

SEMESTER-6

- Flexible manufacturing System -

FMS may be defined as a set of machines, in which Parts are transported automatically under computer control from one m /c to another for processing.

Flexibility means how fast you can adopt to changes.

The various components of FMS are –

- I. Machine Tools.
- II. Control system.
- III. Handling System
- IV. Planning system.
- V. CAD/CAM

All these components has to be properly arranged and organized for its functionality

- I. FMS uses a no of CNC machines in which various m/c tools has to be used separately for its past production. Types of tool depend on the production operation we are doing.
- II. Control system is the component which controls the main important part. It guides the operation on various m/cs to produce the required part. It controls the tool & work piece movement, flow of work piece, & monitors their location within the system thorough material handling System.
- III. The handling part is not necessarily a separate unit.
It can be operated using an industrial Robot or a part Changer which is an integral part of machine itself

When part changer is used the cost is very low as it's already programmed with machine. We don't have to use a

separate control system and programming procedure.

Same programming is used for both machine and part handling.

IV. Major Issues for planning comes which part operation is to be done and what are the processing requirements for each part. It determines the size and weight of work parts also determines the size of material handling system needed.

Production quantities must be determined as it tells us how many machines will be used.

Depending upon no of workstations we have to arrange all the tools required at each workstation.

We must determine when it's best to change tools how long the tool can last before maintenance or wear out

FMS are very versatile as they can produce a Variety of parts and are adaptable since the system can be quickly modified to produce a complete set of different parts using a CNC machine

What is the need for FMS -

- I. It increases machine utilization due to minimum set up time, simultaneous Work part processing.
- II. Reduces manufacturing Lead time as non-operation time is drastically reduced due to successive work station.
- III. It reduces direct and indirect labor.
- IV. It provides a scheduling flexibility.

The best application of FMS is the production of small set of products used for mass production.

- V. It also increases machine efficiency & improves product quality.
- VI. It increase production cost Rate.
- VII. It increases labor productivity & reduce manufacturing cost.

Unit 6

CAD/CAM & CIM

Define CAD, CAM, CIM —

CAD - Computer Aided Design.

CAD can be defined as the use of computer system to assist in the creation, modification analysis or optimization of a design.

CAM - Computer Aided Manufacturing.

CAM can be defined as the use of computer Systems to plan, manage and control the operations of a manufacturing plant thorough direct or indirect Computer interface.

CIM - Computer Integrated Manufacturing

CIM can be defined as the manufacturing process approach of using computers to control the entire production process. It's the complete integration of CAD & CAM.

Difference between CAD & CAM –

CAD

1. CAD is the implementation of computers in transforming engineering design into end products.
 2. It Requires control and coordination of necessary physical process, equipment's & labor.
 3. It involved geometric model, process planning Interface algorithm , NC programs, inspection assembly & packaging.
 4. Software's involved are Siemens NX, power mill Solid cam.
 5. Manufacturing Tools + computer = CAM
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CAM

1. CAD is the implementation of digital computers in engineering design and production.
 2. It requires design conceptualization & analysis.
 3. The process involved 3 in CAD are definition of a geometric model, definition, Translator, geometric model Interface algorithm, design and analysis algorithm.
 4. Software's involved are - AUTOCAD , Autodesk , CATIA inventor.
 5. computer + designing software = CAD.
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Advantage of CAD

6. Minimizes the requirement of huge numbers of an expensive draftsman in designing a product.
7. It can be used directly in order to generate cutting data for CNC M/C.
8. Scaling, Rescaling, modification in drawing & models is easier, automatic, and accurate.
9. Storage & retrieval of model is easier.
10. Design data can be shared in computerized manufacturing management system.
11. Precise 3D models can be examined before making expensive materials.
12. It increases speed of production & requires less labor.
13. Multiple copies can be stored printed and shared electronically which eliminates the need for storing large paper drawings.

Advantage of CAM

6. Manufacturing requires minimum supervision and can be accomplished during unsocial work hour.
7. Manufacturing is less labor Intensive & saves labor cost.
8. M/C are accurate and manufacturing can be repeated consistently with large batches.
9. Error occurrence is negligible and M/C run continuously.
10. Prototype models can be prepared very speedily for elaborated inspection before finalizing design for manufacture.
11. Virtual machining can be used to evaluate machining routines and outcomes on screen.

Main Benefit of using CAD is the ease of manufacturing. It reduces the time required for production planning & also easily allocates jobs.

The computer system consist of hardware and Software to perform the specialized design Functions required by the operator.

CAD hardware consist of 3 major devices –

1. Design workstations –

It communicates with computer's central processing unit. Continuously generate graphic Pages and provides digital description of image. Translate uses commands into operating functions and facilitate interaction between user and system.

2. Digital Computer –

This uses a high speed central processing unit to process CAD operation.

3. Output Devices –

These include plotters and printers which generate output from CAD system.

4. Secondary Storage –

This includes various Storage devices attached to CAD system to Stove programmers and data files. Storage mediums are - magnetic disc, magnetic tape external hard drive etc.

The CAD Software consists of other computer programs to implement computed graphics on the System plus application

programs to facilitate the engineering functions of User Company.

The most popular CAD Software is AutoCAD

Benefits of CAD & CAM –

1. It improves product manufacturing and design accuracy
2. Design and modification of product can be made easily.
3. Minimal error in part programming.
4. Saves material & machining time by optimization algorithm.
- 5 Reduces Lead time and in process inventory
6. Reduces material handling cost.
- 7 Production schedule is Flexible.
8. Better engineering drawing due to use of computers.
9. Assistance in inspection of complicated parts.
10. Tool design is easy so Saves cost,
11. Provides increase capacity due to reduction in Set up times.
12. High equipment utilization and waste management.
13. Quality of product is high
14. Improved engineering productivity and customer satisfaction.
15. Provides better and accurate functional analysis, to reduce .
prototype testing.

Computer Integrated Manufacturing (CIM)-

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 a personal proficiency.

- CIM is the manufacturing approach of using computer's to control the entire production process.
- CIM is not a product that can be purchased and installed it's a way of thinking and solving problems.
- This integration allows individual process to exchange information with each other of initiate actions.

Through Integration of computers, manufacturing can be faster & less error prone although the main advantage is the ability to create automated manufacturing process.

- CIM is the complete integration of CAD, CAM, CNC, DNC and FMS etc.

It' is the union of hardware, Software, database management and communication to plan and control production activities from planning & designing to manufacturing and distribution.

- CIM are used for high volume, highly Standardized production where mass production technology is employed. It also produces Smaller and economically viable batch production.

CIM Systems have following 3 principal elements.

- i. Computer control component.
- ii. Machine Tool component.
- iii. Material handling component

- i. The computer control component uses stored data files to control all aspect of System operations. The various data files associated with CIM systems are
 - a. Part data File.
 - b. Routing data File
 - c. Part production data File.
 - d. Work Station data File.
 - e. Total use data file.

Using this data Files the computer control performs various tasks like program Storage, distribution of Tools and equipment to work Station, System performance tool life.

- ii. Machine Tool component consist of NO OF CNC machines required for machining depending upon production requirement.
- iii. The material handling component moves work piece from work Station to another work Station and do the setting at each Station. The system which moves parts is considered as primary system or conveyor system. The system which orients the parts is known a secondary system. It takes the parts of primary system places them on M/C align properly q remove them after processing.

Benefits of CIM –

1. Improved customer Service & poor quality
2. Shorter time to market with new products.
3. Shorter Flow time
4. Shorter vendor lead time.
5. Reduced inventory Level.
6. Improved scheduled performance.
7. Greater Flexibility & Responsiveness.
8. Improve competitiveness.
9. Lower total cost of increase in manufacturing productivity.
10. Shorter customer lead time