

5S	A method for removing all excess materials and tools from the workplace and organizing the required items (using Visual Controls) such that they are easy to find, use and maintain. Creates a self-sustaining culture which perpetuates a neat, clean, efficient workplace.
5 Why's	Method of evaluating a problem or question by asking "why" five times. Purpose is to get to the root cause of the problem and not to address the symptoms. By asking why and answering each time the root cause becomes more evident.
9 Wastes	From the Toyota Production System - over production, unnecessary waiting, unnecessary transportation, over processing, excess inventory, unnecessary movement, quality defects, underutilized people, and environmental waste.
Andon	A visual and / or audible communication system used to indicate the current operating condition at a work site.
Automatic Time	Time required to complete an automated cycle – such as a machining operation. Time starts after depressing start switch and terminates at machine cycle end.
Autonomation	Stopping a process automatically when a defective part is detected. A concept that a defective unit from a preceding process is never allowed to flow into and disrupt a subsequent process. (also known as "Jidoka")
Available Process Time	Net production time available for processing products based on current resource availability
Capacity	The maximum theoretical amount produced by a production process over a standard time period.
Cellular Manufacturing	A production approach that uses groupings of manufacturing equipment, tools, and people organized to perform an entire sequence of manufacturing operations in one contiguous physical location (cell). A strategy designed to increase the flexibility of operations in order to produce an increasing variety of products in smaller and smaller quantities while simultaneously reducing operating costs and increasing the utilization of the workforce as variation in volume and mix occur.
Changeover	A component of a set-up. Limited to the time used for detaching tools, dies or fixtures needed for the last job and attaching tools, dies or fixtures for the next job.
Constraint	Anything that limits a system from achieving higher performance, or throughput. A bottleneck that severely limits an organization's ability to achieve higher performance relative to its purpose / goal.

Continuous Improvement	A philosophy by which individuals within an organization look for ways to always do things better. A pledge to every day, do or make something better than it was before. The improvement of products, processes, and / or services on an ongoing basis. The gains made through continuous improvement activities are generally incremental, small-step improvements. In Japan, the continuous improvement process is often called kaizen.
Critical Equipment	Equipment that is essential to the production process or plant operation. May be equipment that has no back-up or is a production constraint.
Critical Path	All of the elements in the value stream that a control part follows.
Cycle Time	Elapsed time from the beginning of a process to the completion of that process for the production of a single unit. Cycle time is measured, not calculated and may be longer or shorter than takt time. If cycle time for every operation in a complete process can be reduced to equal takt time products can be made in single piece flow.
DFM / A	Design for Manufacturability / Assembly. Designing products with manufacturing & assembly processes, tools, quality control measures and related equipment in mind.
Defect	A product / part that deviates from specifications or does not meet internal / external customer expectations. All defects are created by errors.
Demand Variability	Measures customer demand fluctuations over time using variance and standard deviation.
Down Time	Manufacturing resource time lost between the production of the last good piece and the next good piece of the same product. Includes planned and unplanned work stoppages.
Error	Any deviation from a specified manufacturing process. Errors can be made by machines or by people and can be caused by previous errors that have occurred. While an error may not produce a defect, all defects are created by errors. When errors are eliminated, defects will not be created.
Error Detection	A group-based improvement strategy that is targeted at discovering defects, errors, and equipment abnormalities in production processes.
Error Detection Device	Simple and inexpensive methods used to detect errors and prevent them from being passed on to the next step in the manufacturing process or the customer.
Error Proofing	A group-based improvement strategy that is targeted at eliminating defects, errors, and equipment abnormalities in production processes before they occur. Using wisdom & ingenuity to create devices that allow you to do your job 100% defect free 100% of the time.

Error Proofing Device	Simple and inexpensive methods used to prevent errors from occurring.
External Work	Work that is performed while the machine is running. Example: Locating tools and fixtures while the machine is running in preparation for a set-up.
FAST	An approach to set-up reduction. Focuses on the 4 components of a set-up. Foresight, Attaching & detaching, Setting conditions and Trial runs and adjustments.
Finished Goods	Items that have completed the production process (including test and packaging) and are released / ready for shipment to a customer.
Flow Production	Describes how goods are processed, ideally, one piece at a time. It rejects the concept of batch or lot production and encompasses pull or demand processing. Often referred to as "1-piece-flow".
Forecasted Demand	Estimate ("guesstimate") of future demand. Many plant production schedules are based on forecasted demand. (Watch me pull a rabbit out of my hat!)
Group Technology Matrix	A matrix that analyzes the processes and operations used in the manufacturing of products to help define product families.
Heijunka	Production Smoothing. Keeping total manufacturing volume as constant as possible.
Improvement Activity	An organized activity focused on improving a process or operation by eliminating waste. Could be a 5 day kaizen activity, 2-3 day mini-kaizen activity or TPM activity.
Internal Work	Work that is performed while a machine is stopped. Example: Removing or replacing a tool or looking for tools & fixtures in preparation for a set-up while the machine is stopped
Jidoka	See Autonomation.
Job Sequence	A repeatable order of actions that a worker must perform to produce a quality product.
Just In Time (JIT) Manufacturing	A strategy that exposes that waste in an operation, makes continuous improvement a reality and provides the opportunity to promote total employee involvement. Concentrates on making what is needed, when it is needed, no sooner, no later.
Kanban	A Japanese term, Kanban is the cornerstone of the just-in-time pull system. Kanban actually means "to put away and to bring out" or "signal". In pull systems, it often refers to a card or other physical device used to signal the previous operation that it is authorized to produce the next unit. A means of communicating need for product or service.

Kaizen	A Japanese term for continuous improvement, founded on the principles of doing things better and setting, working toward, and achieving increasingly higher standards. Kaizen is a process improvement methodology used to quickly and routinely identify and eliminate waste from a workflow process to improve performance/competitiveness.
Lean Manufacturing	An integrated approach to producing goods and services designed to maximize the efficient use of capital, materials and human resources. A manufacturing method used to achieve higher quality, lower costs and shorter lead times.
MRP	Material Resource Planning – A tool used to plan production levels, material needs and anticipate workloads based on a forecast.
Make it Ugly	Making waste highly visible so that resolving the problem(s) causing the waste becomes a priority. 8 months worth of a certain part? – Move the inventory out to where it is used on the line and place some boxes of the items in the responsible buyers office.
Make to Order	Run strategy focused on making what a customer orders. Manufacturing does not start until order is received. No finished goods inventory is required. Manufacturing lead times must be less than the customer order lead time.
Make to Stock	The run strategy focused on making product for inventory. Generally, forecast driven and used when manufacturing lead times are greater than the customer order time.
Manual Time	Time required to manually mount / dismount and visually inspect a work piece at a machine or operation. Time starts when the worker begins work at the machine or process and terminates when they start motion to the next machine or process.
Multi-Skilled Workers	A description for individuals at any level of the organization who are diverse in skill and training. Operators capable of performing a number of different tasks providing the organization with additional flexibility.
Non-Value Added Time	An operation or activity that takes time and resources but does not add value to the product sold to the customer. Non-value adding activities include work-in-process, inspection, defects, waiting, and inefficiency.
One Piece Flow	Products move through various operations in design, order-taking, and production, one piece at a time and without interruptions, backflows, or scrap. Also called Single Piece Flow.

Overall Equipment Effectiveness (OEE)	<p>A Total Productive Maintenance (TPM) measurable. OEE measures the availability, performance efficiency, and quality rate of equipment, in particular, the constraint operation. OEE is part of the Total Productive Maintenance program and improves throughput by eliminating downtime.</p> <p>OEE = Availability x Performance Efficiency x Quality Rate</p>
Pareto Chart	<p>A vertical bar graph showing the bars in order to size from left to right. Helps focus on the vital few problems rather than the trivial many. An extension of the Pareto Principle, which suggests that the significant items in a given group normally constitute a relatively small portion of the items in the total group.</p>
Personal Protective Equipment (PPE)	<p>The necessary safety and protective equipment required to conduct a task and minimize or eliminate the risk of injury. PPE consists of items such as safety glasses, respirators, gloves, hard hats / helmets, steel toe shoes, etc. PPE may vary for different job tasks.</p>
Product Family	<p>A product group that organizes products based on common traits in the production & manufacturing processes.</p>
Point of Use Storage	<p>Locating inventory next to the “point” of use at the assembly line or process instead of in a warehouse or storeroom. (POUS)</p>
Poka-Yoke (Pronounced: “po-ka yo-kay”)	<p>A Japanese expression meaning “common or simple, mistake proof”. It refers to fool proofing a design such that all ambiguity is removed and it becomes virtually impossible to set up a machine or produce a part or an assembly incorrectly. This is often accomplished through designing the components, tools and assemblies so they will fit together only in the proper orientation and sequence.</p>
Process Excellence	<p>A systematic method to measure, analyze and improve business Process Excellence processes to identify critical areas that can cause breakthrough results in market penetration, organizational speed and the cost of doing business.</p>
Production Capacity Sheet	<p>A tool used to determine required completion time per unit of output at each process, at each work station and for each part.</p>
Production Control Board	<p>A tool used to determine required completion time per unit of output at each process, at each work station and for each part.</p>
Pull	<p>Manufacturing based on a known demand signal from a down stream operation. A system of cascading production and delivery instructions from downstream to upstream activities. The upstream supplier only produces when the downstream customer signals a need. Pull is the opposite of push.</p>

Pull System	A way of managing shop floor activity that minimizes work-in-process and dramatically improves throughput time by eliminating storage time between operations. A pull-system requires two things: a pull signal and a fixed upper volume limit. A fixed upper volume limit means the operators must stop producing parts whenever they have not received their (pull signal) authorization to produce more. Pull signals are sometimes called kanbans.
Push	Manufacturing based on anticipation of need. Upstream processes make whatever is scheduled, whether or not the down stream process needs the item. Inventory is then “pushed” on toward the next step or process – hence the name.
Push System	The direct opposite of the pull system. Push systems allow production to continue based on a predetermined schedule. Push systems launch orders into the production system on a scheduled interval and assume that they will come out the end of the process at the end of the designated throughput times. Even the best closed-loop push systems are much less responsive to in-process variation, and therefore much less effective for controlling production and work-in-process than pull systems.
Quality Control Process Charts	A simple quality tool that uses the Deming PDCA cycle to identify and resolve the most common issues that arise in a process. Tracks “turnbacks” in a process to identify which issues should be resolved first. Frequently known as QCPC.
Replenishment Time	Time from when the supplying process is signaled until material is available for use at the signaling process
Required Waste	An activity that is required to be performed but that does not change the size, shape, form, fit or function of the product.
Root Cause	The ultimate reason for an event or condition.
Set-up Reduction	An operating technique that systematically reduces the time and skill level required to prepare or “set-up” a piece of operating equipment in order to produce small quantities of parts or assemblies. There are several approaches to set-up reduction, such as dedicated set-ups, SMED and FAST.
Set-up Time	The entire time it takes a process or operation to switch from producing one part or assembly to another. Defined as the time from the moment the last “good” part / assembly A was produced to the completion of the first “good” part / assembly B.
SKU	Stock Keeping Unit, the lowest level of product definition for unique selling unit.

SMED	An approach to set-up reduction. Single Minute Exchange of Dies, the time required to prepare or “set-up” a piece of operating equipment is less than 9 minutes and 59 seconds. Example: Changing the blades on a food processor.
Standard Cost	Budgeted frozen inventory value.
Standard Work	Specifies the tasks defining the best way to get a job done in the amount of time available while ensuring the job is done right the first time, every time. It provides a routine for consistency of an operation and a basis for improvement. Establishes a routine for repetitive tasks, establishes the relationship between man and environment, provides a basis for improvement by defining the normal and highlighting the abnormal. A precise description of each work activity specifying cycle time, takt time, the work sequence of specific tasks and the minimum inventory of parts on hand needed to conduct the activity. It also details the motion of the operator and the machine processing sequence
Standard Work Combination Sheet	Defines the order of actions that each operator must perform within a given takt time. Illustrates the relationship between the processes manual time{s}, automatic time{s}, walking time{s}, waiting time{s} and the takt time.
Standard Work Sheet	A visual control tool to help the operator, team leader and manager maintain a standardized operation routine. It details the motion of the operator and the sequence of actions. Serves as a guideline for operators and supervisors to show where and in what sequence operations are completed in the work area.
Standard Work in Process	Minimum stock that is necessary to perform the job safely and successfully within a given cycle time. (SWIP) Also known as Standard In-Process Stock.
Supermarket	A pull production technique. Materials in a supermarket are pulled off the “shelves” by the “customer”. A supply of parts are stored near the cell / line and as these parts are used, they are replenished by the upstream process.
Supply Chain	The combination of processes from product definition through delivery and payment from the customer. (Includes both information based and physical processes.)
TPM	Total Productive Maintenance. TPM is a process that maximizes the productivity of equipment for its entire life. TPM is a process not a program. It utilizes Autonomous Maintenance, Preventive Maintenance, and resources of all employees in the plant to make sure that equipment is available when needed and produces at the rate that is required without defects.

Takt time	<p>The rate at which the end product must be produced in order to meet customer demand, how frequently a sold unit must be produced. Takt time is calculated, not <i>measured</i> and may be longer or shorter than cycle time. Takt time is usually expressed in seconds.</p> $\text{Takt Time} = \frac{\text{Available process time for a period}}{\text{Customer requirements for that period}}$
Traditional Manufacturing	Refers to batch and queue operations that schedule using forecast, push and MRP techniques.
Turnback	A QCPC term meaning ANY deviation from established standard process – developed by using design criteria, process parameters, standard work and the precise method in which a product SHOULD BE manufactured. Everything that is deviant from the ideal process is a turnback.
U-shaped cells	In cellular manufacturing, workcenters configured in horizontal “U” shapes, with operators occupying positions within the “U”. This configuration allows operators to more easily move between positions, allowing adjustment of the number of operators in a cell based on the work load present at a given time.
Value Added Time	Time during which an action or process changes the size, shape, form, fit or function of the product.
Value Stream Map	A lean manufacturing tool that illustrates the material flow, information flow and manufacturing & processing data to identify improvement opportunities. (Reference book: Learning to See, by the Lean Enterprise Institute.)
Visual Controls	A method to clearly and immediately inform management and workers of the status of a part, operation, process or inventory store. This would include the use of color, signs, and clear lines of sight in a work area. The visual controls should clearly designate what things are and where they belong. They should provide immediate feedback as to the work being done and its pace.
Visual Factory	A method to clearly and immediately inform management and workers of the status of a part, operation, process or inventory store. This would include the use of color, signs, and clear lines of sight in a work area. The visual controls should clearly designate what things are and where they belong. They should provide immediate feedback as to the work being done and its pace.
Waste	Anything other than the minimum amount of equipment, materials, parts, space and worker’s time, which are absolutely essential to add value to the product. (See 7 Wastes)

Oregon Manufacturing Extension Partnership

Capital Center, 18640 NW Walker Road, Suite 1052

Beaverton, OR 97006

503 725-2666

www.omep.org