

Ch: 13 Introduction to manufacturing System

Definition: A collection of integrated equipment & human resources, who's function to perform one or more processing / assembly operation.

* Value added work.

Production System

Manufacturing Operation

(machining / material removal)

* milling * Drilling * turning

Assembly Operation

joining
* welding
* screwing

handling process
* Gripping
* Moving

Manufacturing System equipment:

- Production machine & tools
- Material handling & work positioning (load, unload, transport)
- Computer systems

* High production volume \Rightarrow (fixed routing)

* High flexible variety \Rightarrow (variable routing)

Examples of manufacturing systems

- single-station cells
- Machine clusters
- Manual assembly line
- Automated transfer line
- Automated Assembly system
- Machine cells (cellular manufacturing)
- flexible manufacturing systems.

① single-station cell: one worker \rightarrow one production machine \rightarrow operates on semi-automatic cycle

② Machine cluster: one worker \rightarrow group of semi-automatic machine.

③ Manual Assembly line: production line \rightarrow series of work station - assembly operation performed by humans

④ Automated Assembly line: assembly operations

⑤ Automated Transfer line: processing operation

⑥ Machine cell : operations on a family of parts/products

⑦ Flexible manufacturing system (FMS) : Highly automated machine cell that produces parts/product family.

• Components of a Manufacturing System:

- ① Production machine, tools -- ② Material handling system ③ computer system
④ Human workers

• Classification of production machines:

- Manually automated machines (worker) ⇒ machine provides the power, worker provides the control
- Semi-Automated machines (Automation & worker) ⇒ portion of workcycle
- Fully-Automated machining (ONLY Automation) ⇒ longer more than one cycle

• Work Station : A location in the factory where task or operation is accomplished

* A system w multiple workstations is called a production line, machine cell.

• Work transport b/w stations:

① fixed routing : - work units flow through the same sequence
- Most production line

② variable routing :
- work unit moved through a variety of diff. station
- Most job shops

• Computer functions in a manufacturing system:

- | | |
|--------------------------|-------------------------|
| - instruction to workers | - Download Part Program |
| - Schedule production | - QC |
| | - operation management |

• Factors that define & distinguish manufacturing systems:

- Types of operation performed (assembly/process)
- no. of workstations
- System layout
- Automation & manning level
- Part or product variety

* $n=1$ (single station) * $n \uparrow$, workload capacity \uparrow , higher production \uparrow
rate

① **Workload**: is the amount of processing or assembly accomplished by system, in terms of time required to perform the work.

- Sum of the cycle times of all work unit completed by the system

② **Work content**: - total time of all work element
- performed on the line to make one unit of product

• **Part or product variety: Flexibility**

Three cases:

① Single-model case

② Batch-model case
↳ hard product variety

③ Mixed-model case
↳ soft product variety