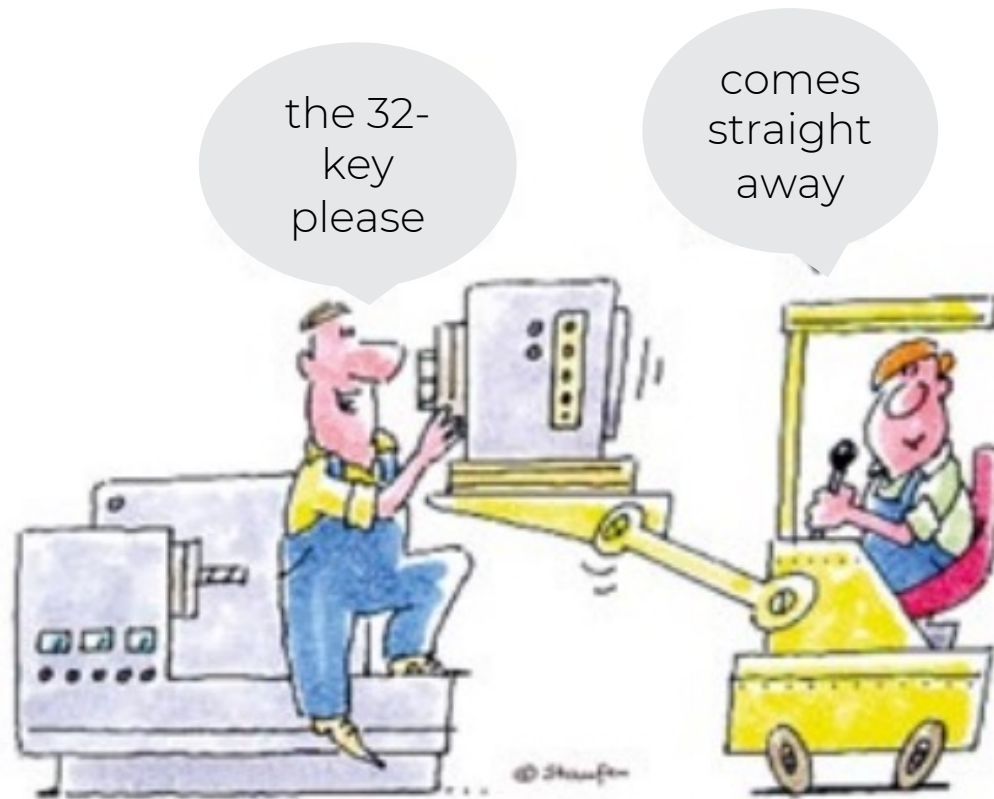
IDEAL STATE

The ideal state in the lean world stands for completely waste-free processes. If there is no more obvious or hidden > waste, the process consists of 100% value creation.

When developing an ideal state for a value stream or process, the team is forced to go beyond currently existing boundaries. This often results in ideas that go further in reducing waste than if the team were only to deal with the next target state. The real image or the real state is the state that comes closest to the ideal image in terms of feasibility.

INTERNAL SET-UP

Internal set-up includes the tool change operations that are carried out while the machine is stationary.



INVENTORY

Inventory is a type of > waste. It refers to all material quantities of raw materials and procurement parts that are not required for the immediate fulfillment of customer orders.



JIDOKA

JAP. FOR "AUTONOMATION"

see > [Autonomation](#)

JIS

JUST-IN-SEQUENCE SYNCHRONIZATION

With the > fishbone principle, a side branch (pre-assembly) produces in the same sequence as the main branch.

JIT

JUST-IN-TIME | "SYNCHRONIZED PRODUCTION"

- The right part,
- in the right quality,
- at the right time,
- in the right quantity
- and in the right place (5-R).



KAIKAKU

JAP. FOR "REFORM"

Kaikaku refers to the radical improvement of an operation or business process - usually in one large step. The scope of investigation is larger than with > Kaizen.

KAIZEN

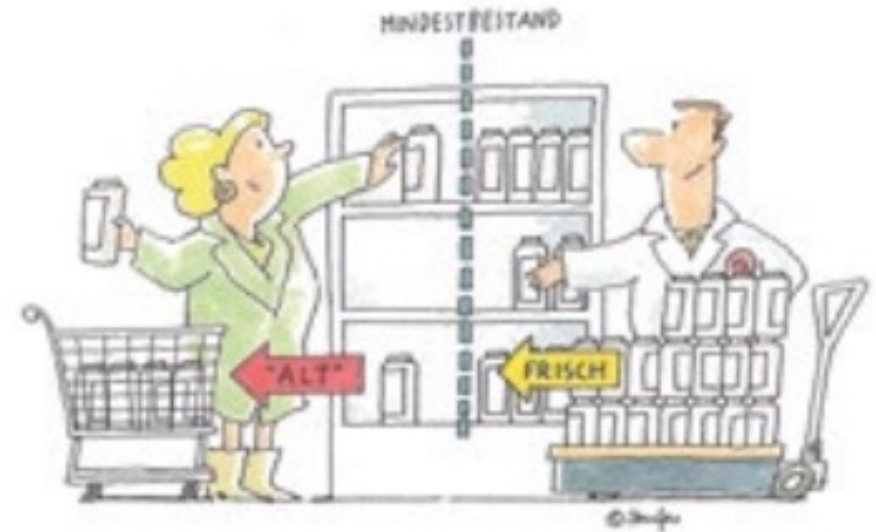
JAP. FOR "CHANGE" (KAI) AND "GOOD" (ZEN)

Kaizen generally stands for continuous improvement (> CIP) in small steps.

KANBAN

KANBAN | JAP. FOR "SIGN, NOTICE BOARD, ORDER BOARD, ORDER CARD"

Material replenishment control can be organized using cards (kanbans) in a consumption-oriented manner according to the > pull principle. A kanban serves as a carrier for information on the part, the quantity and the > source/> drain and signals when the critical material stock has been reached and new material must be delivered according to the motto "If something is gone, something must go!". The Kanban card replaces the traditional production or transport order. The Kanban system guarantees a smooth work process with minimal overproduction / minimal stock. The Kanban method can be used in all areas of the company, from administration to production.



KATA

JAP. FOR "ROUTINE" OR THE "WAY OF THINKING AND ACTING"

The term kata comes from Japanese martial arts and stands for a type of dry exercise. The standardized form and predefined sequence of movements are used to practice the sequence in a fight. In a real fight, the fighter is thus able to instinctively call up the corresponding movement sequences.

Through the guided, routine processing of improvements in their own area of work, employees are invited to drive the > CIP forward intrinsically.

The > mentor accompanies the > mentee - improvement routine and mentoring routine work together.

The improvement routine (kata) consists of four steps:

1. understand direction
2. record the current status
3. define target status
4. carry out PDCA experiments (> PDCA cycle)

KPI

KEY PERFORMANCE INDICATOR

The "performance indicator" is a key performance indicator that can be used to measure the progress or degree of achievement of important objectives within an organization (e.g. increase in EBIT by 15%). It should not be confused with the success factors, which > Hoshin Kanri uses in the second KPI cycle to make transparent the correlation between an organization's own actions and the KPI at the next higher employee level.

LCIA

LOW COST INTELLIGENT AUTONOMATION

LCIA refers to the automation of manual activities using the simplest of means through self-build. Manual activities are first simplified and then standardized, sometimes in several steps. The LCIA device must be designed in such a way that it stops in the event of an error and prevents further processing of the faulty workpiece. When implementing LCIA, mechanical and manual work must be separated from each other

LCIA is mainly used in the areas of assembly, mechanical processing and internal transportation.

LEVELING

Leveling is a part of > Heijunka.

Customer requirements are divided into equal quantities for each time unit (e.g. a shift or a day) so that the same quantity is produced and fed into production according to the average requirement; if the actual customer requirement and the leveled quantity differ, these differences are balanced out by a finished goods supermarket.

An even distribution of requirements (leveling) is the prerequisite for smoothing production quantities.

The ideal is the synchronization of supplier and customer.

LIGHTHOUSE PROJECT

The so-called lighthouse is the area of a company in which the processes and structures have come as close as possible to the ideal. As a high-profile pioneer, this area acts as a role model for company-wide implementation. It sets the direction, shows what is feasible and thus forms the basis for a successful roll-out.

MACHINE CYCLE TIME

The machine cycle time is the time required by a machine to produce a unit, including loading and unloading.

MENTEE

The mentee is the student of the > mentor.

MENTOR

The term "mentor" goes back to Homer's legend from Greek mythology. Mentor was a friend of Odysseus and was responsible for accompanying and supporting Odysseus' son Telemachus during his absence. He was like an uncle to Telemachus, an older person with life experience and wisdom. In this role, he encouraged and supported his protégé and taught him to take responsibility.

In the lean world, the mentor aims to increase the skills of his protégé, the > mentee, and thus increase problem-solving skills and the level of improvement in the organization as a whole.

In contrast to the coach, the mentor has specialist knowledge which he passes on to the mentee after the latter has carried out his (learning) experiment.

MILK RUN

The term milk run comes from the USA, where the traditional milk boy would only put a bottle of milk outside the front door if he could take an empty bottle with him. This ensured that there was never too much milk in the house that could go bad.

In the lean world, milk run refers to a specific logistics concept. The trick here is to increase the frequency of deliveries without increasing freight costs. The trips are no longer made individually from each supplier to the customer in a star shape, but in a closed traffic circle that connects several suppliers with the customer.

MINIMARKET PRINCIPLE

A mini-market is a small warehouse from which the employee takes his parts, often directly from his work system.

The mini market is supplied from the > supermarket.

MIZUSUMASHI

JAP. FOR "WATER STRIDER" OR "BEETLE"

Mizusumashi is the employee responsible for supplying materials to the lines.

MODEL MIX

Defined sequence that ensures a uniform synchronization of the (assembly) line.

MTM

METHODS TIME MEASUREMENT

MTM is a process for analyzing workflows and determining planned and target times.

When using MTM, all movements performed by humans are traced back to certain basic movements for which the time required is known. The target time for an entire work process is determined from the individual time modules.

MUDA

JAP. FOR "WASTE"

All processes in product creation that do not increase the value of the product.

By definition, there are 7 types of waste:

- > Overproduction,
- > Stocks,
- Committee,
- in the work process (overprocessing),
- during transportation,
- during movement and
- in the waiting time.



MURA

JAP. FOR "DISPERSION OF STANDARD VALUES"

Lack of uniformity in process quality, costs and delivery dates

> Waste (> Muda).

MURI

JAP. FOR "EXAGGERATION" AND "OVERLOAD"

Muri is the overuse of resources of all kinds, it causes wear and failures..

O & S

ORDERLINESS AND CLEANLINESS

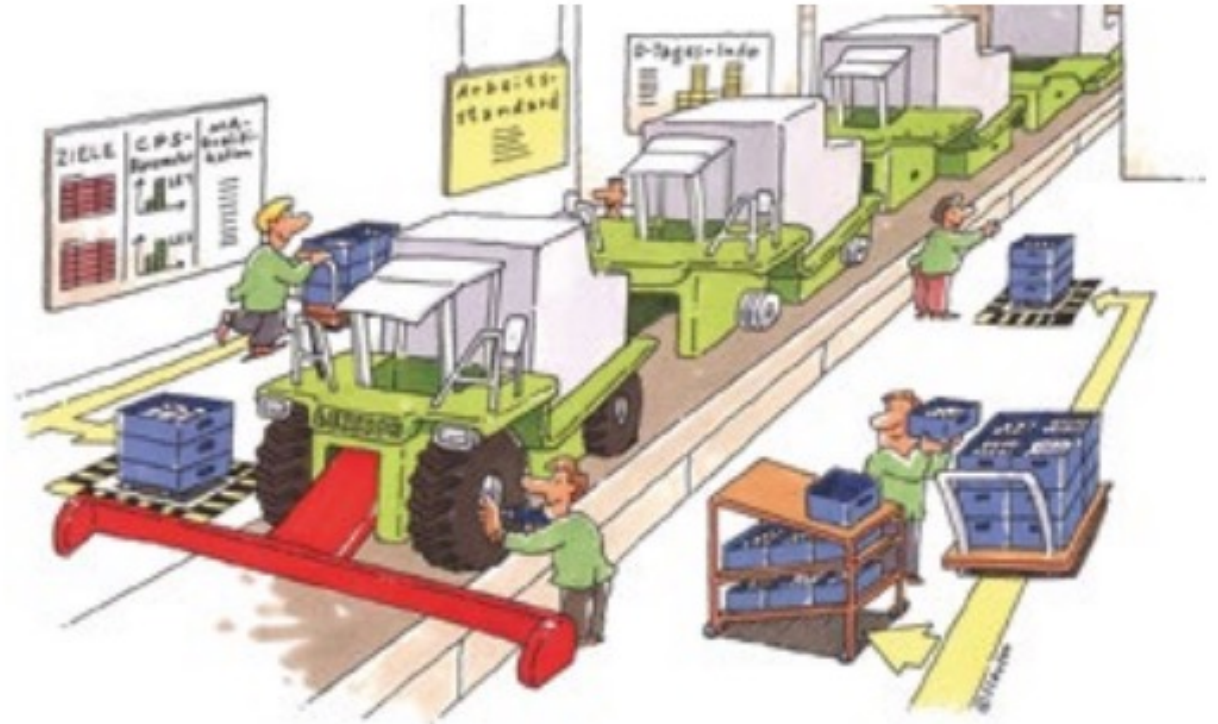
Clean and tidy workplaces reduce > waste through searching (movement) and enable > visual management. Deviations from standards can thus be more easily recognized and remedied. Poor order and, above all, poor cleanliness are also causes of faulty processes. The > 5-S method helps to improve tidiness and cleanliness.



ONE-PIECE-FLOW

Reduction of > throughput time through flow-optimized production. In a process chain based on one-piece flow (flow-optimized production), the parts are passed from machine to machine without intermediate storage. The throughput time is minimal if only one part is passed on at a time. This is only possible in closely interlinked work systems.

Converting the work systems to one-piece flow requires trouble-free processes and can therefore only be achieved with a high availability of existing capacities.



ONE-POINT-LESSON

A one-point-lesson is a work instruction, concisely and precisely presented on one page.

OPERATOR CYCLE TIME

The operator cycle time is the time in which a person carries out a specific work process, including the times for loading and unloading parts, excluding waiting times.

OTED

ONE-TOUCH EXCHANGE OF DIE

OTED, meaning "tool change,,.

The set-up process is improved to such an extent that it can be carried out in a single work step (one touch).

OVERPRODUCTION

Overproduction is the worst of the seven types of waste: it manifests itself in unnecessary in-house production parts and entails all other types of waste.

For purchased parts and raw materials, the lean world uses the term > inventories.



PACEMAKER

The process within a value stream whose **> cycle time** has the shortest distance to the **> customer cycle** determines the rhythm ("step") in a process chain.

PARETO PRINCIPLE

The Pareto principle, named after Vilfredo Pareto (1848-1923), states that most of the effects of a problem (80%) can often only be attributed to a small number of causes (20%).

PARETO CART

The Pareto cart helps to identify rejects on the product. The reject products are sorted and collected on a cart or trolley to visualize the most common defects. > Pareto principle

PDCA CYCLE

The PDCA cycle was first proposed by Walter Stewhart and later developed further by William Deming.

It consists of four phases:

- Plan - planning phase
- Do - Implementation phase
- Check - Effectiveness test
- Act - Standardization

The PDCA cycle is usually run through repeatedly in the spirit of continuous improvement.

POINT KAIZEN

Point Kaizen is an improvement that is limited to a specific workstation (= selective).

POKA YOKE

JAP. FOR "AVOIDING UNINTENTIONAL WRONG ACTIONS"

Poka Yoke is used to prevent unintentional errors. It involves the introduction of simple, error-avoiding mechanisms to consistently prevent incorrect assembly, mix-ups or the passing on of faulty parts. As stable and high-quality processes begin long before the production phase, quality can be assured preventively during the design and planning phase by means of simple Poka Yoke measures.

Poka Yoke is used to prevent:

- Omitting / forgetting work steps,
- Processing / operating errors,
- Incorrect / missing parts and
- Set-up / adjustment errors.

PPM

PARTS PER MILLION

PPM means "error rate in millionths,,,"

The defect rate states that a maximum of one predefined number of one million parts produced may be defective.

Especially in the automotive industry, failure frequencies are expressed in PPM. Car manufacturers demand low PPM rates from suppliers (e.g. for the electronics in the installed control units).

PRODUCTION DIARY

The production diary is a fixed weekly plan for the management team, including supporting functions, and is displayed on the > Shopfloor Management board.

It regulates the daily shop floor meetings with the topics to be dealt with and structures the daily activities of the managers.

This includes support for problem solving and process confirmation. It also defines who takes part in which meeting, when and where. Additional meetings must adhere to the time structure of the production diary.

PRODUCT / MACHINE MATRIX

The product / machine matrix shows which part families are produced on which machines. The matrix is the basis for the creation of flow lines / process chains.

PROJECT MANAGEMENT

Project management is a method for the structured processing of complex tasks / projects by means of a clear organizational structure with defined tasks, competencies and responsibilities as well as a process organization with defined tools, methods and aids.

The aim of project management is to clearly manage the "big" changes in a company. Projects are plans with a defined objective and a time, financial and personnel limit. They are clearly differentiated from other projects and have a project-specific organization.



PRODUCTION SMOOTHING

Production smoothing is part of > Heijunka.

The prerequisite for smoothing is an even loading of requirements into production (leveling). During smoothing, the clocked / leveled quantities are further broken down into the smallest possible equal production lots.

A production pattern is created by lining up the batches for all items that are produced on a resource. This is the specification for the consistent, recurring production sequence.

Smoothing is a prerequisite for synchronous production.

PROCESS CHAIN

The process steps are arranged directly in the flow, in a "chain". The material can inevitably only be passed on to the next work step.

PULL PRINCIPLE

The pull principle (also known as "pull production") is one of the four building blocks of lean production. The downstream process or customer demand determines which item is to be produced or delivered and in what quantity and when.

Min/max limits for stock levels are defined between customers and suppliers. This limits the level of > overproduction.

PUSH PRINCIPLE

"Pushing production": The upstream process or a forecast determines what quantity is to be produced or delivered and when.

This results in > overproduction between the work steps, the > throughput time is extended and usually cannot be planned.

RAW MATERIAL

Raw materials are substances in an unprocessed state that are used as components in finished products.

REGULAR COMMUNICATION

Regular communication refers to the regular, efficient and effective transfer of information. All relevant information must be in the right place at the right time and in the right quality to ensure efficient handling of processes within the company. One instrument for this is standardized regular communication. It can take place, for example, between managers and employees, between project teams or between employees who work together across value streams.

Those involved meet on a regular, short-cycle basis to exchange information in a target-oriented and situation-related manner. This standard communication flow creates clear reporting channels, ensures the flow of information and frees up time, e.g. by significantly reducing the number of e-mails.



SEQUENCE STABILITY

This key figure sets the planned sequence (of products to be manufactured / assembled) in relation to the actual sequence. The better the sequence stability, the more consistent the production and the more transparent and manageable the production control (> just-in-sequence).

SEQUENTIAL MANUFACTURING

In sequential manufacturing, the production equipment / systems are arranged in a value stream-oriented manner and connected by simple transport equipment. Another characteristic of lean sequential manufacturing is that the machines are specialized in a small number of operations (usually only one). Each individual work step should be able to be carried out with as little investment as possible - right sized equipment.

SET-UP REDUCTION

SET-UP TIME REDUCTION

To reduce the set-up time, the set-up process is observed and analysed (e.g. using the > EKUV method), the > waste is reduced, the developed concept is tested and standardized. The defined process standard is the basis for training the employees who carry out the setup process. The aim of reducing set-up time is to reduce > overproduction. This is achieved by producing small batches. In order to be able to produce these batches without major downtimes, set-up times must be kept as short as possible.



SENSEI

JAP. FOR "MASTER" OR "TEACHER"

A sensei is an expert on the subject of "lean" production.

He passes on his knowledge as a > mentor.

SFM

SHOP FLOOR MANAGEMENT

The term SFM stands for improved management on the way to a learning organization and applies to all areas of the company. It does more because it offers methods that focus on optimizing the interaction between

- a) managers and
- b) managers and employees.

The manager is supported in improving their leadership skills, while the employee is supported in the problem-solving and improvement process. The alternation between open questions from the manager and answers from the employee, each of which reveals the management / problem-solving competence, characterizes the joint discussion on site, i.e. where the problem occurred.

The tasks for managers are clearly defined in shop floor management and require special behaviors. Managers are supported by the use of specific tools.

The five management tasks in shop floor management are performed by the manager on site:

1. Carry out regular communications
2. Confirm processes
3. Empowering employees
4. Driving forward the continuous improvement of processes
5. Solving problems in a structured way

In SFM, the manager is brief, only makes binding commitments, gives and receives feedback, gets his or her own picture of the situation, allows for mistakes in learning situations, refrains from assigning blame and uses questioning techniques.

SFM tools support the effectiveness of the manager: e.g. the production diary, key performance indicator charts, the problem-solving sheet and the T-card board.

SIPOC

Supplier - Inputs (input factors) - Process - Output (results) - Customer

SIPOC is a tool from > Six Sigma for recording an overall process at the start of an improvement measure or project. SIPOC can be used to clearly delineate processes in process chains. A SIPOC diagram visualizes the snapshot of a process.

SIX SIGMA

Six Sigma (6σ) is a management system for process improvement, a statistical quality objective and at the same time a quality management method. The core element is the description, measurement, analysis, improvement and monitoring of business processes using statistical means.

As a rule, there is undesirable variation in the process results for every quality characteristic. As part of a so-called process capability analysis, such deviations from the ideal state are set in relation to the tolerance range of the characteristic in question. The standard deviation of the characteristic (letter: σ ; pronounced: sigma) plays a key role here. It measures the spread of the characteristic, i.e. how much the characteristic values deviate from each other. The greater the standard deviation compared to the width of the tolerance range, the more likely it is that the tolerance limits will be exceeded. The same applies:

The further away the mean value is from the center of the tolerance range (the closer it is to one of the tolerance limits), the greater the percentage of overshoot.

It therefore makes sense to measure the distance between the mean value and the nearest tolerance limit in standard deviations. This should never be exceeded.

The distance divided by 3σ is the process capability index Cpk; Cpk = 1 if the mean value is 3σ away from the nearest tolerance limit.

The name "Six Sigma" comes from the Six Sigma requirement that the closest tolerance limit should be at least six standard deviations (6σ , "Six Sigma") away from the mean value. If this requirement is met, it can be assumed that practically "zero-defect production" is achieved and the tolerance limits are almost never exceeded.

SMED

SINGLE MINUTE EXCHANGE OF DIE

Meaning: "tool change"

SMED means "tool change in single-digit minutes" and stands for a series of techniques invented by Shigeo Shingo for retooling production machines in less than 10 minutes (> set-up time reduction).

SOURCE

The place of origin/production of materials is called the source. The place of consumption is called > drain.

STANDARD WORK

Standard work refers to the defined sequence of work steps that an employee performs within the $>$ cycle time.

STANDARD WORK COMBINATION SHEET

The standard work combination sheet is a document that shows the sequence of production steps for one or more employees. It is used to show the optimal combination of human and machine work.

STANDARD LAYOUT

The standard layout is the drawing of a workstation or work cell that shows the order in which the standard work is to be carried out and the ways in which it is to be carried out.

STANDARDIZATION

Standardization is the method that leads to standardized work, standard work and standards.

With the help of standardization, the optimal work result is continuously achieved with consistent quality and efficient use of resources, regardless of who provides the service.

Standards describe the defined sequence of processes and operations. Standards must be made visually recognizable and thus make it possible to identify errors and problems caused by deviations from the standard at an early stage.

From this, for example, error correction measures are derived or a problem-solving process is started. Standards help to make it quicker and easier to train employees.

STOP-THE-LINE AUTHORITY

Request to employees to interrupt the process in the event of faults and to pull the > Andon; this prevents faulty workpieces from being passed on to downstream processes.



SUPERMARKET

A supermarket is a tool for independent production control. In a supermarket, all goods can be found in a defined location and are arranged within easy reach; stock levels are limited and what is removed is replenished.



SWIM LANE DIAGRAM

The swim lane diagram is a method for depicting an organization's business processes in business process analysis and modelling.

Different areas of responsibility are each displayed horizontally on a lane ("swim lane"), so that responsibility transitions and interfaces become visible.

TAKT TIME

The takt time is the basis for a consistent production rhythm. The cycle times of all production steps in manufacturing are aligned with the customer cycle.

To calculate the customer cycle, the available net working time is divided by the customer demand in the respective time. The customer requirement represents the number of end products required by the customer per time unit.

TARGET AGREEMENT

Target agreement refers to a management method in which a manager and their employees agree on the achievement of organizational goals. The target agreement has two elements: the target and the measures to achieve the target, i.e. it is made up of quantitative targets and action plans.



THROUGHPUT TIME

Throughput time is the most important KPI in the lean philosophy and lead time is proportional to the level of > overproduction and > inventories in the value stream.

It describes the time required for a part to pass through either the entire process chain (from the starting machine to final assembly) or individual, clearly definable process chain sections.

"Throughput time" refers to the lead time of the order fulfillment process, including all procurement and distribution processes.

Calculation of the throughput time in the ...

... **Series production:**

Processing times + transportation times + idle times

... **Individual production:**

Time from receipt of order to commissioning

TOYOTA PRODUCTION SYSTEM

TPS

The TPS is regarded as the so-called source code of lean management. In the middle of the last century, Taiichi Ohno, among others, recognized how efficient production can be established with scarce resources.

The aim of the TPS is to avoid >waste, reduce throughput times and develop employees' problem-solving and improvement skills.

TPM

TOTAL PRODUCTIVE MAINTENANCE

TPM is a standardized method for maintaining trouble-free production. TPM pursues the following goals:

- increase the availability of the system by reducing system faults,
- to reduce to a minimum the repair work caused by faults and the associated "fire department operations",
- identify and eliminate weak points in systems and equipment and eliminate them,
- increase employee identification with the systems and equipment and involve employees in maintenance and repair activities,
- increase the productivity of the systems and
- reduce overall maintenance costs through regular and standardized maintenance and inspection.



TRANSITION PERIOD

The transition time is the time required for a material to move from one operation to another. It is made up of waiting time and transportation time. The waiting time is the time that a material lies in one place, e.g. a warehouse.

TRUE NORTH

NORTH STAR

In the lean world, the North Star stands for the ideal image: waste-free processes.

The term „true north“ is based on the "North Star" or Pole Star. This is located around 0.7° from the northern celestial pole and is visible all year round in the northern hemisphere.

Due to its proximity to the pole, it has long been used as an orientation and navigation aid. It can be used to check a compass or, in shipping, the course of a ship. For observers without a telescope, it appears to be in the same place all year round; its height in the sky corresponds approximately to the northern latitude at which the observer is located.

The lean world uses this term as a symbol for the ideal state, which can never change, i.e. is always "in the same position", so to speak.

U-SHAPE LAYOUT

U-shape layout refers to the layout of machines and workstations in the > one-piece flow, which form the shape of a "U". The value-adding employee works within the "U" and therefore covers minimal distances. Materials are supplied from outside without interruption.

VALUE STREAM ANALYSIS / DESIGN

Value stream analysis/design is a method for recording and designing value streams.

The material flow and information flow are displayed on a sheet using standardized symbols.

The most important key figures that are determined from the value stream analysis are the > lead time and the degree of leanness (Lean Index).

In value stream design, the target state is modeled as a target value stream and the implementation projects are derived from this.

VISUAL MANAGEMENT

The "Visual Management" concept includes all the principles, tools and standards that make it possible to visualize information so that it is clear, simple and understandable for employees and managers. Deviations should immediately "catch the eye".

Good visual management directly triggers corrective measures (e.g. > PDCA cycle, > 5-W method) at shop floor level.

WASTE

In contrast to "value creation", waste refers to all activities that do not add "value" to the product from the customer's perspective.

Taiichi Ohno categorized waste into obvious and hidden. Obvious waste should be eliminated, while hidden waste can only be minimized. Taiichi Ohno differentiated between seven types of waste:

1. **Overproduction** (production of more parts than currently required)
2. **Inventories** (of raw materials and purchased parts)
3. **Committee**
4. **Overprocessing** (unadapted processes, e.g. oversized processes, inadequate ergonomics)
5. **Transportation of material**
6. **Movement of employees in the workflow**
7. **Waiting times for employees**

Attention must be paid to the order of priority: > **Overproduction** is the worst type of waste and causes the others.

WAITING TIME

The waiting time is the time that a material lies in a warehouse waiting to be used in the process.

WORK IN PROCESS

WIP

The key figure indicates the number of products in the process chain,
> overproduction in the process chain.

WORK IN PROGRESS

WIP

Work in progress is the key figure that represents the value of the material in the process chain.

YOKOTEN

The term Yokoten refers to methods for documenting and disseminating knowledge about what works and what does not work. Yokoten is therefore a form of knowledge management.

However, the resulting measures in the sense of best practice are only necessary for other applications if the transfer makes sense (is beneficial), i.e. if the same risk hazard prevails in another case / area and it is appropriate to adopt the measures preventively. NOT: "Blindly imposing" solutions / measures. > Muda: Overproduction

ZERO DEFECT PRINCIPLE

The zero-defect principle is a basic principle of lean management. Three basic rules form the basis of the zero-defect principle:

1. do not accept faulty parts.
2. do not cause any errors.
3. do not pass on any faulty parts.

The zero-defect principle promotes robust processes and is therefore a basis for three other lean characteristics: Flow, Rhythm and Pull.

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