
GLOSSARY

ABC Classification: Classification of inventory in three groups: an A group comprising items with a less volume and large rupee value, a B group comprising items with moderate volume and moderate rupee value, and C group comprising items with a large volume and small volume.

Acceptance sampling: A statistical quality control technique used in deciding to accept or reject a shipment of input or output.

Activity Chart: A graphical tool to analyze and time the small, physical actions of workers and machine in performing a routine, repetitive, worker-machine task so that idle time can be identified.

Aggregate capacity planning: It is the process of testing the feasibility of aggregate output plans and evaluating overall capacity utilisation.

Aggregate production (output) planning: The process of determining output levels of product groups over the coming six to eighteen months on a weekly or monthly basis.

Automated guided vehicles systems: An Automated or Automatic Guided Vehicle System (AGVS) is a materials handling system that uses independently operated, self-propelled vehicles that are guided along defined pathways in the floor.

Automated storage/retrieval systems: An Automated Storage/Retrieval System (AS/RS) is defined by the Materials Handling Institute as, "A combination of equipment and controls which handles, stores and retrieves materials with precision, accuracy and speed under a defined degree of automation".

Automation is a technology concerned with the application of mechanical, electronic, and computer based systems to operate and control production.

Backorders: Outstanding or unfilled customer orders.

Backward Scheduling: Determining the start and finish times for waiting jobs by assigning them to the latest available time slot that will enable each job to be completed just when it is due, but not before.

- Batch production:** American Production and Inventory Control Society (APICS) as a form of manufacturing in which the job pass through the functional departments in lots or batches and each lot may have a different routing define batch production. It is characterized by the manufacture of limited number of products produced at regular intervals and stocked awaiting sales.
- Bill of Material:** A document describing the details of an item's product buildup, including all component items, their buildup sequence, the quantity needed for each, and the work centers that perform the buildup sequence.
- Bottleneck Operation:** The station on an assembly line that requires the longest task time.
- Breakdown (reactive) maintenance:** Breakdown maintenance is basically the 'run it till it breaks' maintenance mode. No actions or efforts are taken to maintain the equipment as the designer originally intended to ensure design life is reached.
- Break-Even Analysis:** A graphical and algebraic representation of the relationships among volume of output, cost, and revenues.
- Break-Even-Point:** The level of output volume for which total cost equals total revenues.
- Capacity:** A facility's maximum productive capability, usually expressed as volume of output per period of time.
- Capacity planning:** Design of the production system involves planning for the inputs, conversion process and outputs of production operation.
- Capacity requirement planning:** Capacity Requirements Planning (CRP) is an iterative process of modifying the MPS or planned resources to make capacity consistent with the production schedule.
- Carrying (holding) Costs:** Costs of maintaining the inventory warehouse and protecting the inventoried items.
- Cellular layout** The arrangement of a facility so that equipment used to make similar parts or families of parts is grouped together.
- Chance event** An event leading potentially to several different outcomes, only one of which will definitely occur; the decision maker has no control over which outcome will occur.
- Codification** is a process of representing each item by a number, the digit of which indicates the group, the sub-group, the type and the dimension of the item.
- Combination layout:** This is also called the hybrid or mixed type of layout usually a process layout is combined with the product layout. For example, refrigerator manufacturing uses a combination layout. The process or functional layout is used to produce various operations like stamping, welding, heat treatment are carried out in different work centres as per the requirement. The final assembly of the product is done in a product type layout.
- Computer integrated manufacturing:** The term Computer Integrated Manufacturing (CIM) has been coined to denote the pervasive use of computers to design the products, plan the production, control the operations, and perform the various business related functions needed in a manufacturing firm.
- Computer-aided design (CAD)** Computer software programs that allow a designer to carry out geometric transformations rapidly.

Computer-aided manufacturing (CAM) Manufacturing systems utilizing computer software programs that control the actual machine on the shop floor.

Computer-integrated manufacturing (CIM) Computer information systems utilizing a shared manufacturing database for engineering design, manufacturing engineering, factory production, and information management.

Consumer's risk (type II error) The risk or probability of incorrectly concluding that the conversion process is in control.

Continuous production: Production facilities are arranged as per the sequence of production operations from the first operations to the finished product. The items are made to flow through the sequence of operations through material handling devices such as, conveyors, transfer devices etc.

Control chart: A chart of sampling data used to make inferences about status of a conversion process.

Controlling: Activities that assure that actual performance is in accordance with planned performance.

Enterprise asset management (EAM): Enterprise asset management is an information management system that connects all departments and disciplines within a company making them an integrated unit.

Ergonomics (Human engineering): ILO defines human engineering as, "The application of human biological sciences along with engineering sciences to achieve optimum mutual adjustment of men and his work, the benefits being measured in terms of human efficiency and well-being."

Factory building: Factory building is a factor, which is the most important consideration for every industrial enterprise. A modern factory building is required to provide protection for men, machines, materials, products or even the company's secrets.

Fixed automation is a system in which the sequence of processing (or assembly) operations is fixed by the equipment configuration.

Fixed position layout: This is also called the project type of layout. In this type of layout, the material, or major components remain in a fixed location and tools, machinery, men and other materials are brought to this location. This type of layout is suitable when one or few pieces of identical heavy products are to be manufactured and when the assembly consists of large number of heavy parts, the cost of transportation of these parts is very high.

Flexible automation is an extension of programmable automation. A flexible automated system is one that is capable of producing a variety of products (or parts) with virtually no time lost for changeovers from one product to the next.

Flow diagram: Flow diagram is a drawing, of the working area, showing the location of the various activities identified by their numbered symbols and are associated with particular flow process chart either man type or machine type.

Flow process chart: Flow process chart gives the sequence of flow of work of a product or any part of it through the work centre or the department recording the events using appropriate symbols. It is the amplification of the operation process chart in which operations; inspection, storage, delay and transportation are represented.

Group layout: A grouping of equipment for performing a sequence of operations on family of similar components. Group Technology (GT) is the analysis and comparisons of items to group them into families with similar characteristics.

Infinite loading: Assigning jobs to work centers without considering the work center's capacity (as if the capacity were infinite).

Input/output control: Activities to monitor actual versus planned utilization of a work center's capacity.

Inspection is the most common method of attaining standardization, uniformity and quality of workmanship. It is the cost art of controlling the production quality after comparison with the established standards and specifications. It is the function of quality control.

100% Inspection: This type will involve careful inspection in detail of quality at each strategic point or stage of manufacture where the test is involved is non-destructive and every piece is separately inspected.

Inventory refers to the materials in stock. It is also called the idle resource of an enterprise. Inventories represent those items which are either stocked for sale or they are in the process of manufacturing or they are in the form of materials which are yet to be utilised.

Inventory control is a planned approach of determining what to order, when to order and how much to order and how much to stock so that costs associated with buying and storing are optimal without interrupting production and sales.

Job shop production: Job shop production are characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed time and cost.

Just-in-time (JIT): A manufacturing system whose goal it is to optimize process and procedures by continuously pursuing waste reduction.

Kaizen The Japanese concept of continuous improvement in all things.

Kanban: Literally, a "visual record;" a method of controlling materials flow through a JIT manufacturing systems by using cards to authorize a work station to transfer or produce materials.

Layout Physical location or configuration of departments, work centers, and equipment in the conversion process; spatial arrangement of physical resources used to create the product.

Lead-time: The time passing between ordering and receiving goods.

Lean maintenance is the application of lean principle in maintenance environments, which recognizes seven forms of waste in maintenance.

Load-distance model: An algorithm for laying out work centers to minimize product-flow, based on the number of loads moved and the distance between each pair of work centers.

Mass production: Manufacture of discrete parts or assemblies using a continuous process are called mass production. This production system is justified by very large volume of production. The machines are arranged in a line or product layout. Product and process standardization exists and all outputs follow the same path.

Master production scheduling (MPS): MPS is a schedule showing week-by-week how many of each product must be produced according to customer orders and demand forecasts.

Material handling: Haynes defines, “Material handling embraces the basic operations in connection with the movement of bulk, packaged and individual products in a semi-solid or solid state by means of gravity manually or power-actuated equipment and within the limits of individual producing, fabricating, processing or service establishment”.

Material requirements planning: Material Requirement Planning (MRP) is a system of planning and scheduling the time phased material requirements for releasing materials and receiving materials that enable the master production schedule to be implemented.

Materials management is a function, which aims for integrated approach towards the management of materials in an industrial undertaking. Its main object is cost reduction and efficient handling of materials at all stages and in all sections of the undertaking. Its function includes several important aspects connected with material such as, purchasing, storage, inventory control, material handling, standardisation etc.

Mathematical modelling: Creating and using mathematical representations of management problems and organizations to predict outcomes of proposed courses of action.

Method study is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective methods and reducing costs.

According to British Standards Institution (BS 3138): “Method study is the systematic recording and critical examination of existing and proposed ways of doing work as a means of developing and applying easier and more effective methods and reducing cost.”

Methods time measurement: A widely accepted form of predetermined time study.

Micro-motion study: Micro-motion study provides a technique for recording and timing an activity. It is a set of techniques intended to divide the human activities in a groups of movements or micro-motions (called Therbligs) and the study of such movements helps to find for an operator one best pattern of movements that consumes less time and requires less effort to accomplish the task.

Multiple activity chart: It is a chart where activities of more than subject (worker or equipment) are each recorded on a common time scale to show their inter-relationship.

Obsolete items are these materials and equipments which are not damaged and which have economic worth but which are no longer useful for the company’s operation owing to many reason such as changes in product line, process, materials, and so on.

Operating characteristic (OC) curve: Given a sampling plan, the graph of the probability of accepting a shipment as a function of the quality of the shipment.

Operating system: An operating system (function) of an organization is the part of an organization that produces the organization’s physical goods and services.

Operation process chart: It is also called outline process chart. An operation process chart gives the bird’s eye view of the whole process by recording only the major activities and inspections involved in the process.

Operations management: The set of interrelated management activities, which are involved in services management is called as **operations management**.

- Operations planning and scheduling systems:** Operations planning and scheduling systems concern the volume and timing of outputs, the utilisation of operations capacity at desired levels for competitive effectiveness.
- Order quantity:** As part of the operating doctrine, the amount of stock that behavioral sciences.
- Parameters of purchasing:** The success of any manufacturing activity is largely dependent on the procurement of raw materials of right quality, in the right quantities, from right source, at the right time and at right price popularly known as five 'R's' of the efficient purchasing.
- Pegging** The process of tracing through the MRP records and all levels in the product structure to identify how changes in the records of one component will affect the records of one component will affect the records of other components.
- Percent defective:** The percent of units that is defective.
- Plant layout:** Plant layout refers to the physical arrangement of production facilities. It is the configuration of departments, work centres and equipment in the conversion process. It is a floor plan of the physical facilities, which are used in production.
According to Moore, "Plant layout is a plan of an optimum arrangement of facilities including personnel, operating equipment, storage space, material handling equipment and all other supporting services along with the design of best structure to contain all these facilities".
- Predetermined time study:** A work measurement technique that involves observing or thinking through a job, recording job elements, recording reestablished motion units, and calculating a performance standard.
- Predictive maintenance:** Predictive maintenance can be defined as, "Measurements that detect the onset of a degradation mechanism, thereby allowing causal stressors to be eliminated or controlled prior to any significant deterioration in the component physical state. Results indicate current and future functional capability".
- Preventive maintenance:** Preventive maintenance can be defined as follows: Actions performed on a time or machine-run-based schedule that detect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life through controlling degradation to an acceptable level.
- Preventive maintenance (PM):** JIT Philosophy espousing daily, extensive checkups and repairs for production equipment, lengthening their useful life well beyond the traditional time frame.
- Process design:** Process design is a macroscopic decision-making of an overall process route for converting the raw material into finished goods.
- Process layout:** This layout is recommended for batch production. All machines performing similar type of operations are grouped at one location in the process layout *e.g.*, all lathes, milling machines, etc., are grouped in the shop will be clustered in like groups.
- Procurement costs:** Costs of placing an order, or setup costs if ordered items are manufactured by the firm.
- Producer's risk (type I error)** The risk or probability of incorrectly concluding that the conversion process is out of control.

Product development and design is the process of developing a new product with all the features, which are essential for effective use in the field, and designing it accordingly. At the design stage, one has to take several aspects of design like, design for selling, design for manufacturing and design for usage.

Product layout: In this type of layout, machines and auxiliary services are located according to the processing sequence of the product. If the volume of production of one or more products is large, the facilities can be arranged to achieve efficient flow of materials and lower cost per unit. Special purpose machines are used which perform the required function quickly and reliably.

Product life cycle: Pattern of demand throughout the product's life; similar patterns and stages can be identified for the useful life of a process.

Production management deals with decision-making related to production processes so that the resulting goods or services are produced according to specifications, in the amount and by the schedule demanded and out of minimum cost.

Production planning and control can be defined as, "the direction and coordination of firms' resources towards attaining the prefixed goals".

Production planning and control: Production planning and control can be defined as the process of planning the production in advance, setting the exact route of each item, fixing the starting and finishing dates for each item, to give production orders to shops and to follow up the progress of products according to orders.

The principle of production planning and control lies in the statement 'First Plan Your Work' and then 'Work on Your Plan'.

Production system: The production system of an organization is that part, which produces products of an organization. It is that activity whereby resources, flowing within a defined system, are combined and transformed in a controlled manner to add value in accordance with the policies communicated by management.

Productivity: Efficiency; a ratio of outputs to inputs. Total factor productivity is the ratio of outputs to the total inputs of labor, capital, materials, and energy; partial factor productivity is the ratio of outputs to one, two or three of these inputs.

Programmable automation, the production equipment is designed with the capability to change the sequence of operations to accommodate different product configurations.

Purchasing is an important function of materials management. In any industry purchase means buying of equipments, materials, tools, parts etc. required for industry.

Purchasing: Activities relating to procuring materials and supplies consumed during production.

Quality is a measure of how closely a good or service conforms to specified standard.

Quality standards may be any one or a combination of attributes and variables of the product being manufactured. The attributes will include performance, reliability, appearance, commitment to delivery time, etc.

Quality: The degree to which the design specifications for a product or service are appropriate to its function and use, and the degree to which a product or service conforms to its design specifications.

- Quality and control:** Different meaning could be attached to the word quality under different circumstances. The word quality does not mean the quality of manufactured product only. It may refer to the quality of the process (*i.e.*, men, material, and machines) and even that of management.
- Quality control:** Quality Control (QC) may be defined as “a system that is used to maintain a desired level of quality in a product or service”. Quality control can also be defined as “that industrial management technique by means of which product of uniform acceptable quality is manufactured”. It is the entire collection of activities that ensures that the operation will produce the optimum quality products at minimum cost.
- Quality circle (QC):** A small group of employees who meet frequently to resolve company problems.
- Recorder point:** As part of the operating doctrine, the inventory level at which stock should be recorded.
- Reliability:** Reliability is the probability of survival under a given operating environment. For example, the time between consecutive failures of a refrigerator where continuous working is required is a measure of its reliability. If this time is more, the product is said to have high reliability.
- Reliability centered maintenance:** Reliability Centered Maintenance (RCM) is defined as “a process used to determine the maintenance requirements of any physical asset in its operating context”.
- Resource requirement planning:** Resource requirements planning (rough-cut capacity planning) is the process of testing the feasibility of master production schedule in terms of capacity. This step ensures that a proposed MPS does not inadvertently overload any key department, work centre, or machine, making the MPS unworkable.
- Rough-cut capacity planning:** The process of testing the feasibility of master production schedules in terms of capacity.
- Routing:** The processing steps or stages needed to create a product or to do a job.
- Sampling inspection:** In this method randomly selected samples are inspected. Samples taken from different patches of products are representatives.
- Scheduling** is the function of coordinating all of the logistical issue around the issues regarding the execution phase of the work. Scheduled of maintenance jobs basically deals with answering two questions—‘Who’ and ‘When’ of job, *i.e.*, “who would do the job” and “when the job would be started and done”.
- Scrap** is defined as process wastage, such as turnings, borings, sprues and flashes. They may have an end-use within the plant having commercial values. Hence, should be disposed of periodically.
- Shortest-processing-time rule (SPT)** A priority rule that gives top priority to the waiting job whose operation time at a work center is shortest.
- SIMO chart:** Simultaneous Motion Cycle chart (SIMO chart) is a recording technique for micro-motion study. A SIMO chart is a chart based on the film analysis, used to record simultaneously

on a common time scale the Therbligs or a group of Therbligs performed by different parts of the body of one or more operators.

Six sigma maintenance: It is the application of six sigma principles in maintenance. Six sigma is a maintenance process that focuses on reducing the variation in business production processes.

Statistical process control: Statistical Process Control (SPC) is the application of statistical techniques to determine whether the output of a process conforms to the product or service design.

Stores management: This involves physical control of materials, preservation of stores, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of stores records, proper location and stocking.

String diagram: The string diagram is a scale layout drawing on which, length of a string is used to record the extent as well as the pattern of movement of a worker working within a limited area during a certain period of time.

Surplus items are those materials and equipments which have no immediate use but have accumulated due to faulty planning, forecasting and purchasing. However, they have a usage value in future.

Total quality management is an effective system of integrating the quality development, quality maintenance and quality improvement efforts of various groups in an organization so as to enable marketing, engineering, production and service at the most economical levels which allow for full customer satisfaction.

Two handed process chart: A two handed (operator process chart) is the most detailed type of flow chart in which the activities of the workers hands are recorded in relation to one another. The two handed process chart is normally confined to work carried out at a single workplace. This also gives synchronised and graphical representation of the sequence of manual activities of the worker.

Value analysis is defined as “an organized creative approach which has its objective, the efficient identification of unnecessary cost—cost which provides neither quality nor use nor life nor appearance nor customer features”.

Work measurement is the application or techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level or performance.

Work-study is a generic term for those techniques, method study and work measurement which are used in the examination of human work in all its contexts. And which lead systematically to the investigation of all the factors which affect the efficiency and economy of the situation being reviewed, in order to effect improvement.