Introduction to Computer Integrated Manufacturing

6ME4-02: Computer Integrated Manufacturing Systems

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Curriculum (as per BTU/RTU)

Unit-I	Introduction to CIM: Overview of Production Systems, the product cycle, Automation in Production Systems, computer's role in manufacturing, sources and types of data used in manufacturing. The Beginning of CAM: Historical Background.
	Numerical Control (NC): Basic components of an NC system, coordinate system and motions control systems. Computer Numerical Control (CNC): features of CNC, machine control unit, CNC software. Direct Numerical Control and Distributed Numerical Control. Applications, advantages and disadvantages of NC. Adaptive control of machining system.
Unit-II	NC Part programming: Manual and computer assisted part programming, Part programming with APT. NC part programming using CAD/CAM software. NC cutter path verification.
Unit-III	Computer Aided Process Planning: Traditional Process Planning, Retrieval process planning system, Generative Process Planning, Machinability data systems, computer generated time standards.
	Group Technology: Introduction, part families, part classification and coding, coding system and machining cells.

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Curriculum

Unit-IV	Computer Aided Production Management Systems: Introduction to computer aided PPC, Introduction to computer aided inventory management, manufacturing resource planning (MRPII), computer process monitoring and shop floor control, computer process control.
	Computer Aided Quality Control; Computer in quality control, contact inspection methods, Non contact inspection methods, optical and non optical computer aided testing.
Unit-V	Computer Aided Material Handling; Computer control on material handling, conveying, picking. Ware house control, computerized material handling for automated inspection and assembly.
	Computer Integrated Manufacturing Systems: Introduction, types special manufacturing systems, flexible manufacturing systems (FMS).
	Collaborative Engineering; Introduction, Faster Design throughput, Web based design, Changing design approaches, extended enterprises, concurrent engineering, Agile and lean manufacturing.

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Course Objectives

"At the end of this course students are able to understand the modern methods of manufacturing technologies for betterment of industry".

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Course Outcomes

At the end of this course, students are able to exposed:

1. to the automation in production system
2. to learn the fundamentals of computer assisted numerical control machines and programming
3. To learn the fundamentals of computer aided/integrated process planning, quality control, material handling, manufacturing system along with collaborative concept of engineering

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Text and Reference Books

- Text Book
  - Mikell P. Groover, , Automation, Production Systems, and Computer Integrated Manufacturing, 3rd ed., Pearson/Prentice Hall, 2008
- Reference Books
  - James A. Rehg and Henry W. Kraebber, 2005, Computer-Integrated Manufacturing, 3rd ed., Pearson/Prentice Hall.
  - Nanua Singh, 1996, Systems Approach to Computer-Integrated Design and Manufacturing, John Willey & Sons.
  - Computer Aided Manufacturing, Chang, Wysk and Wang, Pearson Education
  - CAD/CAM: Principles and Applications, P.N. Rao, McGraw Hill
  - Computer Control of Manufacturing Systems,Y. Koren, McGraw Hill
  - Computer aided Manufacturing, Rao, Tiwari and Kundra, Tata McGraw Hill.
  - Computer Numerical Control: Machining and Turning Centres, Quesada and Jeyepoovan, Pearson Education

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Introduction to Computer Integrated Manufacturing Systems

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Learning outcomes

- At the end of this session, students are able to understand
  - Computer integrated manufacturing and its importance in production system
  - Scope, objectives, various elements, functions and potential benefits of if computer integrated manufacturing implemented in any production systems such as enterprise, factory, manufacturing unit etc.

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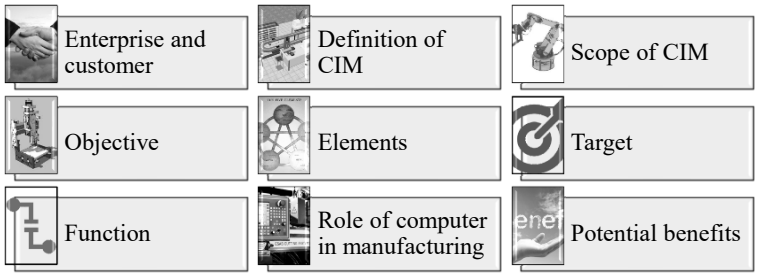
Contents



Enterprise and customer

- External challenges:
  - Niche market entrants,
  - Competitions,
  - Suppliers,
  - Global economy
  - Cost of money
  - Internet
  - Customers
- Customer order-winning and order-qualifying criteria drive the market

Six Worldwide Standards

Six Worldwide Standards

- Design & Manufacturing lead time by product
- Inventory turns by product
- Setup times on production equipment
- Output/productivity by product per employee
- Total quality and level of rework
- Number of suggestions by product for improvements per day employee

Customer demand is always for:

- A quality product
- Wide product selection
- Frequent product improvements
- New models on a regular basis

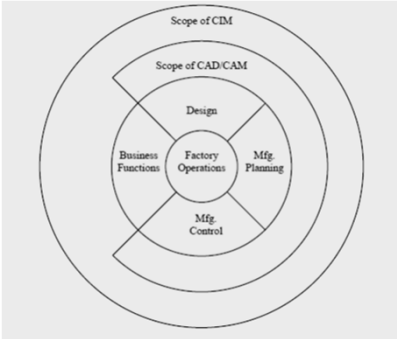
Definition

Computer Integrated Manufacturing, known as CIM, is the phrase used to describe the complete automation of a manufacturing plant, with all processes functioning under computer control and digital information tying them together.

CIM is the integration of the total manufacturing enterprise through the use of integrated systems and data communications coupled with new managerial philosophies that improve organizational and personnel efficiency

By: Computer and Automation Systems Association of the Society of Manufacturing Engineers (CASA/SME)

Scope of CIM



What is CIM?

- CIM is a new approach to Manufacturing Management, and corporate operation.
- CIM is the integration of all enterprise operations and activities around a common corporate data repository.
- It is the use of integrated systems and data communications coupled with new managerial philosophies.
- CIM is not a product that can be purchased and Installed.
- It is a way of thinking and solving problems.

Objectives of CIM

- Simplify production processes, product designs, and factory organization as a vital foundation to automation and integration
- Automate production processes and the business functions that support them with computers, machines, and robots
- Integrate all production and support processes using computer networks, cross-functional business software, and other information technologies

Elements of CIM

Information technology:	Manufacturing technology:
• Computer, • Communication, • Control	• Manufacturing, • Market, • Management 3Cs support 3Ms

Elements of 3Cs

- Computer:
  - IT, OS, programming language, database, artificial intelligence
- Communication:
  - Communication technology, MAP, TOP, LAN, VAN
- Control:
  - Control technology, algorithm, S/W for control

Target of CIM

- Developing high quality products with low cost
- Integration and control of product design and manufacturing processes
- Easy financial management
- Increasing volume of sales

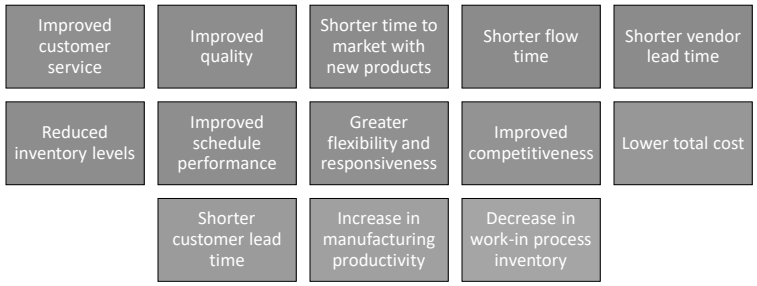
Function of CIM

- Order information and automatic scheduling through computer –
  - dealing individual orders of various products
  - control of due dates
  - preparing production planning
- Inventory control through JIT
  - minimizing raw material, inventory
  - utilizing bar code, RFID
- Statistical quality control
  - quality improvement
- Monitoring facility and process
  - data collection for facility operating
  - report for producing defective goods
  - records & analysis of failing facility

Function of CIM

- Data Collection for MIS
  - Shipment data
  - direct & indirect labor data
  - production control data ; defective rate, operation rate, failure rate, production rate
  - supplier record; quality, accomplishment
  - defective production data
- Managing MIS Data
- Diagnosing failure
  - Minimizing down time
  - details of failure problems
- Managing Technical Data and Documents
- Standard

Potential Benefits of CIM



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CIM: includes

- CAD/CAM, computer-aided design/computer-aided manufacturing,
- CAPP, computer-aided process planning,
- CNC, computer numerical control machine tools,
- DNC, direct numerical control machine tools,
- FMS, flexible machining systems,
- GT, group technology,
- ASRS, automated storage and retrieval systems,
- AGV, automated guided vehicles, use of robotics and automated conveyance, computerized scheduling and production control, and a business system integrated by a common data base.

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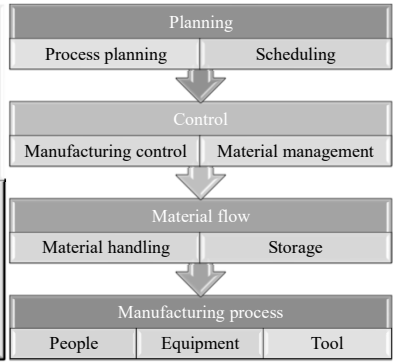
Four-Plan Concept of Manufacturing

- Planning
- Control
- Material Flow
- Manufacturing Process



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