

Glossary for key manufacturing terms:

A comprehensive glossary of terms is available through Build4Scale at <https://build4scale.llnl.gov/glossary.php>

A subset of those manufacturing terms that Cascadia CleanTech Accelerator thinks is of particular importance to teams are as follows (with definitions from the [Build4Scale glossary](#), unless otherwise noted):

3D printing (including Additive Layer Manufacturing)

- From [Wikipedia](#): 3D printing refers to processes in which material is joined or solidified under computer control to create a three-dimensional object, with material being added together (such as liquid molecules or powder grains being fused together). Unlike material removed from a stock in the conventional machining process, 3D printing or AM builds a three-dimensional object from computer-aided design (CAD) model or AMF file, usually by successively adding material layer by layer. Objects can be of almost any shape or geometry and typically are produced using digital model data from a 3D model or another electronic data source.

Autonomation

- From [Wikipedia](#): Autonomation describes a feature of machine design that implements some supervisory functions rather than production functions. It identifies abnormal situations as they arise, stops the machine, allows the worker to fix or correct the immediate condition, and to investigate the root cause and install a countermeasure. Autonomation aims to prevent the production of defective products, eliminate overproduction and focus attention on understanding the problems and ensuring that they do not reoccur.

Beginning Inventory

- Products or services that a business starts out with during a new fiscal year.

Bill of Materials (BOM)

- A list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts, and the quantities of each needed to manufacture an end product.

Bottleneck

- From [Wikipedia](#): One process in a chain of processes, where its limited capacity reduces the capacity of the whole chain. The result of having a bottleneck are stalls in production, supply overstock, pressure from customers and low employee morale.

Buffering

- From [Small Business Chronicle](#): Buffering is used in manufacturing to compensate for variations in the production process (such as changes in supply and demand), and ensure that production lines continue running smoothly despite unforeseen factors, such as machine breakdowns, coming into play.

Calibration

- From [Wikipedia](#): The comparison of measurement values delivered by a device under test with those of a calibration standard of known accuracy. While strictly a term referring to measurement of an instrument's accuracy, in general use, calibration is often regarded as including the process of adjusting the output or indication on a measurement instrument to agree with value of the applied standard, within a specified accuracy.

Continuous (or continual) Improvement

- From [Wikipedia](#): an ongoing effort to improve products, services, or processes. These efforts can seek "incremental" improvement over time or "breakthrough" improvement all at once. Delivery (customer valued) processes are constantly evaluated and improved in the light of their efficiency, effectiveness and flexibility.

Design for the Environment (DfE)

- From [Wikipedia](#): a design approach to reduce the overall human health and environmental impact of a product, process or service, where impacts are considered across its life cycle. Different software tools have been developed to assist designers in finding optimized products or processes/services.

Design for Manufacturing (DFM)

- The general engineering practice of designing products in such a way that they are easy to manufacture.

Design for Usability

- From [Wikipedia](#): Methods for improving usability or ease-of-use during the design process. ISO defines usability as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."

Die Casting

- From [Wikipedia](#): a metal casting process that is characterized by forcing molten metal under high pressure into a mold cavity. The mold cavity is created using two hardened tool steel dies which have been machined into shape and work similarly to an injection mold during the process.

Ending Inventory

- The amount of inventory a company has in stock at the end of its fiscal year.

Finished Goods

- From [Wikipedia](#): goods that have completed the manufacturing process but have not yet been sold or distributed to the end user.

Injection Molding

- From [Wikipedia](#): a manufacturing process for producing parts by injecting molten material into a mold. Injection molding can be performed with a host of materials mainly including metals, (for which the process is called die-casting), glasses, elastomers, confections, and most commonly thermoplastic and thermosetting polymers.

Inventory

- From [Business Dictionary](#): a catalog of the materials and goods held by an organization (1) to support production (raw materials, subassemblies, work in process), (2) for support activities (repair, maintenance, consumables), or (3) for sale or customer service (merchandise, finished goods, spare parts).

Just-In-Time (JIT) Manufacturing

- From [Wikipedia](#): (also known as “just-in-time production”, and sometimes viewed as interchangeable with “lean manufacturing”) A methodology aimed primarily at reducing flow times within production system as well as response times from suppliers and to customers. Its origin and development was in Japan, largely in the 1960s and 1970s and particularly at Toyota.

Kanban

- From [Wikipedia](#): A scheduling system for lean manufacturing and just-in-time manufacturing (JIT). The system takes its name from the cards that track production within a factory. A goal of the kanban system is to limit the buildup of excess inventory at any point in production. Limits on the number of items waiting at supply points are established and then reduced as inefficiencies are identified and removed.

Lead Time (or Customer Lead Time)

- The latency between the initiation and execution of a process. For example, the lead time between the placement of an order and delivery of a new car from a manufacturer may be anywhere from 2 weeks to 6 months. In industry, lead time reduction is an important part of lean manufacturing.

Lean Manufacturing

- From [Wikipedia](#): a systematic method for waste minimization (“Muda”) within a manufacturing system without sacrificing productivity. Lean also takes into account waste created through overburden (“Muri”) and waste created through unevenness in work loads (“Mura”). Working from the perspective of the client who consumes a product or service, “value” is any action or process that a customer would be willing to pay for. Lean manufacturing makes obvious what adds value, by reducing everything else (which is not adding value).

Load Leveling

- From [Six Sigma Daily](#): A technique for reducing the mode of (waste). Load leveling is a method for reducing large fluctuations in customer demand. You might have leveling by volume (where the demand rate among the different product families varies over time), or leveling by product type/mix (reducing time involved in switching from one product to another, enabling smaller batches).

Low-fidelity Prototype

- From [Usability First](#): a prototype that is sketchy and incomplete, that has some characteristics of the target product but is otherwise simple, usually in order to quickly produce the prototype and test broad concepts and analyze form and fit.

Molding process

- The process of manufacturing by shaping liquid or pliable raw material using a rigid frame called a mold or matrix.

Outsource (Contract) Manufacturing [including Contract Packaging (Co-Pack)]

- Or contract manufacturer (CM). A manufacturer that contracts with a firm for components or products. It is a form of outsourcing. A contract manufacturer performing packaging operations is called co-packer or a contract packager.

Pilot Manufacturing

- A small-scale campaign, survey, or test plant commissioned or initiated to check the conditions and operational details before full-scale launch.

Product Specification

- A document that provides critical defining information about a product's required and distinguishing characteristics and features, documented in a manner (either written or illustrated) that facilitates its procurement or production and acceptance.

Prototype

- An early sample, model, or release of a product built to test a concept or process or to act as a thing to be replicated or learned from.

Queueing Theory

- From [Wikipedia](#): Queueing theory is the mathematical study of waiting lines, or queues. A queueing model is constructed so that queue lengths and waiting time can be predicted. The results are often used when making business decisions about the resources needed to provide a service.

Rapid Prototyping

- A group of techniques used to quickly fabricate a scale model of a physical part or assembly using 3D computer-aided design (CAD) data.

Reorder Point (ROP)

- From [Wikipedia](#): the level of inventory which triggers an action to replenish that particular inventory stock. It is a minimum amount of an item which a firm holds in stock, such that, when stock falls to this amount, the item must be reordered. It is normally calculated as the forecast stock usage during the lead time required for replenishment, plus safety stock.

Six Sigma

- A set of techniques and tools for process improvement. 'Sigma' in statistics refers to 'standard deviation', so Six Sigma quality implies that the number of defects is six standard deviations into the tail of a normal distribution. Six standard deviations is so far into the tail that it represents a 99.99966% defect free process. In most manufacturing situations, that's a high mark for quality.

Supply Chain

- A system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer.

The 7 Wastes of Manufacturing

- From [Wikipedia](#) and [EMS Consulting Group](#): These seven categories of unproductive manufacturing practices help manufacturers identify wastes to be eliminated: overproduction, waiting, transporting, inappropriate processing, unnecessary inventory, unnecessary/excess motion, and defects. Underutilization of employees was more recently added as an 8th waste.

Tooling (also known as machine tooling)

- From [TechTarget](#): The process of acquiring the manufacturing components and machines needed for production. The common categories of machine tooling include fixtures, jigs, gauges, molds, dies, cutting equipment and patterns. Proper tooling directly affects output capacity as well as product lifecycle, quality and pricing.

Volume

- The amount or quantity of something

Waste Elimination

- A core tenet of lean manufacturing, waste elimination calls for identifying instances of any of the 7 Wastes in their operations and to address and eliminate them.

Work in Process (WIP)

- A company's partially finished goods waiting for completion and eventual sale or the value of these items. These items are either just being fabricated or waiting for further processing in a queue or a buffer storage. The term is used in production and supply chain management.