<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Andon Board</td>
<td>A visual control device in a work area giving the current status on performance to expectations and alerting team members to emerging issues.</td>
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<tr>
<td>Batch-and-Queue</td>
<td>Waiting until an area has completed all the inventory of work before moving any work to the next activity. This can also apply to keeping an inventory of work until a time or date arrives before moving any work forward. Thus items need to wait in a queue. Also called &quot;Batch-and-Push.&quot; Contrast with continuous flow.</td>
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<td>Cell</td>
<td>Operating a true continuous flow on machines and workstations placed close together in the order of processing, sometimes in a &quot;U&quot; shape. Cell operators may handle multiple processes, and the number of operators is changed when the customer demand rate changes. The &quot;U&quot; shaped equipment layout is used to allow more alternatives for distributing the work elements among operators, and to permit the leadoff and final operations to be performed by the same operator.</td>
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<td>Chaku-Chaku</td>
<td>A method of conducting single-piece flow in which the operators proceeds from machine to machine, taking the part from the previous operation and loading it in the next machine, then taking the part just removed from the machine and loading it in the following machine, etc. Literally means &quot;load-load&quot; in Japanese.</td>
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<td>Changeover</td>
<td>When a piece of equipment has to stop producing in order to be fitted for producing a different item. For example, the installation of a different processing tool in a metal working machine, a different color paint in a painting system, a new plastic resin &amp; mold in an injection molding machine, loading different software, and so on.</td>
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<td>Continuous Flow</td>
<td>Means that items are produced and moved from one processing step to the next one piece-at-a-time. Each process makes only the one piece that the next process needs, and the transfer batch size is one. Also called &quot;single-piece flow&quot; or &quot;one-piece flow.&quot; Contrast with batch-and-queue.</td>
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<tr>
<td>Cycle Time</td>
<td>How frequently an item or product actually is completed by a process, as timed by direct observation. Also, the time it takes an operator to go through all of his or her work elements before repeating them.</td>
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<td>EPEI</td>
<td>Refers to the &quot;every-product-every interval,&quot; which is a measure of production batch size. For example, if a machine is able to change over and produce the required quantity of all the high-running part types dedicated to it within three days, then the production batch size for each individual part type is about three days worth of parts. Thus this machine is making every part every (EPE) three days.</td>
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<tr>
<td>Fabrication Processes</td>
<td>Segments of the value stream that respond to requirements from internal customers. Fabrication processes are often characterized by general-purpose equipment that changes over to make a variety of components for different downstream processes. Compare to &quot;pacemaker process&quot;.</td>
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<tr>
<td>FIFO</td>
<td>Stands for &quot;first in, first out,&quot; which means that material produced by one process is used up in the same order by the next process. FIFO is one way to</td>
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</table>
regulate a queue between two decoupled processes when a supermarket or continuous flow are impractical. A FIFO queue is filled by the supplying process and emptied by the customer process. When a FIFO queue gets full, the supplying process must stop producing until the customer process has used up some of the inventory.

Five S  Five terms beginning with 'S' utilized to create a workplace suited for visual control and lean production. 'Seiri' means to separate needed tools, parts, and instructions from unneeded materials and to remove the latter. 'Seiton' means to neatly arrange and identify parts and tools for ease of use. 'Seiso' means to conduct a cleanup campaign. 'Seiketsu' means to conduct seiri, seiton, and seiso at frequent, indeed daily, intervals to maintain a workplace in perfect condition. 'Shitsuke' means to form the habit of always following the first four Ss.

Flow  A main objective of the entire lean production effort, and one of the key concepts that passed directly from Henry Ford to Taiichi Ohno (Toyota's production manager after WWII). Ford recognized that, ideally, production should flow continuously all the way from raw material to the customer and envisioned realizing that ideal through a production system that acted as one long conveyor.

Heijunka  The act of leveling the variety and/or volume of items produced at a process over a period of time. Used to avoid excessive batching of product types and/or volume fluctuations, especially at a pacemaker process.

Hoshin Kanri  A strategic decision-making tool for a firm's executive team that focuses resources on the critical initiatives necessary to accomplish the business objectives of the firm. Hoshin Kanri unifies and aligns resources and establishes clearly measurable targets against which progress toward the key objectives is measured on a regular basis.

Information Flow  Data that tells a process what to do or produce.

Jidoka  See 'Autonomation'

Just-in-Time  Producing or conveying only the items that are needed by the next process when they are needed and in the quantity needed.

Kaikaku  Radical improvement of an activity to eliminate muda, for example by reorganizing processing operations for a product so that instead of traveling to and from isolated "process villages," the product proceeds through the operations in single-piece flow in one short space. Also called breakthrough kaizen, flow kaizen, and system kaizen.

Kaizen  Continuously improving in incremental steps.

Kanban  A signaling device that gives instruction for production or conveyance of items in a pull system. Can also be used to perform kaizen by reducing the number of kanban in circulation, which highlights line problems.
Appendix – Lean Glossary

Lead Time
The time required for one piece to move all the way through a process or value stream, from start to finish. Envision timing a marked item as it moves from beginning to end.

Material Flow
Movement of physical product through the value stream.

Material Handlers
Production-support persons who travel repeatedly along scheduled routes within a facility to transfer materials, supplies, and parts in response to pull signals, and to make paced withdrawal of finished goods at pacemaker processes.

Material Requirements Planning (MRP)
A computerized system typically used to determine the quantity and timing requirements for delivery and production of items. Using MRP specifically to schedule production at processes in a value stream results in push production, because any predetermined schedule is only an estimate of what the next process will actually need. Manufacturing Resource Planning - often called MRP II - expands MRP to include capacity planning, a finance interface to translate operations planning into financial terms, and a simulation tool to assess alternative production plans.

Milk Run
Routing a delivery vehicle in a way that allows it to make pickups or drop-offs at multiple locations on a single travel loop, as opposed to making separate trips to each location.

Monument
Any design, scheduling, or production technology with scale requirements necessitating that designs, order, and products be brought to the machines to wait in a queue for processing.

Muda
See ‘Waste’

Operation
An activity or activities performed on a product by a single machine. Contrast with ‘process’.

Operator Balance Chart
A bar graph depicting the cycle times of each operator in a process to make one piece compared to takt time. Useful tool for cell balancing and creating continuous flow.

Overproduction
Producing more, sooner or faster than is required by the next process.

Paced Withdrawal
A timed sequence of withdrawal of finished product from the pacemaker process. Paced withdrawal is a tool for pacing an assembly process and becoming aware of production problems within a pitch increment.

Pacemaker Process
The "pacemaker process" is a series of production steps, frequently at the downstream (customer) end of the value stream in a facility, that are dedicated to a particular product family and respond to orders from external customers. The pacemaker is the most important process in a facility because how you operate here determines how well you can serve the customer, and what the demand pattern is like for upstream fabrication processes.

Perfection
The complete elimination of muda so that all activities along a value stream create value.

Pitch
When takt time is too short for a reasonable paced withdrawal it can be
adjusted upward to a consistent increment of work called pitch, which becomes the basic unit of your production schedule for a product family. Pitch represents the frequency at which you withdraw finished goods from a pacemaker process as well as the corresponding amount of schedule you release to that process. Pitch is often calculated based on the customer's ship container quantity.

**Appendix – Lean Glossary**

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**Pitch**
A series of individual operations required to create a design, completed order, or product.

**Process Kaizen**
Improvements made at an individual process or in a specific area. Sometimes called "point kaizen".

**Process Villages**
The practice of grouping machines or activities by type of operation performed; for example, grinding machines or order-entry. Contrast with 'cells'

**Processing Time**
The time a product is actually being worked on in a machine or work area.

**Product Family**
A group of products that go through the same or similar downstream or "assembly" steps and equipment.

**Production Smoothing**
See 'Heijunka'

**Pull System**
An alternative to scheduling individual processes, where the customer process withdraws the items it needs from a supermarket, and the supplying process produces to replenish what was withdrawn. Used to avoid push. See also kanban.

**Queue Time**
The time a product spends waiting in line for the next processing step.

**Right-sized Tool**
A design, scheduling, or production device that can be fitted directly into the flow of products within a product family so that production no longer requires unnecessary transport and waiting. Contrast with 'monument'.

**Sensei**
A personal teacher with a mastery of a body of knowledge, in this case lean thinking techniques.

**Spaghetti Chart**
A map of the path taken by a specific product as it travels down the value stream in a mass-production organization, so-called because the product's route typically looks like a plate of spaghetti.

**SPC**
Statistical Process Control. A method whereby data is collected and statistics used to understand process stability.

**Standard Work**
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.
| **Supermarket** | A controlled inventory of items that is used to schedule production at an upstream process. |
| **System Kaizen** | Improvement aimed at an entire value stream. |
| **Takt Time** | The rate of customer demand. How often the customer requires one finished item. Takt time is used to design assembly and pacemaker processes, to assess production conditions, to calculate pitch, to develop material handling containerization and routes, to determine problem-response requirements, and so on. Takt is the heartbeat of a lean system. Takt time is calculated by dividing production time by the quantity the customer requires in that time. |
| **Total Productive Maintenance (TPM)** | A series of methods, originally pioneered by Nippondenso (a member of the Toyota group), to ensure that every machine in a production process is always able to perform its required tasks so that production is never interrupted. |
| **Value** | A product or service's capability provided to a customer at the right time, at an appropriate price, as defined in each case by the customer. |
| **Value Added Time** | Time for those work elements that transform the product in a way the customer is willing to pay for. |
| **Value Stream** | All activities, both value added and non value added, required to bring a product from raw material into the hands of the customer, a customer requirement from order to delivery, and a design from concept to launch. Value stream improvement usually begins at the door-to-door level within a facility, and then expands outward to eventually encompass the full value stream. |
| **Value Stream Loops** | Segments of a value stream whose boundaries are typically marked by supermarkets. Breaking a value stream into loops is a way to divide future state implementation into manageable pieces. |
| **Value Stream Manager** | Person responsible for creating a future state map and leading door-to-door implementation of the future state for a particular product family. Makes change happen across departmental and functional boundaries. |
| **Value Stream Mapping** | A pencil-and-paper tool used in two stages: a) Follow a product's production path from beginning to end and draw a visual representation of every process in the material and information flows. b) Then draw a future state map of how value should flow. The most important map is the future state map. |
| **Visual Control** | The placement in plain view of all tools, parts, production activities, and indicators of production system performance, so the status of the system can be understood at a glance by everyone involved. |
| **Waste** | Any activity that consumes resources but creates no value for the customer. |
| **Waterspider** | See "Material Handlers" |
WIP  Stands for "work in process." Any inventory between raw material and finished goods.