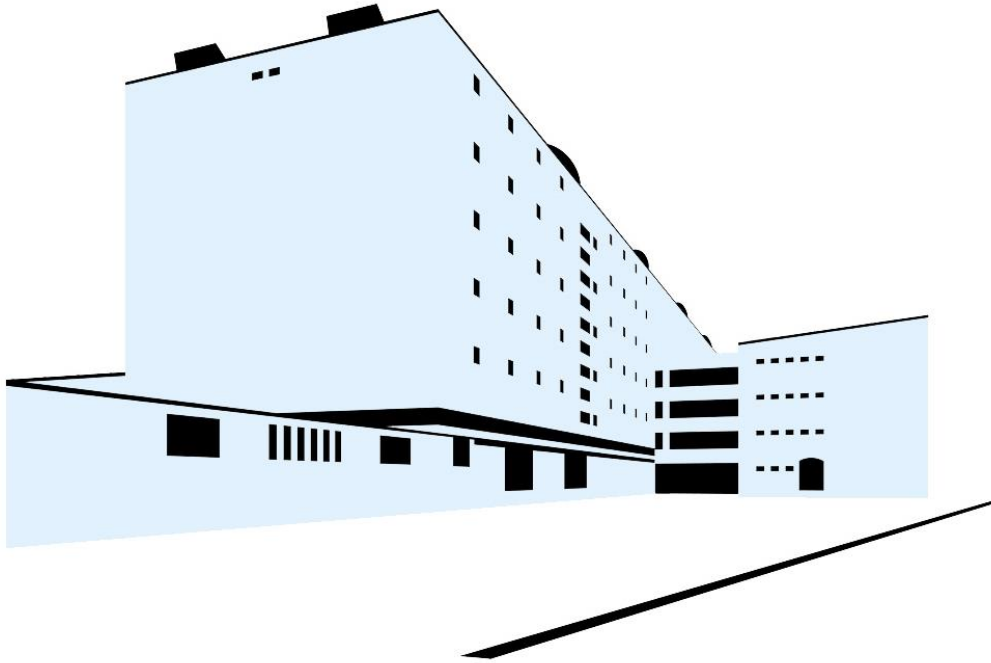


Manufacturing vocabulary

Manufacturing terms you need to know



Lost in industry-specific jargon like CAPA, composites, and Kaizen? Explore this manufacturing glossary with over 80 manufacturing terms and definitions.

Adapted from: <https://www.propelplm.com/articles/95-manufacturing-terms-you-need-to-know>

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3D printing

3-Dimensional printing also known as additive manufacturing, is the process of compiling thin layers of material, generally polymers or metals to produce a 3-dimensional structure with ease. Designs are rendered in a Computer-Aided Design (CAD) or other 3D software. These designs can then be printed layer by layer producing intricate shapes and designs that would prove challenging or impossible when done by hand.

3D printing has streamlined prototyping making it possible to rapidly produce and scale models. This allows designers and engineers to turn ideas into physical prototypes and efficiently concept test those designs.

Activity-based costing

An accounting process, activity-based costing assigns indirect or overhead costs to all products and services based on the consumption by each. This process allows for a more accurate reflection of indirect costs by recognizing certain products or services that require more time than others.

The more traditional way of assigning costs simply divides indirect costs evenly across all products and services.

Additive manufacturing

As technology moved from analogue to digital, additive manufacturing became possible. Also known as 3D printing, additive manufacturing is the process by which a computer-rendered (CAD) model design is produced by a machine layer by layer.

This process has made it possible to quickly and efficiently produce prototypes bringing designs to life in minutes to hours, depending on the intricacy.

Advanced manufacturing

Advanced or innovative manufacturing uses the latest generation of manufacturing technology and improves work/process systems through the integration of advanced

technology, allowing for a smoother more efficient manufacturing process.

Agile manufacturing

The process of quickly responding to consumer needs, agile manufacturing incorporates tools and training to respond to changes in market demands thus reducing lead times across organizations. Agile manufacturing can include lean and flexible manufacturing as well as 'mass customization' concepts.

Andon board

Andon boards are signalling devices displaying the current state of a manufacturing line. Its purpose is to notify management, maintenance teams and other employees of a current or emerging problem in the manufacturing process. The Andon board gives workers the ability to halt production and address production quality issues in a timely manner.

Automation

Automation is the manufacturing process or system of reducing or eliminating the need for human intervention during manufacturing. Automation or labour-saving technology uses various control systems to reduce man-hours in exchange for more efficient machine hours.

Benchmarking

Benchmarking is the practice of comparing one plant or organisation's performance and processes to industry standards. This process looks at specific metrics to determine the quality of performance within the manufacturing process. By analysing indicators such as cost-per-unit or defects-per-batch, benchmarking allows managers to assess performance and construct plans for improvement.

Bill of materials

Bill of materials (BOM) is the list of all raw materials that go into the final assembly of a product. This bill of materials includes all assemblies, subassemblies and the number of parts used in the production of the end product. The BOM is generally tied to the production order which reserves the exact quantity of raw materials for the completion of the product. The bill of materials is used in manufacturing to refer to the current production configuration or recipe rather than the actual bill defining the cost of production.

Bottleneck

Bottlenecking or the bottleneck is the point in the production line where congestions occur due to an influx of products that cannot be processed quickly enough. In the occurrence of a bottleneck production costs generally are increased as the inefficiencies delay production times. Most often, a bottleneck occurs during the run of a new product or production line as there may be unknown flaws in the process that need to be identified and corrected.

Corrective Action Preventative Action (CAPA)

Corrective Action, Preventative Action is the process of investigating, identifying and addressing issues or problems where corrective action is taken to eliminate the root cause of the issues preventing further action from needing to be taken. This method looks at the manufacturing process, customer complaints and internal audits to identify areas where non-conformities or undesirable outcomes occur and seeks to prevent those same issues in the future. CAPA is used to improve manufacturing and end products by eliminating all potential for errors and non-conformities. Ultimately the goal of CAPA is to address the heart of the issue so that no other similar issue will occur.

As a part of the good manufacturing practices, CAPA may be required in certain industries where quality assurance is crucial in the final product, including pharmaceuticals and medical device manufacturing.

Corrective Action Request (CAR)

CAR or Corrective Action Request is a request sent to a supplier or manufacturer to open an investigation into the occurrence of nonconformity or a defect of a specific product. This procedure is used to initiate corrective action, address the root cause of the non-conformity and prevent future instances of the issue stated in the CAR.

Cellular manufacturing

Cellular manufacturing is a manufacturing process that produces similar parts, products or subassemblies within a single cell of machines. A cell is a well-defined group, area of machines or production unit within a manufacturing plant responsible for producing families of parts or similar products. Workers are generally cross-trained to perform a variety of tasks within the cell, thus streamlining the manufacturing process, improving production efficiency and granting more operational autonomy.

The objective of cellular manufacturing is to design cells in a way that measures of performance are optimised. Performance measures can be productivity, cycle time, or other outputs of the manufacturing cycle. Common measures include product per man-hour, unit cost, cycle time, defect per batch, and percentage of parts made cell-complete.

Change management

Change management is the formal process of creating, reviewing and implementing change in the manufacturing process. Change typically begins when a machinist, supervisor, or engineer identifies a problem within the manufacturing process. The formal request for change is then submitted and the process ends when an agreement for change is made among stakeholders.

Change management is the process in which a company implements change within internal and external systems. This includes establishing steps for change and moderating activities to ensure the successful implementation of change.

Organisational change often requires many levels of cooperation from various departments and organisational leaders.

Developing a structured approach to change ensures a beneficial transition through the change process.

Change order

An engineering change notice or change order is a request or proposal to modify the current manufacturing process or equipment. In the process of manufacturing change management, the change order is the driver behind change through the system and is carried out through the change management cycle.

Generally, a change order is required for corrective action to be taken.

Changeover

Simply put, changeover is the process of converting production lines or machines from producing one product to another. In manufacturing, the changeover is also a measurement of the time taken to convert machines and production lines to the next product. In a lean manufacturing system, changeover times should be brief in order to maximise efficiency and reduce waste.

Child item

A child item is an assembly or subassembly of a final product that appears in the product's bill of materials (BOM). The items are generally said to be the child of the final product.

Contract manufacturer (CM)

A Contract Manufacturer is a firm hired by a company to focus on the manufacturing or assembly of all or part of the final product.

By contracting a manufacturer, hiring firms generally can save money as the manufacturer will have experience in the manufacturing process as well as plant assets specific to the manufacturing of similar products. Additionally, through a CM, firms are able to focus energy on the sales and marketing of the products rather than the manufacturing and are thus more efficient for the firm.

Compliance

Manufacturing compliance is the technical, legal and corporate regulations imposed on an organisation that must be followed for the production and marketing of products. Regulations can range from environmental standards, health and safety laws, and product safety requirements and may impact manufactures directly or indirectly based on the products it produces.

The FDA oversees consumer safety, one of the largest regulatory mandates. As laid out by the FDA in Good Manufacturing Practices (GMP), there are extensive measures and processes that must be taken to ensure the quality and safety of products for the consumer. When regulations are met products are granted a manufacturer's certificate of compliance showing the product has met all regulations in the GMP.

Compliance mark

The compliance mark is a physical mark placed on the product or packaging stating that a product has met the regulatory standards and specific requirements. Most notably, the CE mark is placed on products that meet the specification for products sold in the European Economic Area. Similar to the CE, in the United States the Federal Communications Commission grants the FCC mark to electronic devices that meet its regulatory standards and is often seen worldwide. These marks indicate that they may be sold in the respective economic areas regardless of the country of origin.

Composites

Composites are materials composed of two or more materials with significant differences in chemical or physical properties. These materials, when manufactured, resulting in a product that behaves differently than the individual materials it is composed of. Composites are manufactured to perform highly specialised jobs and functions. Often composites are designed to have greater strength and durability than the individual components. Often, composites are chosen because they offer a variety of benefits at a lower cost than substitute materials.

Commonly composites are seen as structural supports in bridges and buildings, electronics, and cars.

Computer-Aided Design (CAD)

Computer-aided design (CAD) is the use of computer-based software to assist in the designing and rendering of 2- and 3D models, replacing traditional drafting. CAD software is used to make the design phase more efficient and reduce lead time. Designers and drafters are able to manipulate and alter designs with better accuracy in the software without having to start over. Additionally, CAD software improves the quality of design and is able to test manufacturing viability, as calculations can be run in the software.

By using CAD, design teams are able to create a database for manufacturing, producing electronic files of all drafts of the project. These databases can often include dimensions of the design, processes, materials and engineering tolerance.

Computer-Aided Manufacturing (CAM)

In automating the manufacturing process Computer-Aided Manufacturing (CAM) may be used. CAM is the process of using computer-controlled machinery and software to increase the efficiency of the process and decrease the need for human intervention.

While CAD focuses on the design of the product, CAM focuses on how it is made. CAD will produce a model, essentially any design created in the software. That model contains a set of elements that will be analysed by a CAM system. After analysing the design the CAM software then begins the process of machining or manufacturing. Using a CAM system, a computer algorithm will check for any possible errors in geometry in the original design, create a toolpath for machines to follow, adjust machine parameters, and configure nesting all to maximise machining efficiency.

Continuous-Flow Manufacturing (CFM)

Continuous-Flow Manufacturing (CFM) is a method of manufacturing where the materials being processed are constantly moving

through the production line. Continuous-flow manufacturing is in opposition to batch production, where materials only move through the production line at a specified time or in specified amounts. CFM smooths the process of manufacturing by ensuring constant movement through the production line until the final product is complete, wherein batch production has units waiting in a queue until the latter part of the production line is ready for the parts to be processed. Ideally, in continuous-flow manufacturing, products would move sequentially through the system at a pace that reduces delay and lead times. CFM optimises production and integrates automation into all elements of production.

As products move efficiently through the production line, continuous-flow manufacturing decreases Work-in-Process (WIP), inventory and non-value added labour. CFM increases manufacturing efficiency, labour efficiency and reduces product defects through the production line.

Continuous-flow manufacturing may be referred to as continuous manufacturing, continuous flow, or continuous processing.

Cross-training

Cross-training refers to the process of training employees in several skills and positions allowing them to work adequately in multiple areas of the organisation. In manufacturing, cross-training is a value-added way of training employees to perform multiple or all tasks needed in production. Cross-training is required for cellular manufacturing to be effective, as cells need workers to be autonomous to maintain efficiency.

Cross-training promotes efficiency as no one person is responsible or knowledgeable of a task, meaning when a production error occurs many or all employees may be capable of handling and fixing the error without having to halt production.

In manufacturing, cross-training is also beneficial in strategic succession-planning, where employees are set to learn new skills to fill roles in plant leadership or management as they become skilled in all areas of production.

Cycle time

The cycle time refers to the time required to complete a full cycle of production in manufacturing. More specifically, the cycle time is the time from the start of production to the delivery of the final product. The cycle time is composed of all wait times in the production cycle including, processing time, queue time, inspection time and wait time.

Cycle time is a measure of efficiency through the entire process of manufacturing and should not be confused with lead time. Lead time, while similar, is customer-centric focusing on the time it takes for a customer to receive a product from the time the order was placed. By monitoring the cycle time managers are able to see where production is slowed and potential solutions to congestion in the manufacturing cycle.

Document change request (DCR)

As a part of change management and systems engineering, a DCR or document change request is a call for the adjustment of a system or process in which a problem has occurred. The DCR documents the standard operating procedure, the issue in the procedure and proposes a new plan to change the process in order to mitigate problems.

Change requests generally stem from non-conformities or bugs within the product that are brought to attention by users, development in other systems, a change in standard operations or demands from senior management.

Design history file (DHF)

A Design History File or DHF is the collection of records documenting all stages of the design phase. The DHF shows the development process through the collection of drafts, detailing decision making, meeting notes, test data and reports that lead to the production and manufacturing of the final product. The DHF should layout the drafting process in chronological order for ease of understanding and clarity. As part of the regulatory process and good manufacturing practices, a DHF may be required for a certification mark, as the DHF will show the

product has been scrutinised and rigorously tested to meet quality control standards.

Device history record (DHR)

The Device History Record (DHR) is a collection of records containing the production history of all versions of a product. The DHR includes the serial and lot numbers of the products produced, and any complaints or issues that are lodged against the product.

The DHR may include corrective action, preventative action (CAPA) records. These records describe any investigations, corrective and preventive actions and details about how the corrections were made.

A DHR may be required to meet regulatory measures in the production of certain products including medical devices.

Device master record (DMR)

A Device Master Record (DMR) is the collection of records containing the procedures and specifications for manufacturing a finished product used in quality management systems. The DMR includes the bill of materials, product and material specifications, design drafts, packaging and assembly instructions, any post-production cleaning and any hardware or software specifications and source codes.

Digital manufacturing

Digital manufacturing refers to the process of improving product design and manufacturing through the integration of information systems across the supply chain. Digital manufacturing aims to reduce the time and cost of manufacturing by digitising all processes including design, production and product use. In order to optimise manufacturing, digital manufacturing runs simulations analysing operations, machine specifications and input materials for maximum efficiency within a product life cycle.

Digital manufacturing shares goals with flexible and lean manufacturing but evolved from the computerised world.

Discrete manufacturing

Discrete manufacturing is a term used to describe the production of physically distinct products. These products generally can be identified either by serial number or by physical appearance examples include cars, smartphones or toys. Discrete manufacturing is the opposite of process manufacturing where products are unable to be separated and individually identified.

Characterised by unit production, in discrete manufacturing, products can be produced with varying complexity and volume. This process improves manufacturing efficiency and quality and improves time-to-market speed.

Discrete manufacturing is unable to be continuous as the final product is composed from many different inputs. Where oil can be produced from the continuous refining of petroleum, a car requires many different parts that come from various manufacturers and thus is unable to be continuous.

Engineering Change Notice (ECN)

An Engineering Change Notice (ECN) is an official notice in change management that a change has been approved. The ECN communicates the details of the approved change and authorises the manufacturer to implement the change to the production. The ECN is used to ensure that contract manufacturers and partners are producing products to standard when changes are made.

The ECN is issued when the change process begins, generally when a problem arises and is reported by a customer, manufacturing partner or internal stakeholder. The problem is then analysed and corrective action is determined.

Engineering Change Order (ECO)

The Engineering Change Order (ECO) is the documentation outlining the proposed change to the design, lists the product or parts affected and requests review and approval from the manufacturers. The ECO is used to make modifications to material, assemblies and subassemblies and other types of product information.

An engineering change order is also known as an engineering change notice, the document outlining the changes in production and product specifications to be used in the manufacturing process.

An ECO is issued when an error is found and corrective action is taken. It is also common for an ECO to be issued in technology manufacturing when an electronic component becomes obsolete or reaches the end of its life cycle.

An ECO may also be issued to reduce production costs when more affordable materials or components become available to be used in manufacturing after the initial production cycle.

Engineering Change Request (ECR)

An Engineering Change Request (ECR) is the change request listing proposed improvements or problems with components or assemblies. Generally, the ECR precedes the engineering change order (ECO). The ECR documents the reason for the change request and lists items in the bill of materials that may be impacted by the proposed change.

In change management, the ECR is the first step in enacting corrective action in the manufacturing process. The document details the proposed changes and the impact of the change on the error in the product. The issuance of the ECR is a formal process of reviewing and proposing a change to a product.

Electronic Design Automation (EDA)

Electronic Design Automation (EDA) are software tools used to develop integrated circuit systems and printed circuit boards. EDA is also referred to as electronic computer-aided design (ECAD). The tools work design flow that chip manufactures and designs used to design and analyse entire semiconductor chips. As a modern semiconductor chip can have billions of components, EDA tools are essential for their design and production of circuit systems and printed circuit boards.

Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) is a business strategy used to track activities like purchasing, inventory and orders. ERP is the ability to deliver an integrated suite of business applications to effectively model and analyse data across departments including finance, HR, distribution, manufacturing and the supply chain.

ERP applications automate administrative and operational business processes by monitoring and managing operational data in real-time. The data generally includes production capacity, raw materials inventory, current purchase orders and payroll. ERPs are often combined in a suite of applications allowing all departments to be monitored from a central database and eases information flow to stakeholders.

Feeder lines

Feeder lines are a special assembly line where pre-assembly tasks can be performed off the main production line. Performing pre-assembly off the main production line increases efficiency as fewer parts are needed in the main assembly line and there is greater availability of service-ready components in the main production area. The use of feeder lines improves quality and lessens the lead time of production.

Field Failure Request (FFR)

A Field Failure Request is a type of change request which details a problem or non-conformity with the product as observed in the use of the product by the end-user known as the 'field.' Products can fail for many reasons and are often not noticed in manufacturing and testing, by documenting field failure requests, manufactures can implement changes into the design or manufacturing process to avoid similar issues from occurring.

Form, Fit and Function (FFF)

The Form, Fit and Function is a framework description of an item's identifying characteristics. Each of the aspects helps engineers match parts to the needs of the products. Using this framework allows for

flexibility in change by allowing changes to be made without documentation so long as the changes align with the form, fit and function of the product.

Form refers to physical characteristics including shape, size, dimensions, weight and other uniquely distinguishable characteristics.

Fit is the ability of a product or subassembly to connect or become an essential part of another product. The fit allows parts to meet engineering tolerances that allow the product to be useful.

The function is the effective and reliable action a product or subassembly is designed to perform.

Good Manufacturing Practices (GMP)

Good Manufacturing Practices (GMP) is a system and set of guidelines and best practices for managing each aspect of production that impact the quality of a product. As part of quality assurance, good manufacturing practices ensure that standards and regulations are met and products perform to specifications without failure.

By following GMPs, manufacturers are able to show that products meet legal regulations, have been thoroughly tested and scrutinised and product defects have been documented and addressed.

Industry 4.0

Industry 4.0 is commonly referred to as the fourth industrial revolution. It is characterised as the name for the current trend of automation and data exchange in manufacturing technologies. Industry 4.0 bridged the gap between physical production and manufacturing and digital manufacturing.

Item master

The Item master is the record listing key information regarding inventory items. Commonly, item description, weight, dimensions, quantity on hand and cost of goods are listed. The item master helps construct the bill of materials and accurately assign costs to the manufacturing of products.

ISO 9000

The International Standards Organisation 9000 is an international quality-process auditing program. Based on a number of quality management principles that manufacturers adhere to ISO 9000 ensures consumers are consistently getting good quality products.

ISO 13485

International standards organisation 13485 is the international quality-process auditing program specific to the manufacturing of medical devices. The International Standards Organisation has implemented a set of best practices for the production of medical devices ensuring the highest quality of production and mitigating product failure.

ISO 14000

Pertaining to environmental management the International Standards Organisation 14000 set standards and guidelines for environmental management systems. This standard offers assurance to stakeholders that environmental impact is accurately being measured and improved.

Just-In-Time (JIT)

Just-in-Time (JIT) manufacturing is a technique to reduce setup times, inventory, and waste, reduce cycle time and improve efficiency in a manufacturing plant. In JIT management, raw materials are ordered to coincide with the production schedule minimising inventory on hand.

To effectively execute JIT manufacturing procedures and production forecasts need to be accurate and detailed to minimise waste. Synonyms with continuous-flow manufacturing, JIT is aimed at reducing production time within the system and improving response times to suppliers and consumers.

Kanban

Kanban, a Japanese term meaning billboard or signage, is a lean manufacturing method of managing and improving workflow across

human production. A Kanban approach aims to add value for the customer without increasing costs to the producer. This is accomplished by visualising the processes to balance demands with available capacity and avoiding bottlenecks and idle time within the system.

Kaizen

Kaizen is a Japanese business philosophy meaning 'continuous improvement.' The word refers to incremental improvements of manufacturing through a methodical process to create value and reduce waste along the production cycle.

The purpose of Kaizen is to understand that small changes in the present can have major impacts in the future. Oftentimes objectives of Kaizen include improving quality control standards, improving the efficiency of equipment and working towards just-in-time manufacturing.

Kitting

Kitting is a process where assemblers are given containers of all parts needed for the production of a product. Kitting eliminates the need for constant movement inventory and tools, as all items or subassemblies are placed into a kit for production. The kit is placed at the point of use through the production line where it will be used.

Kitting reduces production requirements and increases manufacturing efficiency by reducing materials handling and shipping costs as items needed for production are stored and shipped together under a single SKU. This also increases inventory control as kits are put together with the proper number of items and subassemblies need to meet the production quota.

Lead time

Lead time is the latency between a customer's initial purchase and the delivery of the product. It is summed up as the total time a customer must wait to receive a product after placing an order. Lead time can be broken down into specific intervals through the manufacturing process including order preparation, setup time, run time, production

time and inspection time. By breaking down lead time, managers can examine points in production where there are inefficiencies.

For products that are made-to-order, the lead time is the time between the order and the shipment of the final product that fulfils the order. Whereas for make-to-stock product lead time is the time between the order and when the product is received into the finished goods inventory.

Lean manufacturing

Lean manufacturing is a practice that aims to reduce wasted time, effort and other resources in the production process without sacrificing productivity and efficiency. Lean manufacturing is built off the idea that the reduction of waste can be more profitable than an increase in sales.

Waste can appear in many different cases including an overburden or inequality in workloads, wasted materials and unnecessary movement through the production process. By removing waste from the system manufacturing plants are able to improve quality, efficiency and profitability.

Made-to-spec

Made-to-spec is a term that describes a product that is made to the specification of an internal design or by a supplier.

Markup

A markup of price spread is the difference between the selling price of a product and the cost incurred to manufacture it. The markup is generally expressed as a percent over the cost incurred.

As part of the business model, the markup is added to cover the cost of production and generate a profit from the sales of products.

Manufacturing Change Order (MCO)

A Manufacturing Change Order (MCO) is a change order used to make a manufacturing change to a product. An MCO is not generally used to implement a design change to the product. Manufacturing change orders do not require a design change and are often

accompanied by an ECO (Engineering Change Order).

Manufacturing Change Request (MCR)

A Manufacturing Change Request (MCR) is a change request used to propose a new change to the manufacturing process that does not require a change in the design to the product.

Manufacturing cost

The manufacturing cost is the cost directly related to the production of a product. This includes direct and indirect labour, equipment and maintenance, manufacturing support and overhead. Manufacturing costs also include those that can be directly traced to the manufacturing of the product.

Manufacturing cycle time

The manufacturing cycle time is the time used in the production of a product. The manufacturing cycle time starts the moment a customer order arrives to the plant floor until the completion of all product manufacturing, assembly, and testing has been completed. The cycle time includes all processing times, wait and queue times and production. By detailing the average manufacturing cycle time, managers can analyse and understand reasons for lags or delays within the manufacturing system.

Manufacturing Execution System (MES)

Manufacturing execution systems (MES) are digital manufacturing systems used to document and trace the conversions of raw materials into finished products. MES provides data to be used in decision making for optimising the production process.

An MES manages functional aspects of production across the product life-cycle including materials usage, downtime, and overall equipment effectiveness (OEE).

Monument

A monument is any design, scheduling or production technology with scale requirements necessitating that designs, orders and products be brought to the machine to wait in queue for processing. Monuments serve many different types of products and as such lack the ability to manufacture in a continuous flow. A monument is the opposite of a right-sized machine that is specific to producing one type of product.

Material requirements planning (MRP)

Material requirements planning (MRP) is the computer-based process of preparing, scheduling and controlling inventory and raw materials to be purchased and used in the manufacturing process. MRP is a part of push manufacturing as raw materials are purchased based on forecasted demands.

MRP works backward from production utilising forecasted sales to determine raw materials and components needed to meet anticipated sales. Using this method it is important to understand the manufacturing cycle so raw materials arrive on time and to the right place of production.

Proper MRP is a crucial aspect in manufacturing as an abundance of unused inventory can negatively affect profitability and a short supply of inventory slows production.

New Product Development (NPD)

NPD or New Product Development is the process of conceptualising, designing, planning and commercialising a new product to be brought to market. NPD is referred to as product development. More broadly, new product development is the transformation of a market opportunity into a sellable product.

NPD requires an understanding of consumer needs, the nature of the market and competition. In order to maintain profitability firms must design products that have a competitive edge in the market.

NPD process

The New Product Development process is a disciplined set of tasks describing the means by which a company repetitively converts ideas into salable products or services.

The NPD process begins with idea generation and successful ideas are turned into prototypes to be tested. From testing a market strategy is generated to contribute to the successful launch of a new product.

Overall Equipment Effectiveness (OEE)

Overall Equipment Effectiveness (OEE) is a manufacturing best practice for measuring productivity in a plant. Measuring the utilisation of raw materials, time and machinery, OEE offers a percentage score, where 100% indicates firms are manufacturing products as efficiently as possible with no defects and no lag time. By measuring OEE, managers can assess the overall performance of the cycle and insights can be generated on how to best improve workflow.

Similarly, total effective equipment performance (TEEP) can be used to quantify OEE against total calendar hours rather than scheduled operating hours.

Original Equipment Manufacturer (OEM)

An OEM is the Original Equipment Manufacturer of a product that is sold by another company. The secondary seller of the product is known as the value-added reseller, as it changes the product or adds a service to add value to the original product for the consumer.

OEM's are typically business-to-business manufactures while the value-added seller market sells to end consumers.

Off-the-shelf

Off-the-shelf is a product that is sold by the manufacturer as it is produced with no additional changes or modifications. Products that are off-the-shelf there is no need for engineering design services or manufacturing

changes, the product is ready to be sold as it was originally designed.

Parent item

A parent item is a product that contains a secondary product or subassembly (child item) in its bill of materials. The relationship between product and subassembly is described as a parent-child relationship.

Product Data Management (PDM) system

Product Data Management System (PDM system) is a database system used in product lifecycle management to hold all CAD files, parts and assembly, models and product drawing.

The PDM system can be referred to as a 'work in progress vault' or file repository. Using a PDM system allows for all stakeholders to share a common understanding of the product life cycle and manufacturing processes.

Product Lifecycle Management (PLM)

Product Lifecycle Management is the management of product records, including bills of materials, specifications, CAD files, revisions and changes, from the initial design and prototype to the end-of-life delivery and service. Product lifecycle management integrates people, business systems, and processes into the core of a product.

Point of use

Point of use is a technique of distributing products and tools to the point in the manufacturing process that they will be used and are needed. The point of use increases efficiency in the manufacturing process by reducing unnecessary movement and time spent obtaining products or tools. By utilising point of use methods, manufacturing plants can reduce lead time, manufacturing cycle time and improve efficiency and potential profitability.

Poka-yoke

Is a Japanese term meaning 'mistake-proofing.' Poka-yoke is a system within manufacturing that reduces product defects by addressing human errors as they occur through the production cycle. By ensuring all proper conditions are met before moving to the next process in the manufacturing cycle, Poka-yoke helps prevent mistakes and defects from occurring in the first place.

Process control

Process control is the monitoring of the production process through software. Specifically, referring to the changes implemented to maintain production efficiency, safety and consistency through the monitoring of the entire system. As manufacturing systems can be complex, the digital process controlling manages production data in a way that human monitoring would fail.

Process manufacturing

Process manufacturing is also known as batch manufacturing is the production of products that are unable to be separated into physically distinct items. Products produced in process manufacturing are referred to as 'batches.' Examples of this include oil which cannot be separated into physically distinct products or identified by a serial number, but can be identified by the batch it was produced in. With process manufacturing the final product is unable to be disassembled into its original raw material.

Process manufacturing is the opposite of discrete manufacturing and thus better suited to continuous-flow manufacturing.

Product development cycle

Product development cycle or, as it is often called, time-to-market, is the period from when product design begins to the time that the final product becomes available for purchase. When introducing a new product to a market the product-development cycle is crucial to monitor, as being late to introduce products results in lost revenue and sales.

Product record

The Product record is a general term describing all design, manufacturing, quality, sales and information about a product. The Product record is critical in effective product life cycle management as the product record contains all information regarding product designs and manufacturing. Multiple product records may exist if the product is supplied by multiple parties at any point in the product life cycle.

Prototype

A prototype is a sample build of a product. The prototype precedes the initial run of the product and is typically intended to test high-risk aspects of the design and establish any potential flaw or errors in the design. Prototyping serves to produce a tangible model of a product that can be tested and manipulated rather than a theoretical version of a design.

Pull production

Pull production is the process in which products are made only when the customer has ordered or 'pulled' a product, and not before. By using pull production, manufacturing firms prevent building products that are not needed and holding unused inventory. Pull production is part of a lean manufacturing process by which waste can be reduced by avoiding the production of unnecessary items.

Push production

Opposite to pull production, push production is the process of manufacturing that uses market estimates rather than customer orders to initiate production. Push production is better suited for meeting market demand as in the system there will always be inventory available to be sold. As push production increases work-in-process and inventory on hand but is better suited for made-to-stock products.

Rapid prototyping

Rapid prototyping is a technique used to quickly produce a model of a part or assembly. Commonly, 3D printing or additive manufacturing is used to rapidly produce scale models. By using 3D printing prototypes more closely match the initial design and corrections to the design are more accurate in the final product. By using rapid prototyping technologies, engineers and designers are able to complete the final design for production without drastically affecting the time-to-market.

Redline

A redline is a marking of an assembly drawing or bill of materials used to indicate a modification or change in the process and manufacturing of a product.

Revision

Revision is a snapshot of a product, part, process, program, design or document at any moment in its development often in the bill of materials. A revision allows engineers to see all components that go into the manufacturing of a product as well as components that have gone into the product in different versions.

Revision control

Revision control is the process of tracking and documenting changes to a product, part, process, program, design or document.

Restriction of Hazardous Substances (RoHS)

Restriction of Hazardous Substances is a mandate issued by the European Union, which restrict the usage of six hazardous substances — lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers — in products sold within the EU. The restricted materials have been banned as they pollute landfills and contribute to occupational hazards in manufacturing and recycling.

Right-sizing

Right-sizing or 'right size machinery' is the process that challenges the complexity of the equipment. It examines how equipment fits into an overall vision for how work will flow through the factory. When using right-sized machinery, smaller, dedicated machines are used rather than large, multipurpose, batch-processing machines.

Right-sized machines are best used in cell manufacturing when a cell only produces one type of product.

Robotics

Robotics is the intersection of mechanical or electrical engineering and computer science used to design, construct, operate, and use robots. Robotics includes computer systems for control, sensory feedback, and information processing.

A robot is a programmable, multifunctional machine designed to move materials or parts, or specialised devices through various motions for the performance of a task.

Robots differ from machines as they contain sets of codes allowing for the autonomous completion of tasks. The code used in the programming of robots allows them to know when and how to carry out a task.

Return Material Authorisation (RMA)

Return Material Authorisation (RMA) is a financial and work order tracking key used to identify a returned item's origin. The RMA is the process where a customer returns an unneeded or damaged product to the supplier or manufacturer in exchange for a refund, replacement or credit to the consumer's account.

Supplier Corrective Action Request (SCAR)

Supplier Corrective Action Request (SCAR) is a change request that describes an issue with a part, process, or component of a product from a manufacturer that asks for a resolution.

A SCAR is a consumer requisition asking for corrective action or preventative action to be

taken to fix an issue or non-conformity of a product.

In engineering quality management, the actions taken to fix the root problem as described in the SCAR are documented to ensure the problem or non-conformity doesn't happen again.

Six Sigma

Six Sigma is a data-driven approach and quality measure for eliminating product defects in manufacturing. It is one method of preparing and controlling the compliance of processes and products with quality standards. A six sigma process guarantees that production is defect-free 99.99966% of the time.

Six Sigma seeks to increase quality control by addressing issues within the manufacturing process that cause defects. By using empirical data and statistical models Six Sigma methods can produce a better and more robust manufacturing process.

Smart manufacturing

Smart manufacturing is a term that utilises computer-integrated manufacturing, adaptability, design changes and digital manufacturing. The goal of smart manufacturing is to reduce costs from effective management, productivity and processes. Smart manufacturing makes use of real-time data processing, innovative process modelling and simulations, and control to successfully manage energy and material use through the manufacturing process.

Single-minute exchange of dies (SMED)

Single-minute exchange of dies (SMED) is a method of lean manufacturing to reduce waste during the manufacturing cycle. SMED provides efficient and quick ways of converting from one product to the next. This process of change over is a key to reducing manufacturing cycle time, uneven production flow and increasing efficiency along the system.

Single-minute does not mean that production change only takes one minute, but rather that the change over time ideally takes less than 10 minutes, or a single-digit minute. SMED is critical for reducing machine downtime, increasing responsiveness to customer demand, and smoothing out the production process.

Standard Operating Procedure (SOP)

Standard Operating Procedure (SOP) is a written document or instruction detailing the steps and activities included in a process or procedure. Standards of operation increase efficiency through the detailed instructions of a process. By following these standards, managers can ensure manufacturing regulations are met while increasing performance and quality assurance.

Supply chain

The supply chain is the sequence of processes involved in the manufacturing, transportation and selling of a product. Supply chain activities include all entities involved in the manufacturing of raw materials into a final product to be sold to the end consumer.

Takt time

Takt time is a manufacturing term used to help describe the rate of production to sales. It is the rate at which customers require finished units. The takt time is the time interval between the beginning of the manufacturing of one first and the start of the next.

Quality Management System

A Quality Management System documents the aspects of a company's design and operational controls. The system includes monitoring, issue reporting, improvements and changes, in order to ensure that product design and manufacturing are repeatable. Quality management systems help ensure that production is meeting consumer and regulatory requirements and improvements in the process are continuously being made.

Value chain

The value chain is the process of turning an idea into a marketable product. In monitoring the value chain, engineers and managers can deliver the most valuable products to consumers at the lowest cost possible. The main goal of a value chain is to create a competitive advantage by increasing the value add of a product while keeping costs minimal.

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