UNIT II

PROCESS PLANNING ACTIVITIES

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- 1. Specific activities involved in Process planning are
- 2. Analysis of the finished part requirements as specified in the engineering design
- 3. Determining the sequence of operation required
- 4. Selecting the proper equipment to accomplish the required operations
- 5. Calculating the specific operation setup times and cycle times on each machine
- 6. Documenting the established process plans
- 7. Communicating the manufacturing knowledge to the shop floor

1. Analyze finished part requirements

- Component drawing should be analyzed to identify its features, dimensions, and tolerance specifications
- Part's requirement defined by its features, dimensions, and tolerance specifications will Π determine corresponding processing requirements

2. Determine operating sequence

- Basic aim is to determine the type of processing operation that has the capability to generate various types of features, given the tolerance requirements Π
- Π There are two ways of viewing decision process
 - First view is to consider processing evaluation of part from rough state to finished final state. In this view material is removed or modified on rough part in stages in order to transform it into finished part Π
 - Second view is to consider part evaluation from finished state back to rough/ initial state. In this view material is added back onto the part.

3. Select machines

- Machineselectionrequiresdetermininghowthepartwouldbeprocessedoneachofthe
- ?
- alternative machines so that best machine can be selected At this phase, firm has to decide whether to make or buy the component part
- Break even analysis is most convenient method for selecting optimum method of Π manufacture or machine amongst the competing ones

4. Material selection parameters

- **Function**
- Appearance
- Reliability
- Service life
- **Environment**
- Compatibility
- Productivity
- Cost
- 5. Calculate processing time
 - Determination of set-up times requires knowledge of available tooling and sequence of steps necessary to prepare the machine for processing given work piece
 - For establishing accurate set-up times, detailed knowledge of equipment capacity, tooling, and shop practice required
 - Calculation of part processing time requires determination of sequence of processing steps on each machine. This is called as OUTPLANNING
 - After calculation of processing time, appropriate times for loading, part unloading, machine indexing, and other factors involved in one complete cycle for processing a part must be included to compute the expected machine cycle time
 - Allowances are added with machine cycle time to calculate standard cycle time for processing one piece
 - Appropriate machine rates are added with calculated cycle time to calculate expected standard cost for given operation

6. Document process planning

- Process plan is documented as job routing or operation sheet
- Operation sheet also called -route sheet,-instruction sheet,-traveler, -planner
- Information provided by route sheet are,
 - Part identification
 - Description of processing steps in each operation
 - Operation sequence and machines
 - Standard set-up and cycle times
 - **Tooling requirements for each operation**
 - Production control information showing the planning lead time at each operation

Reasons for documentation

- Tohavearecordonhoeapartisprocessedinordertoplanfuturepartswithsimilar Π
- design requirements in a consistent manner To provide a record for future job quoting, cost estimating, and standard costing systems ?
- Π To act as a vehicle for communication

7. Communicate process knowledge

- Communication is essential to ensure that part will be processed according to most economical way
- Process documentation and communication provide basis for improved part consistency and quality in manufacturing

DEVELOPING MANUFACTURING LOGIC AND KNOWLEDGE

- To support process planning system, the acquisition and documentation of manufacturing knowledge is very essential
- Knowledge structure should be determined prior to any type of program coding or data presentation
- Knowledge structure will help to ensure error reduction, debugging case, clarity, and future modification
- Production engineers need a tool to develop Knowledge structure format that can be used Π in an interactive process and will emphasis what questions to ask and what data to collect to support standardized format
- ? Commonly used tools are,
 - 1. Flowcharts
 - 2. Decision tables
 - 3. Expert system shells

Benefits

- Itassiststheproductionengineersinthinkingthroughaproblemthoroughlyand
- ?
- presenting its resolution in a systematic and rationally structured format Ensure accuracy, eliminate redundancy, and avoid contradiction It assists in stating problem, agreeing on criteria, stating alternatives, and accepting Π actions between criteria and alternatives ?
- Provide knowledge structure and readable documentation as by-product

SELECTION OF PROCESS PLANNING SYSTEM

Factors to be considered while selecting best process planning system are,

- Environment in which process planning is conducted
- Organizational structure of company
- **Technical expertise available to the company**
- Needs and objective of company regarding generation of manufacturing information and process plans

1.6 MACHINING TIME FOR VARIOUSMACHINING

Basic time is the time taken by an operator of standard performance (rating of 100). A man whose work is observed, may be a slow worker or a fast worker. His rating may be less than 100 or above 100. The observed time cannot be taken as the basic time. Here the rating factor is applied and basic time is calculated as follows.

Basic time = Observed time $\times \frac{\text{Operator rating}}{\text{Standard rating}}$

For example, assume that observed time for an operation is 0.7 mts. The rating of the Operator is found to be 120.



Fig. 1.8: Basic time calculation

1.7 ALLOWANCES Various types of allowance are

- 6. Rest and personal allowance.
- 7. Process allowance.
- 8. Contingency allowance.
- 9. Special allowance.
- 10.Policy allowance.

1.9 CALCULATION OF STANDARD TIME

Standard time or allowed time is the total time in which a job should be completed at standard performance. It is the sum of normal time (basic time) and allowances. Policy allowance is not included.

Standard time is worked out in a stop watch time study in the following manner.

Observed time

This is the actual time observed by using a stop watch. The observed time of an operation is The total of the element al times.

The time study for the same job is conducted for a number of times. The average of the observed times is calculated.

Basic or normal time

Basic time is the time taken by a worker with standard performance. Basic time is calculated from the observed time by applying the rating factor.



Allowed time or standard time

The standard time is obtained by adding the following allowances with the basic or normal time.

- 5. Rest and personal allowance or relaxation allowance.
- 6. Process allowance or unavoidable delay allowance.
- 7. Contingency allowance.
- 8. Special allowance.

Policy allowance may be added to the standard time if the management wants.

2 MARKS

1. Define Process planning

Process planning can be defined as an act of preparing a detailed processing documentation for the manufacture of a piece part or assembly.

- 2. Brief about scope of Process planning
 - Process rationalization and standardization Π
 - Π Faster response to engineering changes
 - Standard plans leads to achieve six sigma level Π
- 3. What are the documents used in Process planning?
 - Process sheet Π
 - Π Operation sheet
 - Π Route sheet
- 4. What are the factors affect process planning?
 - Volume of production
 - Π The skill and experience of man power
 - Delivery dates for parts or products
 - Material specifications
 - Π Accuracy and process capability of machines
 - Accuracy requirements of parts or products
- 5. What are the reasons for process documentation?
 - Tohavearecordonhoeapartisprocessedinordertoplanfuturepartswithsimilar

 - design requirements in a consistent manner To provide a record for future job quoting, cost estimating, and standard costing systems ?
 - To act as a vehicle for communication Π

- 6. State the general approaches to process planning?
 - 1. Manual Process planning
 - 2. Computer Aided Process planning(CAPP)
 - a. Retrieval CAPP system
 - b. Generative CAPP system
- 7. What are the tools used for acquiring and documenting knowledge?
 - 1. Flowcharts
 - 2. Decision tables
 - 3. Expert system shells
- 8. State the benefits of decision table?
 - $\label{eq:liststep} It assists the production engineers in thinking through a problem thoroughly and$ presenting its resolution in a systematic and rationally structured format Ensure accuracy, eliminate redundancy,

 - and avoid contradiction
 - Π It assists in stating problem, agreeing on criteria, stating alternatives, and accepting
- actions between criteria and alternatives
- Provide knowledge structure and readable documentation as by-product
 - 9. List Material selection parameters
 - Function Π

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- Appearance
- Reliability
- Service life
- Π Environment
- Compatibility
- Productivity
- Π Cost

10. State the process planning activities

- 1. Specific activities involved in Process planning are
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