

A Lean Glossary

Activity Based Costing – a management accounting system that assigns costs to products based on the amount of resources used (including floor space, raw materials, machine hours, and human effort) in order to design, order or make a product.

andon - a system of flashing lights used to indicate production status and alerting team members to emerging problems in one or more work centers; the number of lights and their possible colors can vary, even by work center within a plant; however, the traditional colors and their meanings are:

green - no problems
yellow - situation requires attention
red - production stopped; attention urgently needed

autonomation - Transferring human intelligence to automated machinery. See Jidoka below.

Batch and queue – The practice of making large lots of a part and then sending the batch to wait in queue before the next step in the production process as opposed to single piece flow.

bakayoke - literally, 'fool-proofing', this term quickly fell into disuse as it was perceived by workers as being applicable to 'fools' (baka). A more descriptive term is [poke-yoke](#) (see below).

cellular manufacturing – the layout of machines of different types performing different operations in a tight sequence typically in a U-shape. Work centers are known as cells; cells have the total capabilities needed to produce an item or group of similar items; contrasts to setting up work centers on the basis of similar equipment or capabilities, in which case items must move among multiple work centers before they are completed.

Chaku-chaku – means “load-load” in Japanese. Process of conducting single piece flow where the operator proceeds from machine to machine, taking a part from the previous operation and loading it in the next machine, then taking the part just removed from that machine and loading it in the following machine...repeat, repeat.

cycle time - the normal time to complete an operation on a product. If cycle time for every operation in a complete process can be reduced to equal TAKT TIME (see below), products can be made in single-piece flow. Cycle time is different than Takt time.

error-proofing - a manufacturing technique of preventing production errors by designing the manufacturing process, equipment, and tools so that an operation literally cannot be performed incorrectly (see [poke-yoke](#)).

Five S's - refers to the Japanese words **seiri, seiton, seiso, seiketsu, shitsuke**. These words are shorthand expressions for **principles of maintaining an effective, efficient workplace**

- **seiri** - **eliminating everything not required for the work** being performed – separate needed tools, parts and instructions from the unneeded.
- **seiton** - **efficient placement and arrangement of equipment** and material – ease of use
- **seiso** - **tidiness and cleanliness** –conduct a cleanup campaign
- **seiketsu** - **ongoing, standardized, continually improving** *seiri, seiton, seiso to maintain workplace in perfect condition*
- **shitsuke** - **discipline with leadership** – always follow the first 4 S's.

Five Whys – Practice of asking why five times in order to get to the root of the problem.

flexible manufacturing system - an integrated manufacturing capability to produce small numbers of a great variety of items at low unit cost; an FMS is also characterized by low changeover time and rapid response time.

Flow – the **progressive achievement of tasks along the value stream**.

heijunka - A production scheduling/leveling tool, essentially **sequencing orders in a repetitive pattern to level the day-to-day variations in total orders to correspond to long term demand**.

Hoshin kanri – a decision making tool for to help unify and align resources and establish measurable targets against which progress toward goals can be measured on a regular basis.

jidoka - a Japanese word which translates as automation; a form of **automation in which machinery automatically inspects each item after producing it, ceasing production and notifying humans if a defect is detected**; Toyota expands the meaning of jidoka to include the responsibility of all workers to function similarly, i.e. to check every item produced and to make no more if a defect is detected, until the cause of the defect has been identified and corrected.

jishu kanri - self-management, or voluntary participation.

just-in-time - a production scheduling **concept that calls for any item needed** at a production operation - whether raw material, finished item, or anything in between, **to be produced and available precisely when needed**, neither a moment earlier nor a moment later.

jutsu - **to talk, or 'the art of'** (i.e., 'leanjutsu: the art of lean production').

kaikaku - A rapid and radical change process, sometimes used as a **kaizen** - the philosophy of continual improvement, that every process can and should be continually evaluated and improved in terms of time required, resources used, resultant quality, and other aspects relevant to the process.

Kaizen – continuous, incremental improvement of an activity to create more value with less muda – usually accomplished through the use of teams.

kanban - card system that regulates pull by signaling upstream production and delivery; used to authorize production or movement of an item; as follows:

1. All production and movement of parts and material take place only as required by a downstream operation, i.e. all manufacturing and procurement are ultimately driven by the requirements of final assembly or the equivalent.
2. The specific tool which authorizes production or movement is called a **kanban**. The word literally means card or sign, but it can legitimately refer to a container or other authorizing device. **Kanban** have various formats and content as appropriate for their usage; for example, a **kanban** for a vendor is different than a **kanban** for an internal machining operation.
3. The quantity authorized per individual **kanban** is minimal, ideally one. The number of circulating or available **kanban** for an item is determined by the demand rate for the item and the time required to produce or acquire more. This number generally is established and remains unchanged unless demand or other circumstances are altered dramatically; in this way inventory is kept under control while production is forced to keep pace with shipment volume. A routine exception to this rule is that managers and workers are continually exhorted to improve their processes and thereby reduce the number of **kanban** required.

karoshi - death from overwork.

lean - the philosophy of continually reducing waste in all areas and in all forms; lean manufacturing combines the principles of continuous improvement, JIT Production, and standardization of work processes to increase productivity, decrease costs and ultimately increase the competitiveness of the organization which maintaining a customer focus.

mistake-proofing - a manufacturing technique of providing a signal when an error is about to be introduced into the production process. Also see Poka-yoke.

mixed-model production - capability to produce a variety of models, that in fact differ in labor and material content, on the same production line; allows for efficient utilization of resources while providing rapid response to marketplace demands.

mizusumashi - the classic 'water spider', who performs a wide range of tasks which allow workers to perform 'value-added' tasks.

mokeru - the Japanese term for the industrial engineering, more properly translated as 'profit-making I.E.'

muda (waste) - ...consumes resources but creates no value... activities and results to be eliminated. There are 7 categories of waste:

1. Excess production and early production

2. Delays
3. Movement and transport
4. Poor process design
5. Inventory
6. Inefficient performance of a process
7. Making defective items

mura - **inconsistency**

muri - **unreasonableness**

nagara - **smooth production flow**, ideally one piece at a time, characterized by synchronization [balancing] of production processes and maximum utilization of available time, including overlapping of operations where practical.

ninjutsu - **the art of invisibility** (applies to management)

poka-yoke - '**mistake-proofing**', a means of providing a visual or other signal to indicate a characteristic state. Often referred to as 'error-proofing', poka-yoke is actually the first step in truly error-proofing a system. Error-proofing is a manufacturing technique of preventing errors by designing the manufacturing process, equipment, and tools so that an operation literally cannot be performed incorrectly.

pull system - a **manufacturing planning system based on communication of actual real-time needs from downstream operations ultimately final assembly or the equivalent** - as opposed to a push system which schedules upstream operations according to theoretical downstream results based on a plan which may not be current.

seiban - Seiban is the name of a Japanese management practice taken from the Japanese words "sei", which means manufacturing, and "ban", which means number. A Seiban **number** is **assigned to all parts, materials, and purchase orders associated with a particular customer job, or with a project, or anything else**. This enables a manufacturer to track everything related with a particular product, project, or customer. It also facilitates setting aside inventory for specific projects or priorities. That makes it great for project and build-to-order manufacturing.

sensei – a **personal teacher**... one who provides a mastery of knowledge and information.

setup time - work required to change over a machine or process from one item or operation to the next item or operation; can be divided into two types:

1. **internal**: setup work that can be done only when the machine or process is not actively engaged in production; OR
2. **external**: setup work that can be done concurrently with the machine or process performing production duties.

shojinka - continually optimizing the number of workers in a work center to meet the type and volume of demand imposed on the work center; shojinka requires workers trained in multiple disciplines; work center layout, such as U-shaped or circular, that supports a variable number of workers performing the tasks in the layout; the capability to vary the manufacturing process as appropriate to fit the demand profile.

SMED - abbreviation for Single Minute Exchange of Die; a series of techniques pioneered by Shigeo Shingo for changeovers of production. Literally, **changing a die on a forming or stamping machine in a minute or less**; broadly, the ability to perform any setup activity in a minute or less of machine or process downtime; the key to doing this is frequently the capability to convert internal setup time to external setup time; variations on SMED include:

- **Single-digit setup:** performing a setup activity in a single-digit number of minutes, i.e. fewer than ten.
- **OTED:** One touch exchange of die; literally, changing a die with one physical motion such as pushing a button; broadly, an extremely simple procedure for performing a setup activity.

takt time - takt, is a **German term for rhythm**. The available production time divided by the rate of customer demand. Takt time is the rate at which customers are demanding a product. This is NOT the same as cycle time.

Throughput – the **time required for a product to proceed from concept to launch**, order to delivery, or raw materials into the hands of the customers. This includes both processing and queue time.

teian - a **proposal, proposition, or suggestion**. A **teian** system can be likened to a system which allows and encourages workers to actively propose process and product improvements.

Toyota - modification of **Toyoda**, meaning **abundant rice field**, by the Toyota marketing department. Toyoda is the family name of the founders.

Total Productive Maintenance (TPM) – a process **to insure that every machine in a production process is able to perform its required tasks** so that production is never interrupted.

Value Stream – the **activities required to design, order, and provide product from concept to launch**, order to delivery, and raw materials into the hands of the customer. **Value Stream Mapping** – identification of all specific activities occurring along the value stream for a product or product family.

Waste- (muda) The MUDA 7:

1. Excess production and early production
2. Delays
3. Movement and transport
4. Poor process design
5. Inventory
6. Inefficient performance of a process

7. Making defective items

water spider - one who performs a wide range of tasks which allow workers to perform 'value-added' tasks.

WCM – world-class manufacturing is **the philosophy of being the best, the fastest, and the lowest cost producer of a product** or service. It implies the constant improvement of products, processes, and services to remain an industry leader and provide the best choice for customers, regardless of where they are in the process.