

## **Unit IV FMS and AGV**

### **Flexible Manufacturing System (FMS)**

A **Flexible Manufacturing System (FMS)** is an advanced manufacturing system designed to adapt to changes in production without requiring significant reconfiguration. It integrates **CNC machines, robots, automated material handling systems, and computer control** to produce different products with high efficiency.

#### **Key Components of FMS**

1. **Workstations** – CNC machines, robotic arms, and other equipment.
2. **Material Handling System** – Conveyor belts, Automated Guided Vehicles (AGVs), robotic arms.
3. **Computer Control System** – Monitors and coordinates all operations.
4. **Loading & Unloading Stations** – For feeding raw materials and collecting finished products.

#### **Types of FMS**

1. **Dedicated FMS** – Designed for a specific family of products.
2. **Random FMS** – Can handle a wide variety of products with frequent changes.
3. **Modular FMS** – Allows expansion and reconfiguration as needed.

#### **Types of Flexible Manufacturing Systems (FMS)**

FMS can be categorized based on **the level of flexibility, the type of operation, and system layout**.

##### **1. Based on Flexibility:**

###### **1. Dedicated FMS**

- Designed to manufacture a specific set of products with minimal variation.
- High efficiency but limited adaptability.
- Example: A system designed to produce different models of car engine blocks.

###### **2. Random FMS**

- Can handle a wide variety of products with frequent changes.
- High adaptability and reconfigurability.
- Example: A system used in electronics manufacturing, producing different circuit boards.

##### **2. Based on System Layout:**

###### **1. Sequential FMS**

- Products follow a fixed sequence of operations.

- Suitable for mass production with slight variations.
- Example: Assembly lines with CNC machines for automotive parts.

## 2. Random FMS

- No fixed sequence; parts can follow different paths based on need.
- Offers high flexibility for varying product designs.

## 3. Modular FMS

- System components can be added or removed based on demand.
- High scalability and reconfigurability.
- Example: A system that adds new robotic arms or AGVs as production demand increases.

## 4. Dedicated FMS

- Fixed layout optimized for a specific family of products.
- Limited flexibility but high efficiency for predefined tasks.

## 3. Based on Level of Automation:

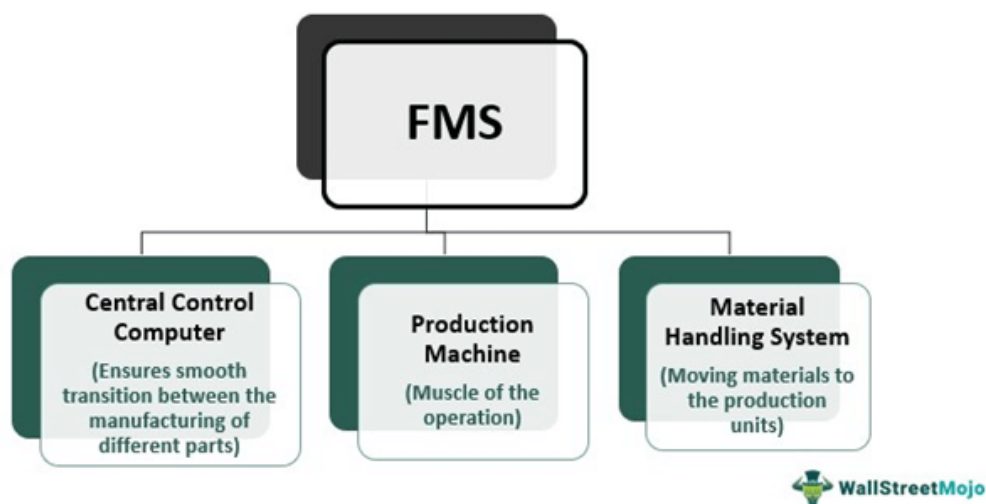
### 1. Fully Automated FMS

- Minimal human intervention; controlled by a central computer.
- Example: Automated semiconductor manufacturing.

### 2. Semi-Automated FMS

- Requires human intervention for some tasks like loading/unloading.
- Example: CNC machining centers with manual part feeding.

## Flexible Manufacturing Systems



### **Advantages of FMS**

- ✓ High production flexibility
- ✓ Reduced setup time
- ✓ Lower labor costs
- ✓ Improved product quality
- ✓ Efficient use of resources

### **Disadvantages of FMS**

- ✗ High initial investment
- ✗ Complex maintenance and programming
- ✗ Requires skilled workforce