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VIDYALAYA**

(University Established under section 3 of UGC Act, 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

Name of the Course : **Flexible Manufacturing Systems (FMS)**
Name of the unit : **PLANNING, SCHEDULING AND CONTROL**
Topic – Title : **Introduction to FMS– development of manufacturing systems**

1. Objectives and Outcomes:

- To understand the modern manufacturing systems.
- Upon successful completion, the student should be able to understand the Flexible manufacturing system and its application

2. Pre-Test - MCQ type:

1. The following is the preliminary stage of Production planning

- (A) Capacity planning
- (B) Material requirements planning
- (C) Scheduling
- (D) Product development and design**

2. The following is the source(s) for developing new or improved product

- (A) Research and Development department of the enterprise
- (B) Consumer suggestions and Complaints
- (C) Other competitive products in the market
- (D) All of the above**

3. Product cost can be reduced by considering the following aspect(s) at the design stage

- (A) Minimum number of operations
- (B) Unnecessary tight tolerance should not be provided
- (C) Design should consist of standard parts
- (D) All of the above**

4. The ultimate objective of the product is

- (A) To provide a new look
- (B) Utilizing existing manpower

(C) To monopolize the market

(D) All of the above

5. Based on their field of application, manufactured goods can be classified as

(A) Primary, Secondary and Tertiary

(B) Consumer, Capital and Defense

(C) Essential, Market and Standard

(D) Primary, Luxury and Consumer

6. The following aspect of product is concerned with the ease and efficiency of the product performance

(A) Functional aspect

(B) Operational aspect

(C) Durability aspect

(D) Aesthetic aspect

7. In which of the following type the manufacturing cost may go up

(A) Standardization

(B) Simplification

(C) Diversification

(D) All of the above

8. Product _____ is the ultimate objective of variety reduction

(A) Simplification

(B) Standardization

(C) Specialization

(D) All of the above

3. Prerequisites:

The basic knowledge about the planning and manufacturing process.

4. Theory Behind:

INTRODUCTION:

In the middle of 1960s, market competition became more intense. During 1960 to 1970 cost was the primary concern. Later quality became the priority. As the market became more and more complex, speed of delivery became something customer also needed. A new strategy was formulated (Customizability). The companies have to adapt to the environment in which they operate, to be more flexible in their operations and to satisfy different market segments. Thus the innovation of FMS became related to the effort of gaining competitive advantage. First of all,

FMS is a manufacturing technology. Secondly, FMS is a philosophy. “System” is the key word. Philosophically, FMS incorporates a system view of manufacturing. The buzzword for today’s manufacturer is “agility”. An agile manufacturer is one who is the fastest to the market, operates with the lowest total cost and has the greatest ability to “delight” its customers. FMS is simply one way that manufacturers are able to achieve this agility

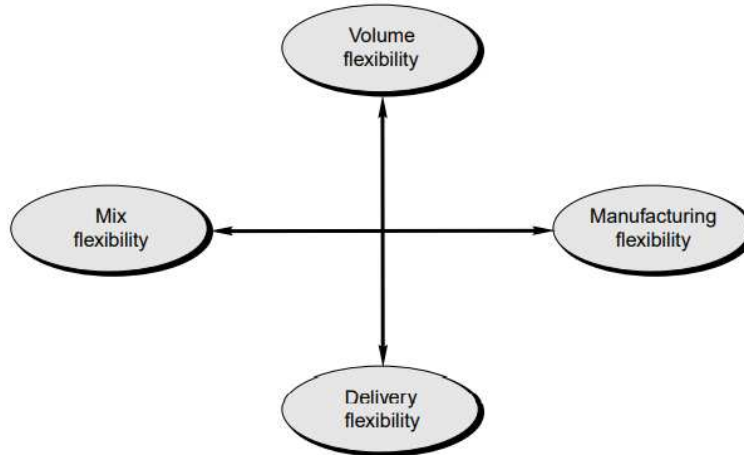


Fig. 1.1 Types of flexibilities

A flexible manufacturing system (FMS) is an arrangement of machines ... interconnected by a transport system. The transporter carries work to the machines on pallets or other interface units so that work-machine registration is accurate, rapid and automatic. A central computer controls both machines and transport system.

The basic components of FMS are:

1. Workstations
2. Automated Material Handling and Storage system.
3. Computer Control System

1. Workstations:

In present day application these workstations are typically computer numerical control (CNC) machine tools that perform machining operation on families of parts. Flexible manufacturing systems are being designed with other type of processing equipments including inspection stations, assembly works and sheet metal presses. The various workstations are (i) Machining centers (ii) Load and unload stations (iii) Assembly work stations (iv) Inspection stations (v) Forging stations (vi) Sheet metal processing, etc.

2. Automated Material Handling and Storage system:

The various automated material handling systems are used to transport work parts and subassembly parts between the processing stations, sometimes incorporating storage into function. The various functions of automated material handling and storage system are (i)

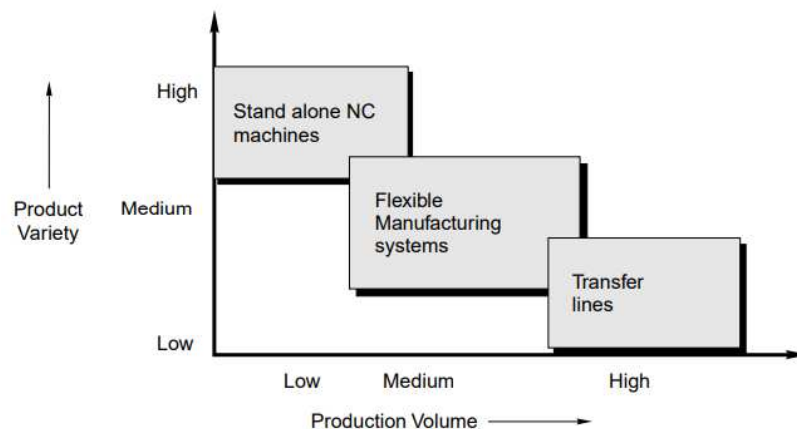
Random and independent movement of work parts between workstations (ii) Handling of a variety of work part configurations (iii) Temporary storage (iv) Convenient access for loading and unloading of work parts (v) Compatible with computer control

3. Computer Control System:

It is used to coordinate the activities of the processing stations and the material handling system in the FMS. The various functions of computer control system are: (i) Control of each work station (ii) Distribution of control instruction to work station (iii) Production control (vi) Traffic control (v) Shuttle control (vi) Work handling system and monitoring (vii) System performance monitoring and reporting

5. Applications / Simulation / Related Laboratory example

The FMS is most suited for the mid variety, mid value production range.



6. MCQ- post-test

1. From the following which is the main components of Flexible manufacturing system (FMS).

- a) Main frame computer
- b) Automated guided vehicle
- c) Material handling system

d) All of the above

2. The type in which the range or universe of part styles that can be produced on the system

- a) Mix flexibility

b) Production flexibility

- c) Volume flexibility
- d) Product flexibility

3. FMS can be classified basing on

- a) Kinds of operation they perform
- b) Number of machines
- c) Level of flexibility

d) All of the above

4. One of the classification of FMS based on number of machines in the system

a) **Flexible manufacturing cell**

b) Random-order FMS

c) Dedicated FMS

d) None of the above

5. The appropriate layout, when the application consists exclusively of in-sequence moves is

a) Rectangular layout

b) Loop layout

c) **In-line layout**

d) U-shape layout

7. Conclusion

- Understood basics of manufacturing process.
- Understood about the various types of Flexible manufacturing systems.
- The importance of FMS in various applications in types of productions.

8. References

- Jha.N.K., "Handbook of flexible manufacturing systems", Academic Press Inc., 1991

9. Audio/ video - if any

<https://youtu.be/tiarT1YS-IM>

10. Assignments

- Define FMS? and explain the various components of FMS?