ME8793 PROCESS PLANNING AND COST ESTIMATION

UNIT 1 INTRODUCTION TO PROCESS PLANNING

1.PROCESS PLANNING:

Process planning is a preparatory step before manufacturing, which determines the sequence of operations or processes needed to produce a part or an assembly. This step is more important in job shops, where one-of-a-kind products are made or the same product is made infrequently.

Planning processes can result in increased output, higher precision, and faster turnaround for vital business tasks. A process is described as a set of steps that result in a specific outcome. It converts input into output.

Process planning is also called manufacturing planning, material processing, process engineering, and machine routing. It is the act of preparing detailed work instructions to produce a part. It is a complete description of specific stages in the production process.

Process planning determines how the product will be produced or service will be provided. Process planning converts design information into the process steps and instructions to powerfully and effectively manufacture products. As the design process is supported by many computer-aided tools, computer-aided process planning (CAPP) has evolved to make simpler and improve process planning and realize more effectual use of manufacturing resources.

It has been documented that process planning is required for new product and services. It is the base for designing factory buildings, facility layout and selecting production equipment. It also affects the job design and quality control.

It is understood that the product design for each product has been developed in the design department. To convert the product design into a product, a manufacturing plan is required. The activity of developing such a plan is called process planning.

Process planning consists of preparing set of instructions that describe how to manufacture the product and its parts.

The task of process planning consists of determining the manufacturing operations required to transform a part from a rough (raw material) to the finished state specified on the engineering drawing.

Process planning, also known as operations planning, is the systematic determination of the engineering processes and systems to manufacture a product competitively and economically.

"Process planning is a detailed specification which lists the operations, tools, and facilities. Process planning is usually accomplished in manufacturing department.

Process planning can be defined as "an act of preparing detailed work instructions for the manufacture and assembly of components into a finished product in discrete part manufacturing environments.

According to the American Society of Tool and Manufacturing Engineers. "process planning is the systematic determination of the methods by which a product is to be manufactured, economically and competitively."

It consists of

(î) the selection of manufacturing processes and operations, production equipment, tooling and jigs & fixtures;

(ii) determination of manufacturing parameters; and

(iii) specification of selection criteria for the quality assurance (QA) methods to ensure product quality

Importance of Process Planning

Process planning establishes the link between engineering design and shop floor manufacturing. Since process planning determines how a part / product will be manufactured, it becomes the important determinant of production costs and profitability. Also, production process plans should be based on in-depth knowledge of

process and equipment capabilities, tooling availability, material processing characteristics, related costs, and shop practices.

The economic future of the industry demands that process plans that are developed should be feasible, low cost, and consistent with plans for similar parts.

In addition, process planning facilitates the feedback from the shop floor to design engineering regarding the manufacturability of alternative.

Process planning is an intermediate stage between designing the product and manufacturing.

Objective of Process Planning:

The chief of process planning is to augment and modernize the business methods of a company. Process planning is planned to renovate design specification into manufacturing instructions and to make products within the function and quality specification at the least possible costs. This will result in reduced costs, due to fewer staff required to complete the same process, higher competence, by eradicating process steps such as loops and bottlenecks, greater precision, by including checkpoints and success measures to make sure process steps are completed precisely, better understanding by all employees to fulfil their department objectives. Process planning deals with the selection of the processes and the determination of conditions of the processes.

The particular operations and conditions have to be realised in order to change raw material into a specified shape. All the specifications and conditions of operations are included in the process plan. The process plan is a certificate such as engineering drawing. Both the engineering drawing and the process plan present the fundamental document for the manufacturing of products. Process planning influences time to market and productions cost. Consequently, the planning activities have immense importance for competitive advantage.

PRINCIPLES OF PROCESS PLANNING:

General principles for evaluating or enhancing processes are as follows:

1. First define the outputs, and then look toward the inputs needed to achieve those outputs.
2. Describe the goals of the process, and assess them frequently to make sure they are still appropriate. This would include specific measures like quality scores and turnaround times.
3. When mapped, the process should appear as a logical flow, without loops back to earlier steps or departments.
4. Any step executed needs to be included in the documentation. If not, it should be eliminated or documented, depending on whether or not it's necessary to the process.
5. People involved in the process should be consulted, as they often have the most current information.
6. Process planning includes the activities and functions to develop a comprehensive plans and instructions to produce a part. The planning starts with engineering drawings, specifications, parts or material lists and a forecast of demand. The results of the planning are routings which specify operations, operation sequences, work centers, standards, tooling and fixtures. This routing becomes a major input to the manufacturing resource planning system to define operations for production activity control purposes and define required resources for capacity requirements planning purposes.

Process plans which characteristically offer more detailed, step-by-step work instructions including dimensions linked to individual operations, machining parameters, set-up instructions, and quality assurance checkpoints.

Process plans results in fabrication and assembly drawings to support manufacture and annual process planning is based on a manufacturing engineer's experience and knowledge of production facilities, equipment, their capabilities,

processes, and tooling. But process planning is very lengthy and the results differ based on the person doing the planning.

MAJOR STEPS IN PROCESS PLANNING:

Process planning has numerous steps to complete the project that include the definition, documentation, review and improvement of steps in business processes used in a company.

Definition:

The first step is to describe what the process should accomplish. It includes queries like, what is the output of this process? Who receives the output, and how do they define success?, What are the inputs for the process?, Are there defined success measures in place - such as turnaround time or quality scores? And Are there specific checkpoints in the process that need to be addressed.

Documentation:

During the documentation stage, interviews are conducted with company personnel to determine the steps and actions they take as part of a specific business process. The results of these interviews is written down, generally in the form of a flow chart, with copies of any forms used or attached. These flow charts are given to the involved departments to review, to make sure information has been correctly captured in the chart.

Review:

Next, the flow charts are reviewed for potential problem areas.

Process planning in manufacturing may include the following activities:

1. Selection of raw-stock,
2. Determination of machining methods,
3. Selection of machine tools,
4. Selection of cutting tools,
5. Selection or design of fixtures and jigs,

6. Determination of set-up,
7. Determination of machining sequences,
8. Calculations or determination of cutting conditions,
9. Calculation and planning of tool paths,
10. Processing the process plan