

Planning and Design of Integrated Quality Control System Using Computer Integrated Manufacturing

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Abstract: In this research paper, a methodology for planning and design of CIM systems is developed by

In this research, a methodology for planning and design of Integrated Quality Control System using Computer Integrated Manufacturing a methodology is developed by presented as solutions to manufacturing organizations which need to perform well in all customer-related dimensions simultaneously. we introduce the computer integrated manufacturing concept and the information system structure preponderance ascendancy. We then present quality management activity in flexible manufacturing system. CIM technologies providing such benefits as more frequent production changes. Reduced inventory level, improved ability of producing complex parts with a high degree of accuracy and repeatability, considerable savings in scrap and rework, lower manufacturing lead-times

Keywords-Planning, design, CIM, Data management.

I- INTRODUCTION

In this paper a general In CIM, there are three important development stages, namely, planning, design and implementation. Powerful modeling methodologies and techniques are requested to achieve the requirements of these development stages. To understand the concept of planning, design and implementation, the question “what are systems planning, design and implementation?” must be answered. This section is concerned with reviewing the previous research that has been carried out in modeling, planning and design of CIM due to the wide research trend in the areas of computer-based systems in manufacturing. CIM includes all the functional areas of manufacturing organization. Each functional area should be integrated with the others. The major

components of CIM are Computer Aided Design (CAD), Computer Aided Process Planning (CAPP), Computer Aided Manufacturing (CAM), Computer-Aided Quality Control (CAQ) and Production Planning and Control (PPC).

By reviewing the literature, it has been found that the inadequate planning and design of CIM and lack of proper modeling methods and techniques represent the fundamental problems of this advanced philosophy. Lack of proper planning for CIM not only hampers its effectiveness when fully implemented, but also produces inadequate insights into the benefits that can be achieved [Sarkis and Lin, 1994]. Effective organizational plans must exist to achieve the desired business goals. The planning step is important in traditional manufacturing system projects, so due to the higher investment and design complexity of CIM, it is essential to improve the planning aspects of the CIM at the early stages of design. Inadequate planning of CIM strategy causes critical problems in decision-making for CIM development and implementation. A formal CIM plan is one of the factors ranked as important and of significant help to CIM implementation [Fossum and Ettl, 1990].

II-METHODOLOGY

2.1 FUNCTIONS IN MANUFACTURING

For any of the three sorts of generation, there are certain basic capacities that must be carried out to change over raw materials into finished item. For a firm engaged in making discrete items, the capacities are :

- Processing
- Assembly

- Material handling and storage
- Inspection and test
- Control

The initial four of these capacities are the physical activities that “touch” the item as it is being made. Processing and assembly are operations that add value to the item. The third and fourth capacities must be performed in a manufacturing plant however they don’t add value to the item. The figure 6 demonstrates the model of the elements of manufacturing in factory.

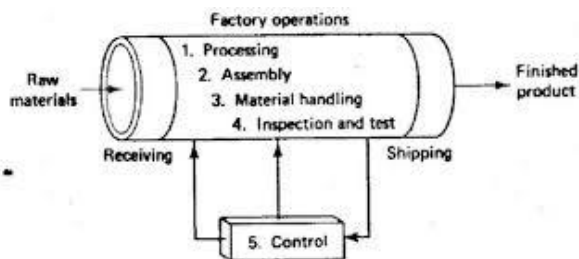


Figure 1.1: Model of the factory showing five functions of manufacturing

Processing operations:

Processing operations transform the item from one state of fruition into a more advance state of finishing. Processing operations can be classified into one of the following four categories:

- Basic process
- Secondary processes
- Operations to enhance physical properties
- Finishing operations

Basic processes are those which give the work material its initial form. Metal casting and plastic molding are examples. In both cases, the raw materials are changed over into the basic geometry of the fancied item. Secondary processes take after the basic process and are performed to give the work part its final wanted geometry. Examples in this category include machining (turning, drilling, milling, and so on) and squeeze working operations (blanking, forming, and drawing, and so on). Operations to enhance physical properties don’t recognizably change the physical geometry of the work part. Instead, the physical properties of the material are enhanced somehow. Heat-treating operations to strengthen metal pans and preshrinking utilized as a part of the garment industry are examples in this category. Finishing operations are the final processes performed on the work part. Their motivation is, for example, to enhance the appearance, or to give a defensive coating on the part. Examples in this fourth category include polishing, painting, and chrome plating.

Figure 6 shows an input/yield model of a typical processing operation in manufacturing. Most manufacturing processes require five inputs.

- Raw materials
- Equipment
- Tooling installations
- Energy (Electrical vitality)
- Labor

Assembly operations: Assembly and joining processes constitute the second major kind of manufacturing operation. In assembly., the distinguishing feature is that tow or more separate components are joined together. Included in this category are mechanical fastening operations. Which make utilization of screws, nuts, bolts, and so on, and joining processes, such as welding, brazing, and soldering in the fabrication of an item, the assembly operations take after the processing operations.

Material handling and storage :

A means of moving and storing materials between the processing and assembly operations must be given. In most manufacturing plants, materials invest more energy being moved and stored than being processed. At times, the majority of the labor cost in the factory is expended in handling, moving, and storing materials. It is important that this capacity be carried out as proficiently as conceivable.

Inspection and testing: Inspection and testing are generally considered part of quality control. The motivation behind inspection is to determine whether the manufactured item meets the established outline standards and specifications, for example, inspection examines whether the actual dimensions of a mechanical part are within the tolerances indicated on the engineering drawing for the part and testing is generally worried with the functional specifications of the final item rather than the individual parts that go into the item. Control: The control work in manufacturing includes both the regulation of individual processing and assembly operations, and the management of plant-level activities. Control at the process level involves the achievement of certain performance goals by appropriate manipulation of the inputs to the process. Control at the plant level includes compelling utilization of labor, maintenance of the gear, moving materials in the factory, shipping results of good quality on timetable, and keeping plant operating expenses at the minimum level conceivable. The manufacturing control work at the plant level speaks to the major point of intersection between the physical operations in the factory and the information-processing activities that happen underway.

2.2 Plant layout

In addition to the organizational structure, a firm engaged in manufacturing- should also be worried with its physical facilities. The term plant layout alludes to the arrangement of these physical facilities in a creation plant. A layout suited to steam sort mass generation is not appropriate for occupation shop creation. And the other way around. There are three principal sorts of plant layout associated with traditional creation shops.

- Fixed-position layout
- Process layout
- Product-stream layout

1. FIXED-POSITION LAYOUT:

In this kind of layout, the expression “settled position” alludes to the item. Because of its size and weight, the item remains in one location and the hardware utilized as a part of its fabrication is conveyed to it. Large aircraft assembly and shipbuilding, are examples of operations in which settled position layout is used. As item is large, the development gear and workers must be moved to the item. This sort of arrangement is often associated with occupation shops in which complex items are fabricated in low quantities.

2. PROCESS LAYOUT:

In a process layout, the generation machines are arranged into gatherings according to general kind of manufacturing process. The advantage of this kind of layout is its adaptability. Diverse parts, each requiring its own particular one of a kind grouping of operations, can be steered through the separate departments in the best possible order.

3. PRODUCT-FLOW LAYOUT:

Preparations machines are arranged according to succession of operations. On the off chance that a plant specializes in the creation of one item or one class of item in large volumes, the plant facilities ought to be arranged to deliver the item as effectively as conceivable with this kind of layout, the processing and assembly facilities are placed along the line of stream of the item. As the name infers, this sort of layout is appropriate for stream sort mass generation. The arrangement of facilities within the plant is relatively inflexible and is warranted just when the creation quantities are sufficiently large to legitimize the investment.

2.3 PC INCORPORATED ASSEMBLING SYSTEMS :

Today in order to be competitive in market and to improve products and processes, manufacturing organizations need to utilize proper technologies.

Technologies that integrate all functions are including marketing, product design, process plan, manufacturing, management, customers and suppliers. Manufacturing organization should be capable to produce competitive products in characterized as products with high levels of design, technologically complex and innovative products, reliable, affordable., and Newer, better products, products that solve a variety of society’s problems. The evolution of engineering design and manufacturing is based on man’s effort to change and improve himself, society and environment. Design, process planning and manufacturing are three related activities that date from the early days of human creation. If people require new goods owing to social conditions, they have to improve existing product, or even invent new products to suit their needs. When more than one person is involved integration, communication and cooperation become necessary. In traditional product development, design is not really separated from process planning and manufacturing phase.

The computer assumes a critical part incorporating the accompanying utilitarian regions of a CIM framework:

Part and item outline: there are four stages that are essential partially and item outline they incorporate preparatory outline, refinement, investigation, and execution.

Apparatus and installation plan: Tooling engineers utilizing computer- supported plan (computer aided design) devices to build up the frameworks or apparatuses that create the parts.

Prepare arranging: the Procedure organizer plans an arrangement that frameworks the courses, operations, machines, and apparatuses required. He or she additionally endeavors to limit cost, fabricating time, and machine sit without moving time while expanding profitability and quality.

Programming: Programming of numerically controlled machines and material taking care of frameworks.

Generation arranging: there are two ideas utilized here including materials necessity arranging (MRP) and machine stacking and booking

Machining: This is a piece of the genuine assembling process. Including turning, penetrating, and confront processing for metal evacuation operations. Get together. After they are fabricated, parts and subassemblies are assembled with different parts to make a completed item or subassembly.

Upkeep: Computers can screen, intercede, and even right machine breakdowns and additionally quality issues inside assembling. Quality control. This includes three stages including framework plan, parameter outline, and resistance outline. Assessment. This stage figures out

whether there have been mistakes and quality issues amid the assembling of the item

Capacity and recovery: These assignments include crude materials, work- in- process stock, completed products, and hardware.

This methodological approach is connected to all exercises from the outline of the item to client bolster in an incorporated way, utilizing different strategies, means and procedures with a specific end goal to accomplish generation change, cost diminishment, satisfaction of planned conveyance dates, quality change and aggregate adaptability in the assembling framework. CIM requires each one of those connected with an organization to include absolutely during the time spent item advancement and produce. In such an all-encompassing methodology, monetary, social and human perspectives have and indistinguishable significance from specialized angles, CIM likewise incorporates the entire part of empowering advancements including all out quality administration, business handle reengineering, simultaneous designing, work process robotization, venture asset arranging and adaptable assembling. The challenge before the manufacturing engineers is illustrated in Fig. 1.2

2.4 CIM HARDWARE AND CIM SOFTWARE

CIM Hardware contains the accompanying:

Computers, controllers, CAD/CAM frameworks, work stations/ terminals, information section terminals, scanner tag peruses, RFID labels, printers, plotters and other fringe gadgets, modems, links, connectors and so on.,

Manufacturing hardware, for example, CNC machines or automated work focuses, mechanical work cells DNC/FMS frame works, work taking care of and apparatus taking care of gadgets, stock piling gadgets, sensors, shop floor information accumulation gadgets, review machines and so forth.

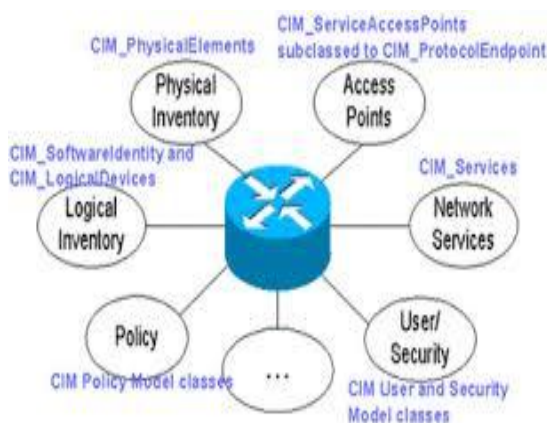


Figure 1.2 working framework of Hardware and software of CIM

CIM Programming involves PC projects to complete the accompanying capacities

- Materials Handling
- Device Drives
- Process Planning
- Manufacturing Facilities Planning
- Work Flow Automation
- Business preprocess Engineering
- Network Management
- Quality Management
- Management Information System
- Sales
- Marketing
- Finance Database Management Modeling and Design
- Analysis
- Simulation
- Communications
- Monitoring
- Production Control
- Manufacturing Area Control
- Job Tracking
- Inventory Control
- Shop Floor Data Collection
- Order Entry

2.5 EVOLUTION OF COMPUTER INTEGRATED MANUFACTURING

The primary real advancement in machine control is the Numerical Control (NC), Showed at MIT in 1952. Early Numerical Control Systems were all fundamentally hardwired frameworks, since these were worked with discrete frameworks or with later original coordinated chips. Early NC machines utilized paper tape as an info medium/.. Each NC machine was fitted with a tape peruse to peruse paper tape and exchange the program to the memory of the machine instrument obstruct by square. Centralized computer PCs was utilized to control a gathering of NC machines by mid 60's. this course of action was then called direct Numerical Control (DNC) as the PC avoided the tape peruses to exchange the program information to the machine controller. By late 60's smaller than normal PCs were by and large ordinarily used to control NC machines. At this stage NC turned out to be genuinely delicate set up with the offices of mass program stockpiling, disconnected altering and programming rationale control and handling. This advancement is called computer Numerical Control (CNC). Since 70's numerical controllers are being outlined around chip, bringing about minimized CNC frameworks. A further

improvement to this innovation is the circulated numerical control (additionally called DNC) In which handling of NC program is completed in various PCs working at various progressive levels regularly from centralized computer have PCs to plant PCs to the machine controller. Today the CNC frameworks are worked around capable 32 bit and 64 bit microchips. PC based frameworks are additionally turning out to be progressively prevalent.

PC Integrated Manufacturing (CIM) is viewed as a characteristic development of the innovation of CAD/CAM which without anyone else advanced by the mix of CAD and CAM. Massachusetts Institute of Technology (MIT, USA) is credited with spearheading the advancement in both CAD and CAM. The need to meet the outline and assembling prerequisites of aviation businesses after the second world war required the improvement these advancements the assembling innovation accessible amid 40's and mid 50's couldn't meet the outline and assembling challenges emerging out of the need to create advanced airplane and satellite dispatch vehicles. This incited the US Air force to approach MIT to create reasonable control frameworks, drives and programming procedures for machine instruments utilizing electronic control.

Fabricating engineers additionally began utilizing PCs for such assignments like stock control, request determining, generation arranging and control and so forth. CNC innovation was adjusted in the advancement of co-ordinate measuring machine's (CMMs) which robotized assessment. Robots were acquainted with mechanize a few assignments like machine stacking , materials taking care of , welding painting and gathering. Every one of these advancements prompted to the development of adaptable assembling cells and adaptable assembling frameworks in late 70's. Development of Computer Aided Design (CAD), then given was to oblige the geometric demonstrating needs of vehicle and aeronautical enterprises. The improvements in PCs outline workstations, realistic cards show gadgets and realistic info and yield gadgets amid the most recent then years have been extraordinary. This combined with the advancement of working framework with realistic UIs and effective intuitive (easy to use) programming bundles for displaying, drafting, investigation and enhancement gives the vital instruments to robotize the plan procedure. Computer aided design in reality owes its improvement to the APT dialect extend at MIT in mid 50's. A few clones of APT were acquainted in 80's with consequently create NC codes from the geometric model of the part. Presently,

one can display, draft, break down, recreate, adjust, streamline and make the NC code to produce a segment and reenact the machining operation sitting at a PC workstation. On the off chance that we audit the assembling situation amid 80's we will find that the assembling is described by a couple of islands of mechanization. On account of outline, the assignment is all around computerized. On account of fabricate, CNC machines, DNC frameworks, FMC, FMS and so on give firmly controlled mechanization frameworks. Likewise PC control has been actualized in a few zones like assembling asset arranging, bookkeeping, deals, showcasing and buy. However the maximum capacity of computerization couldn't be acquired unless every one of the sections of assembling are incorporated, allowing the exchange of information crosswise over different useful modules. This acknowledgement prompted to the ideas of PC incorporated assembling. In this way the usage of CIM required the advancement of entire part of PC advances identified with equipment and programming.

2.6 NATURE AND ROLE OF THE ELEMENTS OF CIM SYSTEM

Nine noteworthy components of a CIM framework are in figure 3 they are,

- Warehousing
- Logistics and supply Chain Management
- Finance
- Marketing
- Product Design
- Planning
- Purchase
- Manufacturing Engineering
- Factory Automation Hardware
- Information management



Figure 1.3 Elements of CIM system

1) Warehousing :

Warehousing is the capacity including capacity and recovery of crude materials, parts, and completed merchandise and in addition shipment of things. In today's mind boggling outsourcing situation and the requirement for in the nick of time supply parts and subsystems, coordination's and production network administration expect awesome significance.

2) Product Design:

The plan bureau of the organization builds up the underlying database for example, geometric displaying and PC helped plan while considering the item prerequisites and ideas produced by the inventiveness of the outline build. Setup administration is an imperative movement in many plans. Complex plans are typically done by a few groups working at the same time, found frequently in various parts of the world, the outline procedure is compelled by the costs that will be brought about in real generation and by the abilities of the accessible creation hardware and procedures. The plan procedure makes the database required to produce the part.

3) Planning:

The arranging office takes the database built up by the outline division and improves it with generation information and data to deliver an arrangement for the creation of the item. Arranging includes a few subsystems managing materials, office, prepare, devices, labor, limit, booking, outsourcing, gathering, examination, coordination's and so on. In a CIM framework, this arranging procedure. Ought to be obliged by the creation costs and by the generation gear and process capacity, with a specific end goal to produce an improved arrangement.

4) Purchase:

The buy divisions is in charge of submitting the buy requests and development, guarantee quality in the generation procedure of the merchant, get the things, organize assessment and supply the things to the stores or mastermind convenient conveyance relying upon the creation plan for inevitable supply to produce and get together.

5) Manufacturing Engineering:

Manufacturing Engineering is the movement of doing the generation of the item, including further advancement of the database with execution information and data about the creation hardware and procedures. In CIM, action this ought to incorporate online element planning and control in light of the ongoing requires

exercises like CNC programming, reenactment and PC supported booking of the creak execution of the gear and procedures to guarantee persistent creation movement. Regularly. The need to take care of fluctuation business sector demand requires the assembling framework adaptable and deft.

1) FACTORY AUTOMATION HARDWARE:

Factory mechanization gear additionally advances the database with gear and process information, inhabitant either in the administrator or the hardware to do the creation procedure. In CIM framework this comprises of PC controlled process hardware, for example, CNC machine devices, adaptable assembling frameworks (FMS), Computer controlled robots, material taking care of frameworks, PC controlled gathering frameworks, adaptable mechanized investigation frameworks, cetera.

2) MARKETING:

The requirement for an item is recognized by the showcasing division. The determinations of the item, the projection of assembling amounts and the system for advertising the item are additionally chosen by the promoting division. Showcasing additionally works out the assembling expenses to survey the monetary practicality of the item.

3) Back:

Finance manages the assets relating to cash Arranging of venture, working capital, and income control, acknowledgment of receipts, bookkeeping and assignment of assets are the real undertakings of the fund offices.

4) INFORMATION MANAGEMENT:

Information management is may be one of the vital errands in CIM. This includes ace creation booking, database administration, and correspondence, fabricating frameworks reconciliation and administration data frameworks.

Meaning of CIM: Joel Goldhar, Dean Illinois Institute of Technology gives CIM as a PC framework in which the peripherals are robots, Machine Instruments and other handling hardware. Dan Appleton, President, DACOM, Inc. characterizes CIM is an administration rationality, not a turnkey item. Jack Conaway, CIM Marketing director, DEC, characterizes CIM is only an information administration and systems administration issue.

The PC and robotized frameworks relationship of the general public of manufacturing Engineers (CASA/SEM) characterizes CIM is the joining of aggregate assembling endeavor by utilizing coordinated frameworks and information correspondence combined

with new administrative methods of insight that enhance hierarchical and faculty effectiveness.

CIM is perceived as Islands of Automation. They are

1. CAD/CAM/CAE/GT
2. Manufacturing Planning and Control.
3. Factory Automation General Business Management

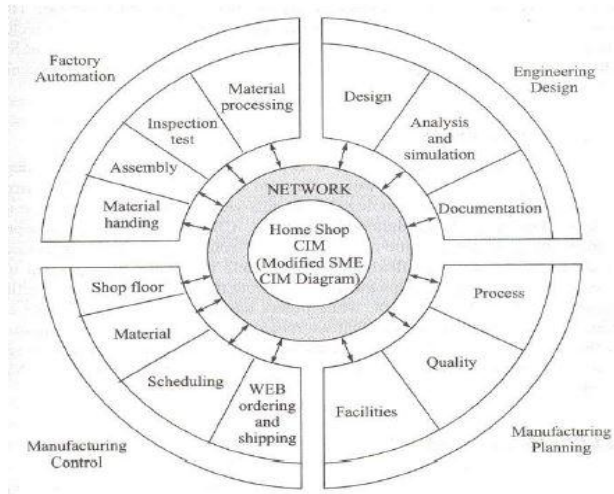


Figure 1.4: Applied Model of assembling

The PC has had and keeps on dramatically affecting the advancement of generation robotization innovations. Almost all cutting edge generation frameworks are implemented today utilizing PC frameworks. The term PC coordinated assembling (CIM) has been instituted to signify the inescapable utilization of PCs to outline the items, arrange the creation, control the operations, and play out the different business related capacities required in and assembling firm. Computer aided design/CAM (PC helped outline and computer supported assembling) is another term that is utilized synonymously with CIM. Presently consider the destination amongst robotization and CIM. Mechanization is worried with the physical exercises in assembling. Mechanized generation frameworks are intended to fulfill the preparing. Get together, material taking care of, and examining exdercises with practically no human interest. By correlation, PC incorporated assembling is In the figure 4 Model of assembling, appearing.

- a) The industrial facility as a handling pipeline where the physical assembling exercises are performed, and
- b) The data preparing exercises that bolster fabricating as a ring that encompasses the manufacturing plant concerned more with the data handling capacities that are required to bolster the generation operations.
- c) CIM includes the utilization of PC frameworks to play out the four sorts of data preparing capacities. Similarly as computerization manages the physical

exercises, CIM manages robotizing the data handling exercises in assembling.

It gives us a chance to endeavor to characterize the relationship amongst computerization and CIM by building up an applied model of assembling. In an assembling firm, the physical exercises identified with creation that happen in the industrial facility can be recognized from the information handling exercises, for example, item outline and generation arranging, that normally happen in an office situation, the physical exercises incorporate the majority to the assembling preparing, gathering, material dealing with, and assessments that are performed on the nudge cut. These operations come in direct contract with the item amid make. They touch the item. The relationship between the physical exercises and the data handling exercises in our model is portrayed in Figure 4 Crude materials stream in one end of the manufacturing plant and completed items stream out the flip side. The physical exercises (Preparing, taking care of, and so on.) happen inside the production line. The data preparing capacities frame a ring that encompasses the manufacturing plant, giving the information and learning required to deliver the item effectively. These data preparing capacities incorporate.

1. Certain business exercises (e.g., promoting and deals, arrange section, client charging, and so forth.)
2. Item outline
3. Producing arranging, and
4. Fabricating control.

These four capacities shape a cycle of occasions that must go with the physical creation exercises however which don't specifically touch the item.

III-CONCLUSION

Among the few issues in CIM, the plan of CAMS utilizing Objective Functional Clustering Algorithms (OFCA) and Artificial Neural Network (ANN) and plan of CAPP utilizing a learning base have been done in this review. The writing overview has drawn out the degree for review the issue from various edges and for growing new calculations utilizing Artificial Intelligence strategies. Seeking after the Artificial Intelligence systems, two calculations, in particular OFCAs and SUCLA have been produced. Gathering proficiency, gathering adequacy and computational time are utilized to assess these calculations. AN Artificial Intelligence based process arranging utilizing strong demonstrating for the machining focus device holders has been created.

2.In the most recent two decades robots have been discovering concentrated applications in plants to

perform complex assignments, for example, pounding inclusion debarring affixing and other get together related undertakings in such errands it is basic that the controller takes after a preplanned way. The productivity of a control system depends on the correct estimation of the parameter varieties or blunders. The present research endeavors to investigate the control system of modern robot arm and to lessen the mistake that happens amid constant working of the robot by proposing another scientific device called single. Term Haar Wavelet Arrangement strategy Control system for test examination.

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