

UNIT 5

Flexible manufacturing System

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Flexible Manufacturing System : Elements, Limitations, Features & Characteri- stics, New Development

Flexible manufacturing system (FMS) is a manufacturing system in which there is some amount of flexibility that allows the system to react in case of changes, whether predicted or unpredicted. This flexibility is generally considered to fall into two categories, which both contain numerous subcategories.

The first category, routing flexibility, covers the system's ability to be changed to produce new product types, and ability to change the order of operations executed on a part.

The second category is called machine flexibility, which consists of the ability to use multiple machines to perform the same operation on a part as well as the system's ability to absorb large-scale changes, such as in volume, capacity or capability.

Elements of FMS FMS consists of three main systems. The work machine which automated CNC machines are connected by a material handling system to optimize parts flow and the central control computer which controls material movements and machine flow.

Key features of Flexible Manufacturing system

Some characteristics that differentiate flexible manufacturing system from conventional mfg system are their technical flexibility i.e. the ability to quickly change mix, routing, and sequence of operations within the parts envelope and also complexity resulting from the integration mechanization and reprogrammable control operation i.e. parts machining, material handling and tool changes. Some key features of the process are

→ cell: It consists of several grouping of two or more automated machines within a company. Each grouping is called a cell. All the machines present are controlled by a computer.

→ Random bypass capability: The material handling system has a random bypass capability i.e. a part can be moved from any tool in the interconnected system to another because the transport system can bypass any tool along the path on demand. This implies

- Each part can transverse a variable route through the system
- This flexibility in material handling, in combination with ϕ multi purpose tools, make it possible for a flexible manufacturing system to process a great diversity of parts

→ Automation: Computers are the heart of automation. They provide the framework for the information systems which direct

action and monitor feedback from machine activities

→ Component redundancy: Flexible mfg systems as the equipment is highly integrated. The interdependencies of one component affect other components. This results in a greater time to trace the problem when compared with isolated components. In some cases, the interruption effect, and greater downtime may result before the actual cause of the problem is found. In this situation component redundancy provides flexibility with the opportunity for choice, which exists when there are at least two available options. Flexible manufacturing contains functionally equivalent machinery.

→ Multiple Paths : A path in flexible manufacturing represents a part sequence and requisite fixtures to complete its required operations. In conventional machine environment only one path exists for a part because a single fixture remains at a single machine. However, this is not the case with flexible manufacturing systems. There are multiple paths. Obviously, the higher the number of paths, higher is the degree of flexibility.

The Process : The features of this manufacturing innovation process are similar across all type of firms. The manner in which they are adopted and implemented depends on product type, cost, maintenance process planning and quality control processes.

New Development: An important transformation has taken place in the nature of manufacturing. New forms of production organizations pioneered in Japan are outperforming traditional methods of mass production in the west. Revolutionary "Just in time" system turns upside down many western assumptions about manufacturing.