Lecture 5

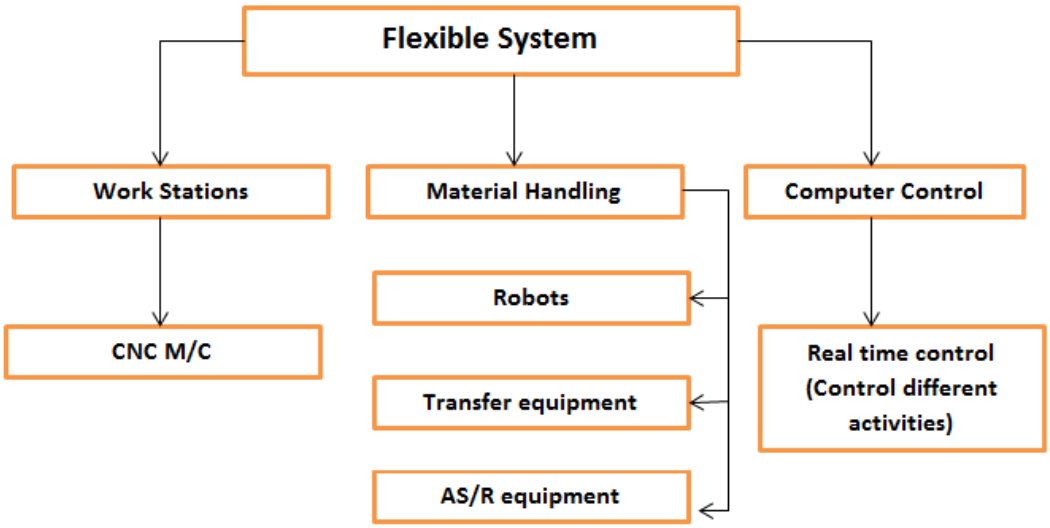
Flexible Manufacturing System (FMS)

Flexible manufacturing system is a system dealing with the group of machining stations (NC, CNC, machine tools) and automated material handling system using computer controlled machines. FMS is a group of CNC machine tools integrated with automated material handling system to process a variety of different types of parts at various work stations.

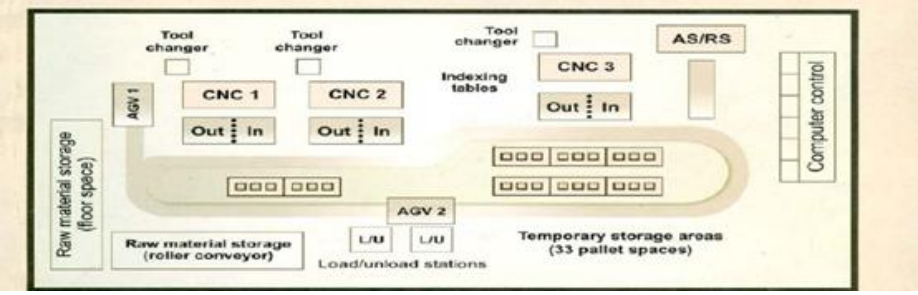
The reason for FMS is called flexible is that it is capable of processing a variety of different part styles simultaneously at the various workstations and the mix of the part styles and quantities of production can be adjusted in response to changing demand patterns. The FMS is most suited for the variety, mid volume production range.

Why FMS is needed?

- External changes such as change in product design and production system.
- Optimizing the manufacturing cycle time.
- Reduced production costs.
- Overcoming internal changes like breakdowns etc.



Processing work stations- The work stations that perform different operations on part families are called processing stations. These work stations are CNC machine tools, inspection equipments, assembly system, inspection system, lead changers and loading/unloading area.



Material handling system – It is used to move the material or parts from one machine to another machine and from machine to storage point etc. These systems include automated guided vehicles, roller conveyor, robots etc.

The functions are:

- It allows the random, independent movement of work parts between processing stations. It will increase the utilisation of machines and reduce the idleness of machine.
- It provides easy accessibility for loading and unloading work parts.
- It handles a wide spectrum or variety of work part configurations.
- It works as a temporary storage between two processing stations.

Material storage and retrieval system - An automated storage and retrieval system (ASRS or AS/RS) consists of a variety of computer controlled systems for automatically placing and retrieving loads from defined storage locations. Automated storage and retrieval systems (AS/RS) are typically used in applications where:

- There is a very high volume of loads being moved into and out of storage
- Storage density is important because of space constraints
- No value is added in this process (no processing, only storage and transport)
- Accuracy is critical because of potential expensive damages to the load

Various types of storage retrieval system are pallets, carousels (merry-go-around). Ex: conveyor system at an airport.
It helps in convenient access of different types of parts from store.

It also helps to increase machine utilization.

Computer control components

The FMS includes a distributed computer system that is interfaced to the workstations material handling system and other hardware components.

The functions of computer control components are as follows:

- It controls the working of each processing station
- It distributes the control instructions to processing centres.

- It also helps in traffic and shuttle control.
- It monitors the status of handling system.
- It performs the function of a system monitor.

Control hardware

This included the different types of computers, programming logic controller (PLC), sensors, switch communication networks and some other devices.

Control software

It includes the set of files and programs used to control physical subsystem. It is very important that there should be compatibility between hardware and software for efficient and effective working of flexible manufacturing system (FMS).