

Flexible Manufacturing System.

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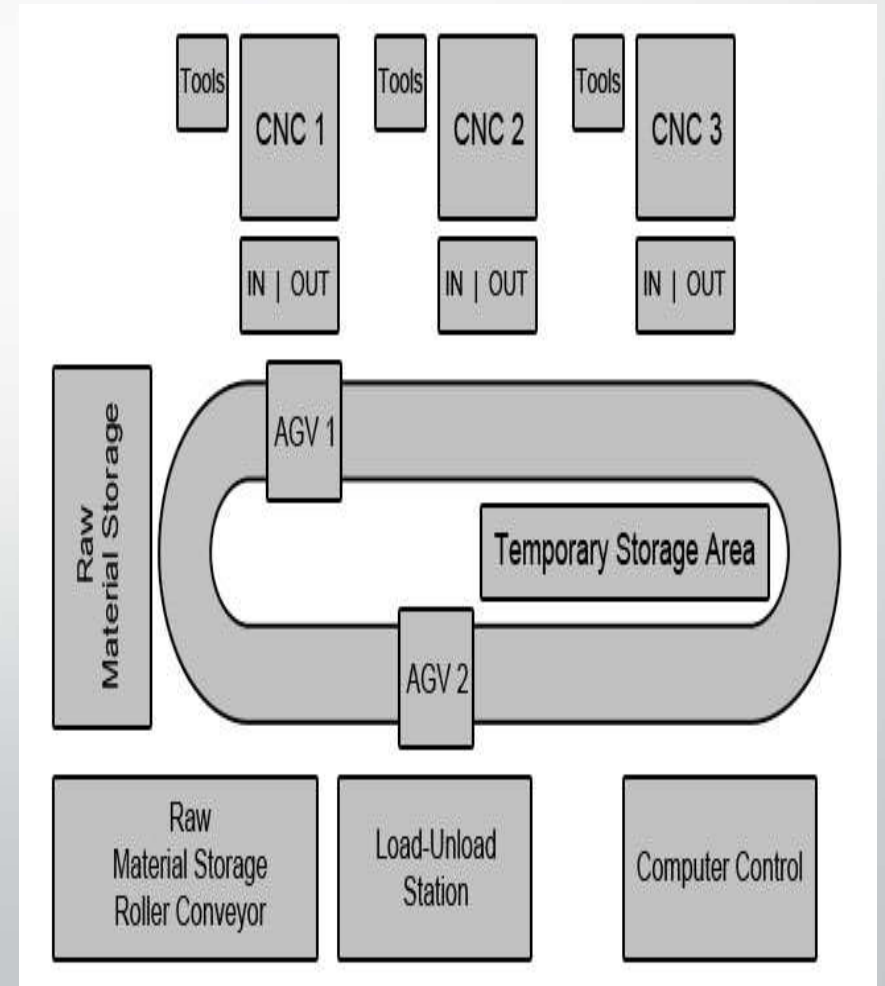
Pankaj Bagwe ()

History.

- The FMS was first conceptualized for machining, and it required the prior development of NC.
- This concept is credited to David Williamson, a British engineer during mid-1960s.
- In late 1960s the first FMS machining system was installed at Ingersoll-Rand company in Virginia.
- Germany implemented its first FMS in 1969, in cooperation with the university of Stuttgart.
- Russia and Japan implemented FMS in 1972.

What is FMS ???

- A flexible manufacturing system is a automated machine cell, consisting of a group of processing workstations, interconnected with automated material handling and storage system.
- The FMS is most suited for the mid-variety, mid-volume production range



Why FMS ?

- 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.

What makes it flexible???

- Three capabilities that a manufacturing system must possess to be a flexible.
 1. The ability to identify and distinguish among the different part styles processed by the system.
 2. Quick changeover of operating instructions, and
 3. Quick changeover of physical setup.

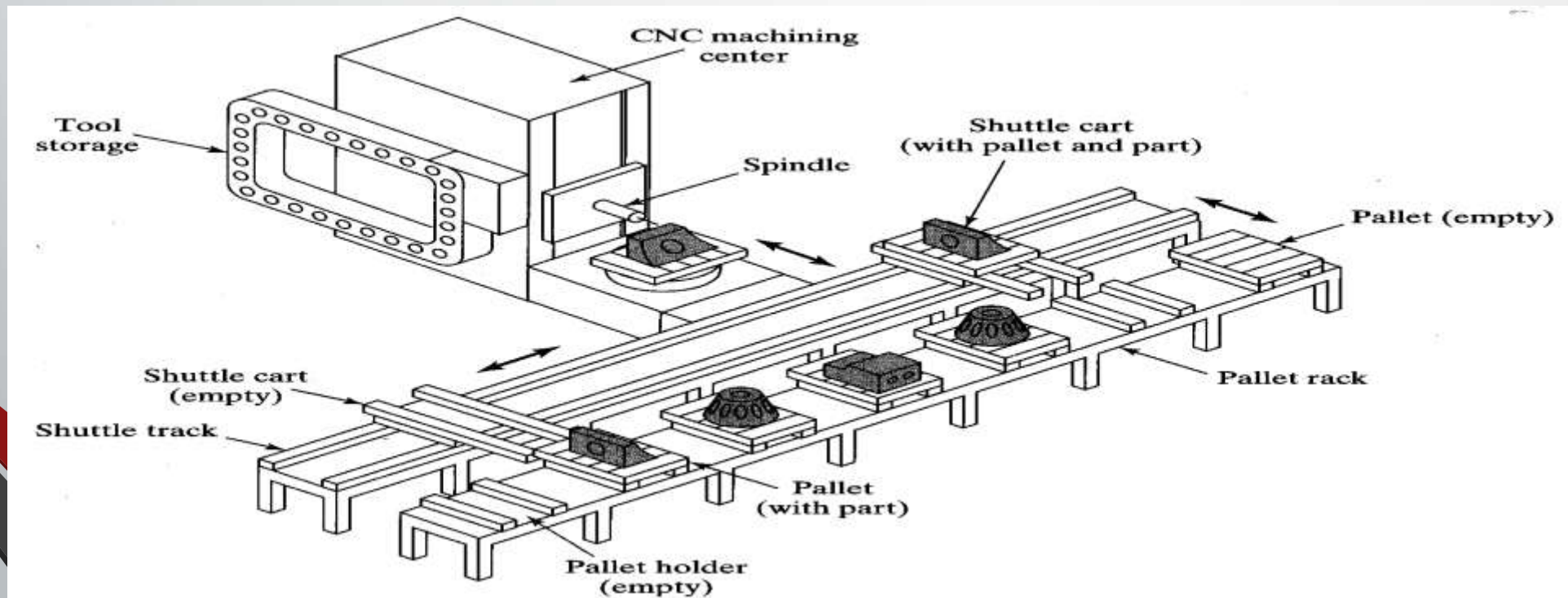
Classification of FMS...

- Flexible manufacturing systems can be distinguished according to the number of machines in the system. The following are typical categories:

- Single machine cell
- Flexible manufacturing cell
- Flexible manufacturing system

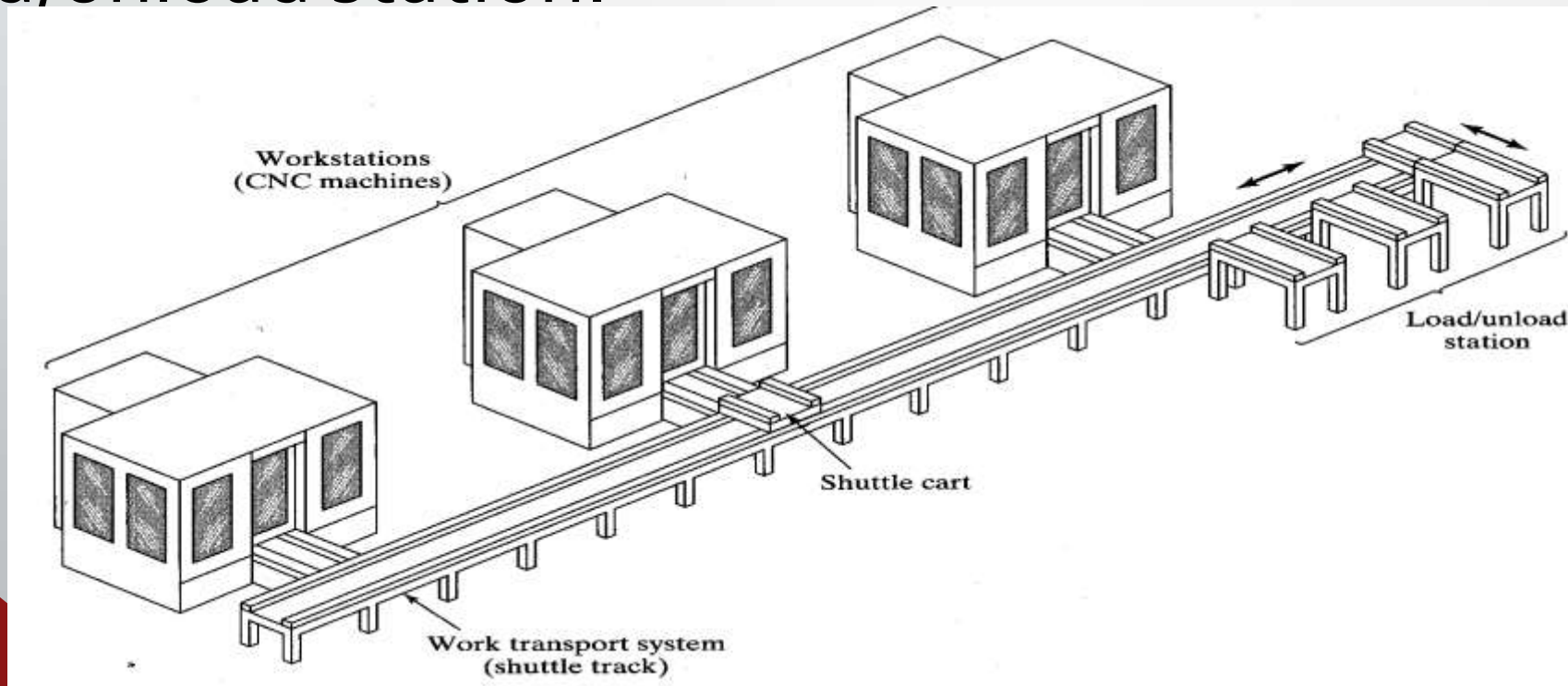
Single Machine Cell (SMC)

- A single machine cell consists of one CNC machining center combined with a parts storage system for unattended operation.
- Completed parts are periodically unloaded from the parts storage unit, and raw work parts are loaded into it



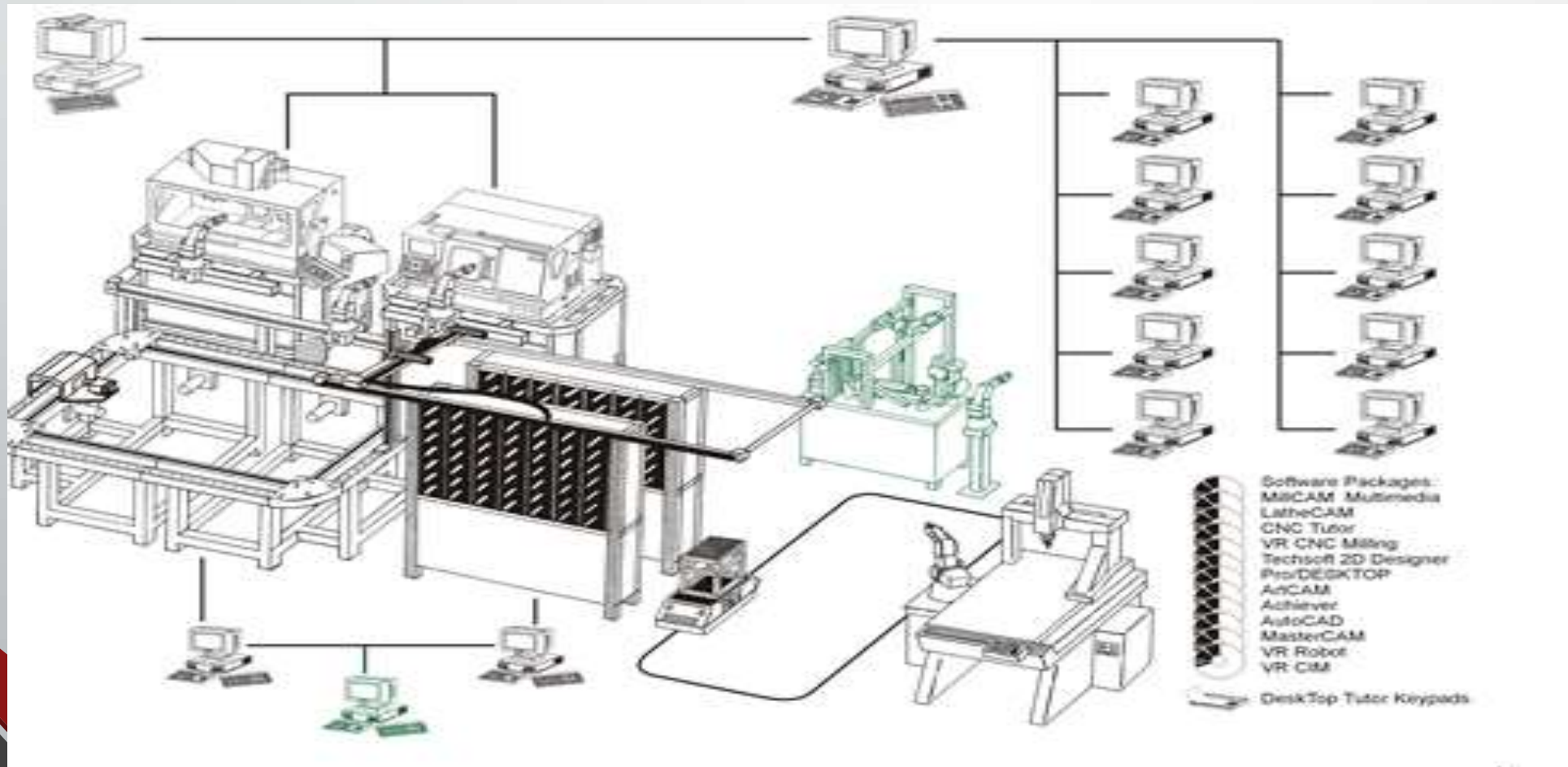
Flexible Manufacturing Cell (FMC)

- A flexible manufacturing cell consists of two or three processing workstations (typically CNC machining centers) plus a part handling system.
- The part handling system is connected to a load/unload station.



Flexible Manufacturing System (FMS)

- A flexible manufacturing system has four or more processing workstations connected mechanically by a common part handling





■ Basic components of FMS

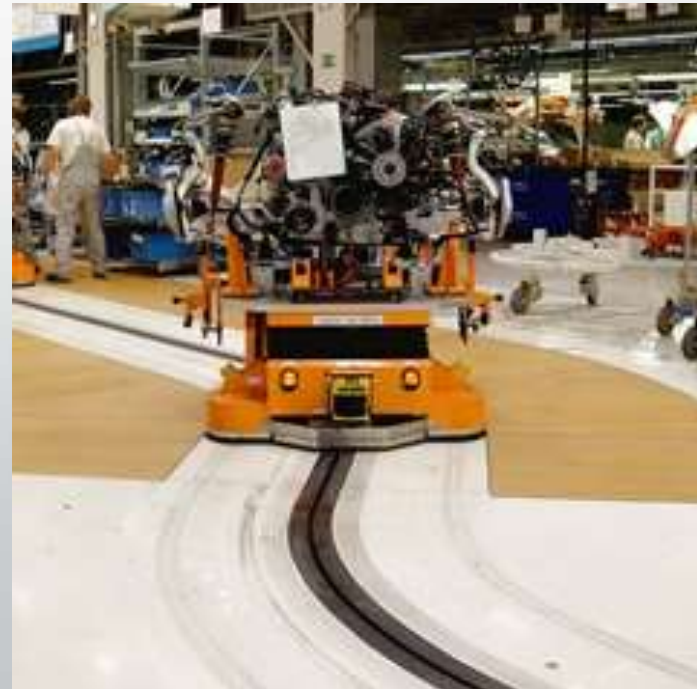
- Workstations
- Automated Material Handling and Storage systems
- Computer Control System

Workstation

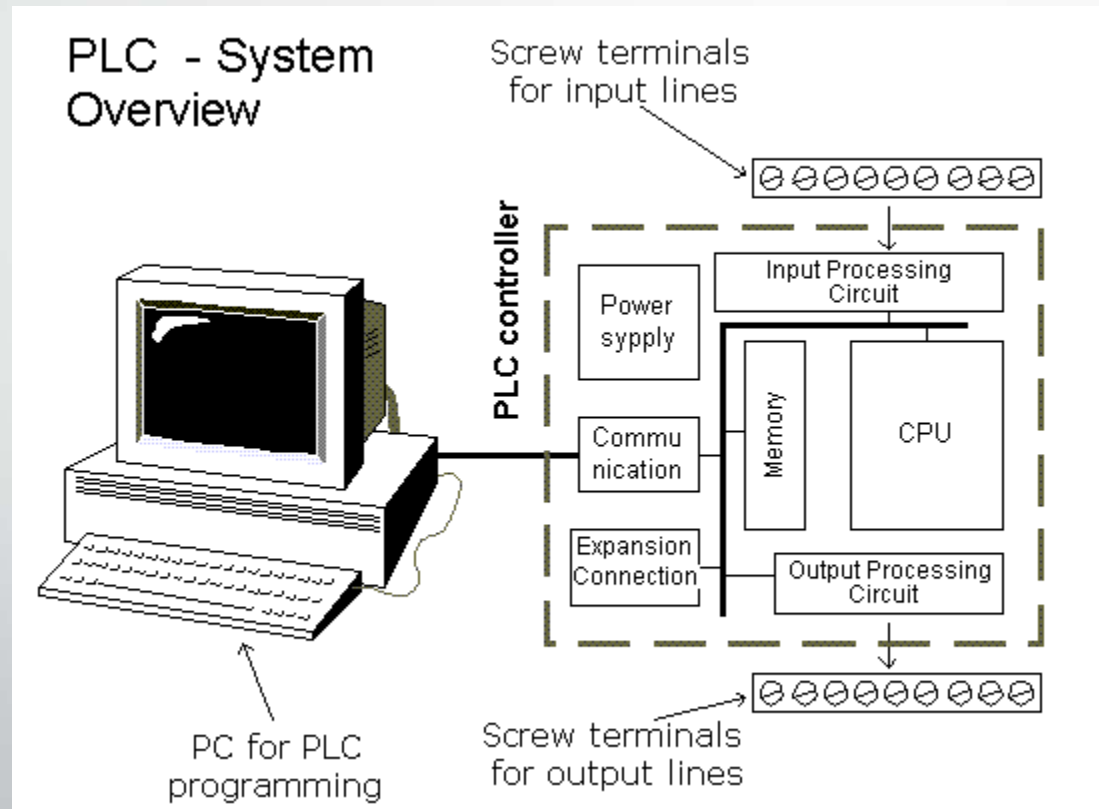
- Substations
 1. Load/Unload Stations
 2. Machining Stations
 3. Other processing stations
 4. Assembly

Material handling system

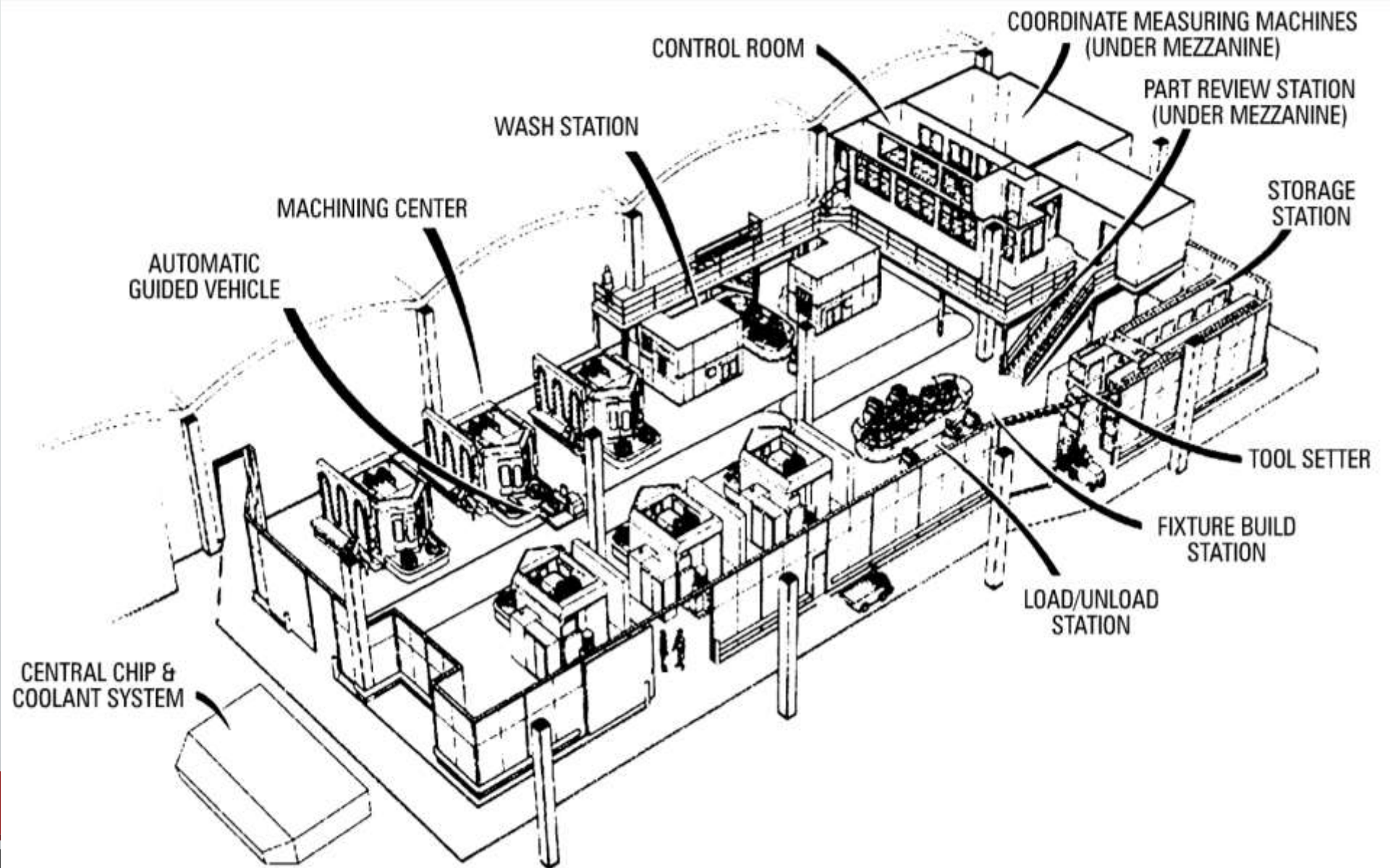
- Automated fork lifting and Rail traveler.



Computer control Programmable logic Controller



Allied Signal's Flexible Manufacturing System



A 5 machines FMS for machining:-photo courtesy of Cincinnati
Milacron



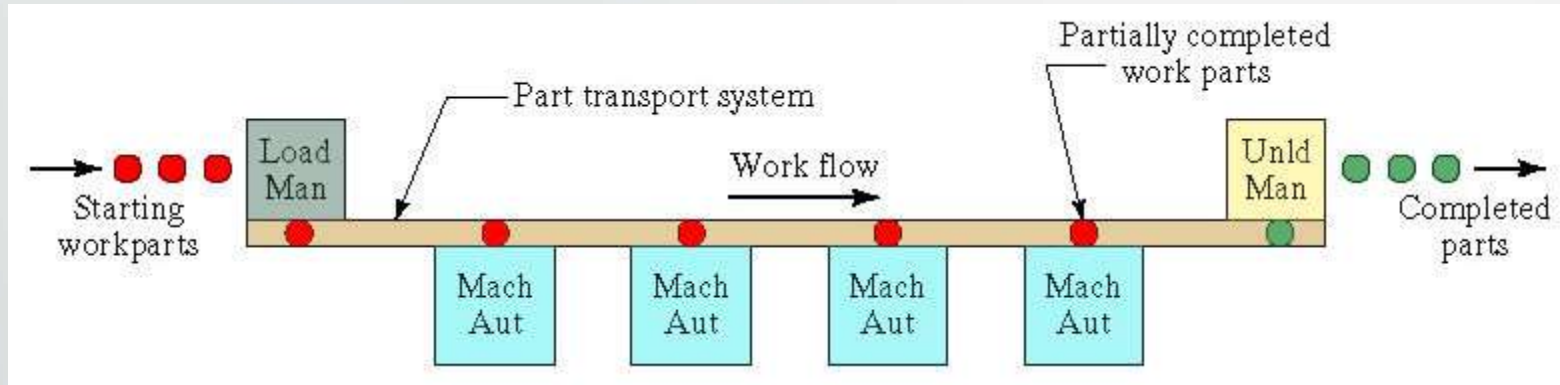
Human Resources

- Human are needed to manage the operations of the FMS. Functions typically performed by human includes:
 - Loading raw work parts into the system,
 - Unloading finished parts (or assemblies) from the system,
 - Changing and setting tools,
 - Equipment maintenance and repair,
 - NC part programming in a machining

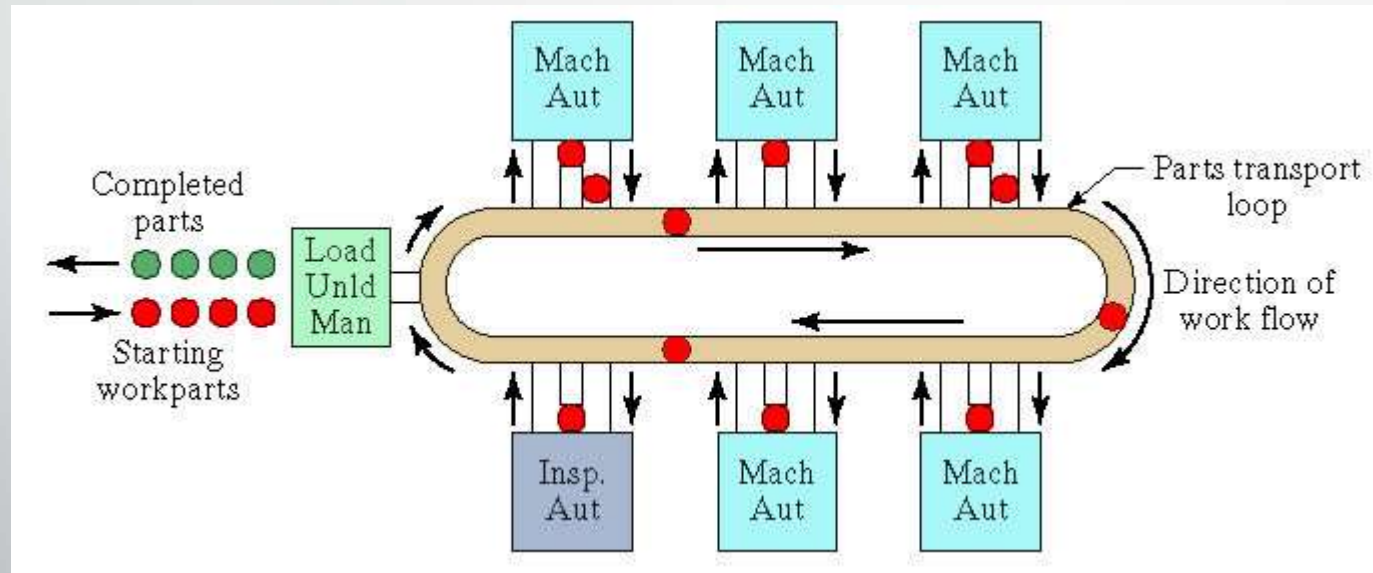
Layouts of FMS

- Progressive or Line Type
- Loop Type
- Ladder Type
- Open field type
- Robot centered type

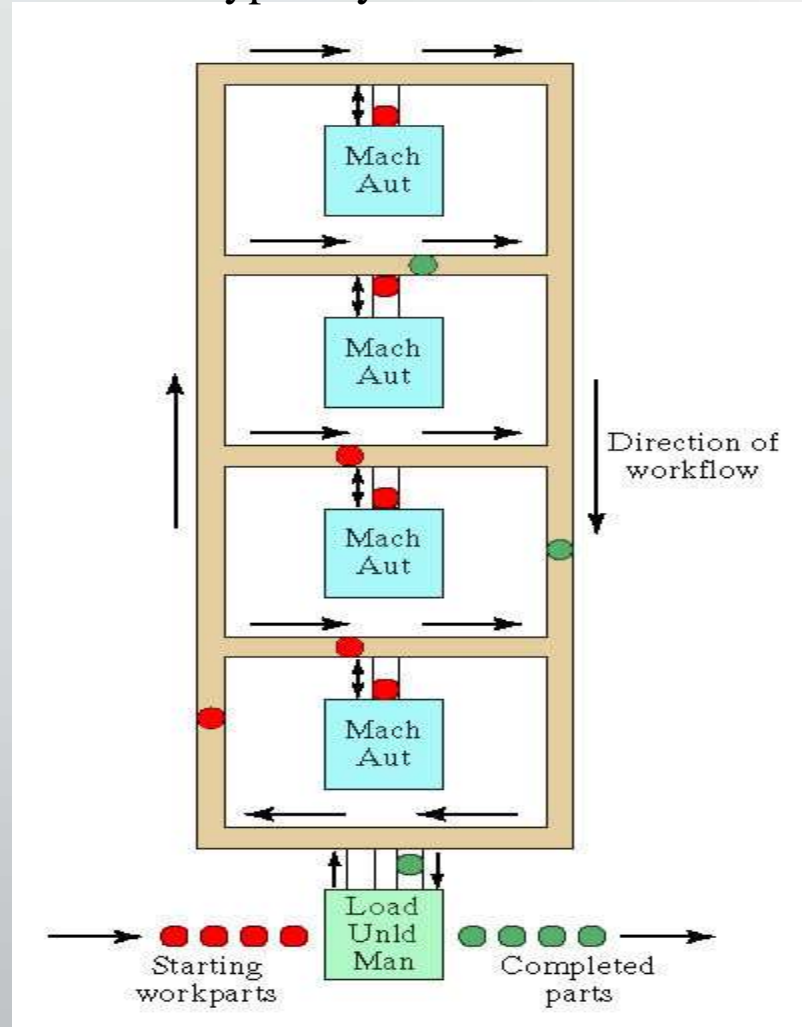
1. Progressive Layout



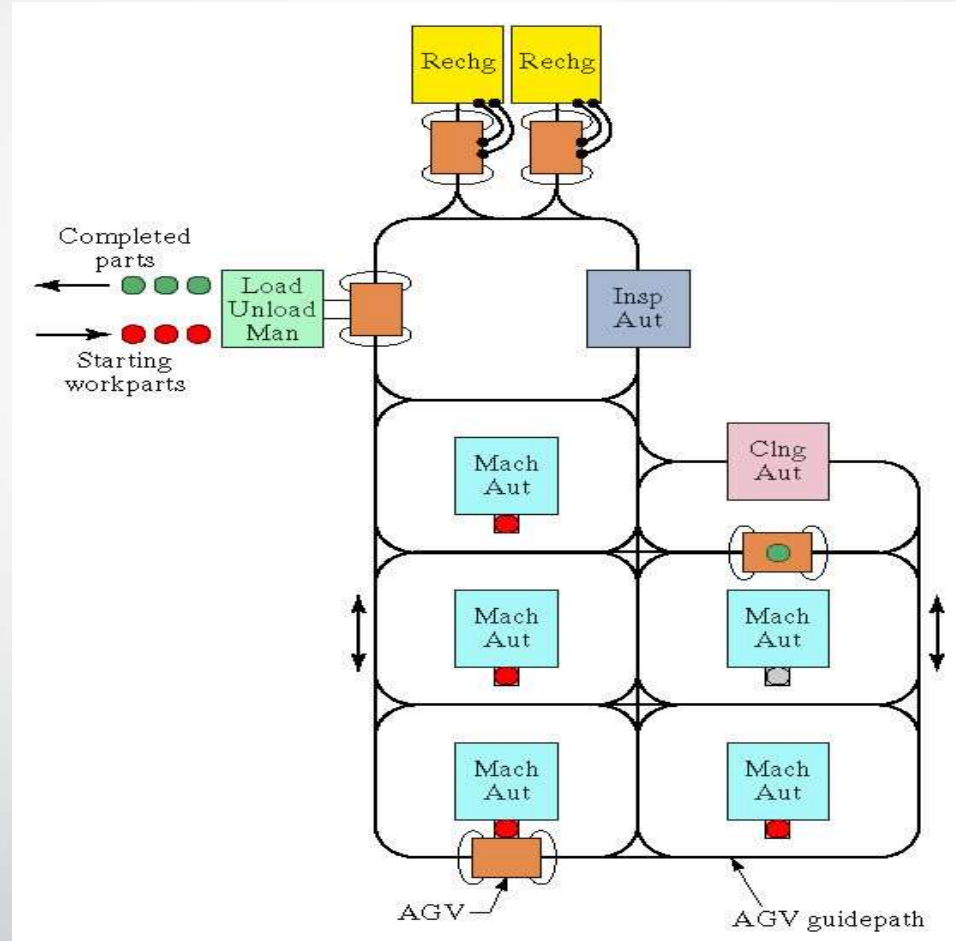
2. Loop Layout



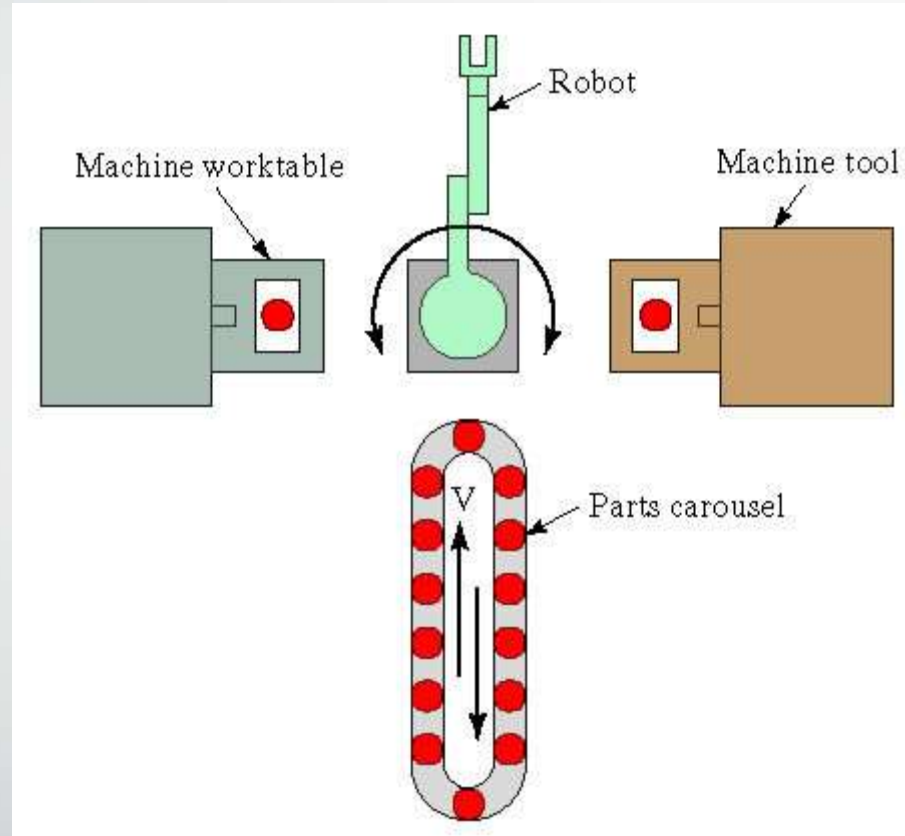
3. Ladder Type Layout

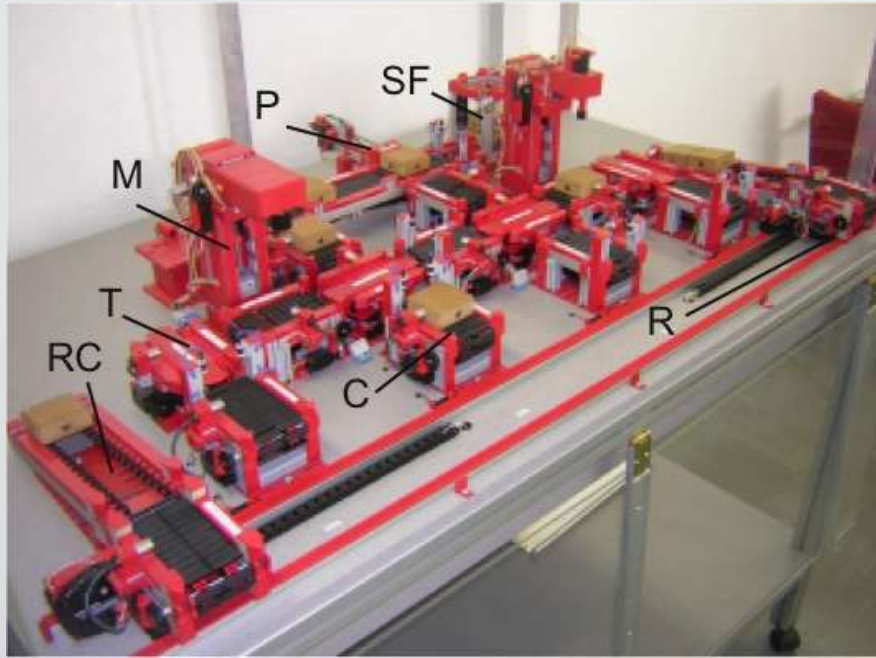


4. Open Field Layout



5. Robot Centered Layout





Application of FMS

- Metal-cutting machining
- Metal forming
- Assembly
- Joining-welding (arc , spot), gluing
- Surface treatment
- Inspection
- Testing

■ Advantages of FMS

- To reduce set up and queue times
- Improve efficiency
- Reduce time for product completion
- Utilize human workers better
- Improve product routing
- Produce a variety of Items under one roof
- Improve product quality
- Serve a variety of vendors simultaneously
- Produce more product more quickly



■ Disadvantages of FMS


- Expensive.
- Substantial pre-planning activity.

Challenges with FMS

- Determining if FMS the best production system for your company
- Possible expansion costs associated with implementing FMS

Conclusion

- FMS is a revolution in the field of Manufacturing Technology.
- FMS can be designed to meet the specific demand of each company
- FMS is used for multitask operation.
- FMS requires substantial investment of time and resources.



Thank you...