period because of the much smaller car market in Japan and the need to be as efficient as possible.

Continuous Improvement: In mass production, there is a tendency to set up the operation, and if it is working, leave it alone. Mass production lives by the motto “if it ain't broke, don’t fix it." By contrast lean production supports the policy of continuous improvement. Continuous improvement means constantly searching for and implementing ways to reduce cost, improve quality, and increase productivity.

The scope of continuous improvement goes beyond factory operations and involves design improvements as well. Continuous improvement is carried out one project at a time. The projects may be concerned with any of the following problem areas: cost reduction. Quality improvement, productivity improvement, setup time reduction, cycle time reduction, manufacturing lead time and work-in-process inventory reduction, and improvement of product design to increase performance and customer appeal.

UNIT II

PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING

PART -A

1. What is process planning in a manufacturing system?

Process plans which typically provide more detailed, step-by-step work instructions including dimensions related to individual operations, machining parameters, set-up instructions, and quality assurance checkpoints, Fabrication and assembly drawings to support manufacture.

2. List any advantages of CAPP.

* Investment in hardware and software is not much
* The system offers a shorter development time and lower manpower
* Consumption to develop process plan.

3. Define MRP II.

The MRP II process is carried out by a synergistic combination of computer and human resources. It differs fundamentally from point contact planning, in which individual characteristics and functions have their own dedicated systems.

4. Define master production schedule.

A Master Production Schedule or MPS is the plan that a company has developed for production, inventory, staffing, etc. It sets the quantity of each end item to be completed in each week of a short-range planning horizon. A Master Production Schedule is the master of all schedules

5. What is production planning?

It is a preproduction activity. It may be defined as the determination, acquisition and arrangement of all facilities necessary for future production of products.

6. Give the main component of generative CAPP systems.

CAPP system contains of two main components.

i) Manufacturing data base (part description, machine tool library etc..)

ii) Decision logic (to represent the process planner)

7. What are the important reasons for shop floor scheduling?

Job shops have to produce products against customer order for delivery dates have to be promised production lots tend to be quite small and may require numerous machine change over possibility of assigning and reassigning workers and machines to many different orders due to flexibility.

8. What are the phases for shop floor control?

A typical shop floor control system consist of three phases

- Order release
- Order scheduling
- Order progress

9. Distinguish clearly between MRP and MRP II. (Nov/Dec 2016)

Material requirement Planning (MRP) : It is a computational technique that converts the master schedule for end products into a detailed schedule for the raw materials and components used in the end products. The detailed schedule identifies the quantities of each raw material and component items. It indicates when each item must be ordered and delivered to meet the master schedule for final products.

Manufacturing Resource Planning (MRP II): It can be defined as a computer based system for planning, scheduling, and controlling the materials, resources and supporting activities needed to meet the master production schedule. It is a closed loop system that integrates and coordinates all of the major functions of the business to produce the right products at the right times. Closed loop system means that MRP II incorporates feedback of data on various aspects of operating performance so that corrective action can be taken in a timely manner.

10. Why retrieval CAPP is called as variant CAPP system?

For a new component for which the process plan is to be determined, the first step is to derive the GT code number for the part. With this code number, a search is made of the part family file to determine if a standard route sheet exists for the given part code. If the file contains a process plan for the part, it is retrieved and displayed for the user. Hence this CAPP is called as retrieval CAPP system.

11. Differentiate process planning and production planning.(Nov/Dec 2016)

Process planning is concerned with the engineering and technological issues of how to make the product and it parts. It deals with what types of equipment and tools required to fabricate the parts and assemble the product.

Production planning is concerned with logistics issues of making the product. It is concerned with ordering the materials and obtaining the resources required to make the product.

12. Comment on the output of aggregate production planning.(Apr/May 2017)

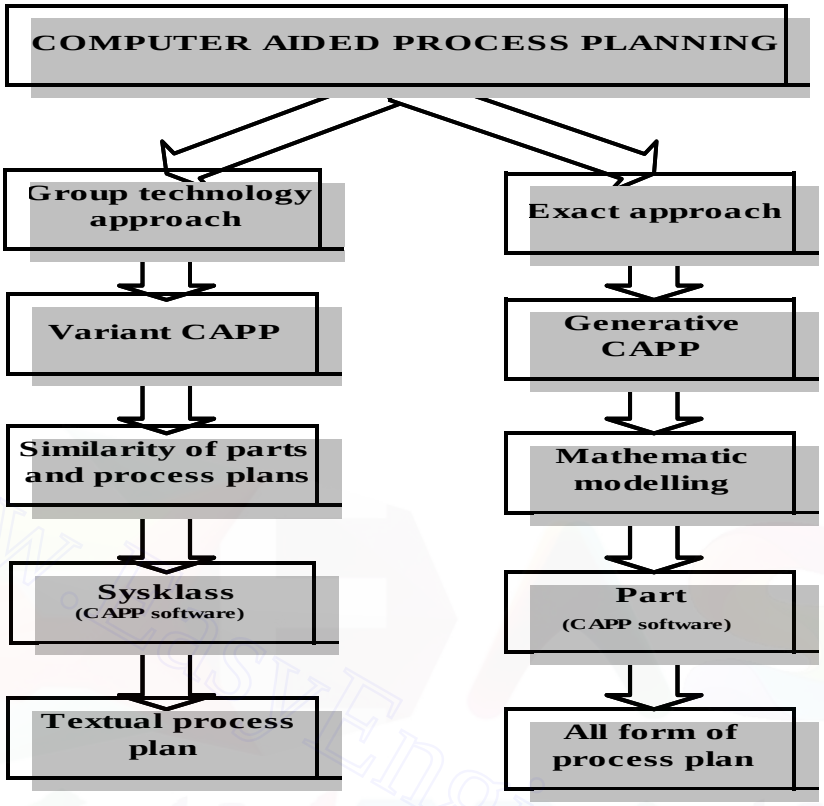
Inputs to aggregate planning include demand forecast, available resources, and policies regarding employment levels, and so on. The output of the aggregate planning is a production plan or an operations plan with overall decisions on level of output, capacity, employment, and inventory.

13. List the basic steps in developing a process plan. (Apr/May 2017)

- Generating an Idea
- Evolution of the Idea
- Market Research
- Product Introduction
- Product Life Cycle

PART- B

1. Define variant CAPP systems. Explain the general procedure for using one of the variant CAPP systems. (Apr/May 2017), (Nov/Dec 2016)



Variant Process Planning

Variant process planning implements a coding and classification scheme by which a process plan for a previously planned part is retrieved. The retrieved plan is based on the similarity to the new part. The process plan is then manually modified as required for the new part design. There is high probability that similar parts have similar process plans. This is a basic assumption of utilizing the variant process planning method.

Variant methods assume that the user is able to determine the appropriate classification codes needed to retrieve appropriate plans, and that plans exist and include features which are closely analogous to those of the new part.

Because variant systems are based on the process plans on historic data, it is also assumed that the factory configuration is stable, with only minimal workstation or process capability changes.

The variant approach to CAPP was the first approach used in computer process planning. Variant CAPP is based on the concept that similar parts have similar process plans. The computer is used as a tool to assist in identifying similar process plans, as well as in retrieving and editing the plans to suit the requirements for specific parts. Variant CAPP is related to part classification and Group Technology coding. In these approaches, parts are classified and coded based upon several characteristics or attributes. A Group Technology code can be used for the retrieval of process plans for similar parts.

A retrieval CAPP system, also called a variant CAPP system, has been widely used in machining applications. The basic idea behind the retrieval CAPP is that similar parts will have similar process plans. In this system, a process plan for a new part is created by recalling, identifying and retrieving an existing plan for a similar part, and making the necessary modifications for the new part.

In fact, the variant CAPP is a computer – assisted extension of the manual approach. The computer assists by providing an efficient system for data management, retrieval, editing and high speed printing of the process plans. The retrieval CAPP system has the capacity to alter an existing process plan. That's why it is also known as variant CAPP system.

Procedure for using Retrieval CAPP system

A retrieval CAPP system is based on the principles of group technology (GT) and parts classification and coding. In this system, for each part family a standard process plan is prepared and stored in computer files. Through classification and coding, a code number is generated. These codes are often used to identify the part family and the associated standard plan. The standard plan is retrieval and edited for the new part.

Variant CAPP system procedure:

Step 1: Define the coding scheme

Adopt existing coding or classification schemes to label parts for the purpose of classification. In some extreme cases, a new coding scheme maybe developed.

Step 2: Group the parts into part families

Group the part families using the coding scheme defined in Step 1. based on some common part features. A standard plan is attached to each part family (see step 3). Often, a number of part types are associated with a family, thereby reducing the total number of standard process plan.

Step 3: Develop a standard process plan for each part family based on the common features of the part types. This process plan can be used for every part type within the family with suitable modifications.

Step 4: Retrieve and modify the standard plan:

When a new part enters the system, it is assigned to a part family based on the coding and classification scheme. Then the corresponding standard process plan is retrieved and modified to accommodate the unique features of the new part.

Advantages of Retrieval CAPP system:

- Once a standard plan has been written, a variety of parts can be planned.
- Comparatively simple programming and installation (compare with generative CAPP systems) is required to implement a planning system.
- Efficient processing and evaluation of complicated activities and decisions, thus reducing the time and labour requirements.
- Lower development and hardware costs.

2. Explain in detail the Generative and Variant approaches in process planning and differentiate both approaches? (Apr/May 2017)

Generative approaches in Computer aided manufacturing process planning:

In the generative approach, an automatic computerized system is used to synthesize or generate each individual process plan automatically and without reference to any prior plan. The automatic computerized system normally consists of decision logic, formulas, technology algorithms and geometry based data to uniquely determine the many processing decisions required for generating process plans.

Unlike the retrieval CAPP no standard manufacturing plans are predefined or stored. Instead, the computer automatically generates a unique operation/ route sheet whenever the part is ordered.

Thus the generative CAPP system automatically generates the process plan based on decision logics and pre-coded algorithms. The computer stores the rules of manufacturing and the equipment capabilities.

When using a system, a specific process plan for a specific part can be generated without any involvement of a process planner. The human role in running the system includes

Inputting the GT code of the given part design, and (ii) monitoring the function.

Components of Generative CAPP system

The various components of a generative system are,

i) A part description, which identifies a series of component characteristics, including geometric features, dimensions, tolerances and surface condition.

ii) A subsystem to define the machining parameters for example using look – up tables and analytical results for cutting parameters.

iii) A subsystem to select and sequence individual operations.

iv) Decision logic is used to associate appropriate operations with features of a component, and heuristics and algorithms are used to calculate operation steps, times and sequences.

v) A database of available machines and tooling.

vi) A report generator which prepares the process plan report.

Advantages of Generative CAPP:

i) New components can be planned as easily as existing components.

ii) It has potential for integrating with an automated manufacturing facility to provide

iii) Detailed control information.

Variant or Retrieval approaches in Computer aided manufacturing process planning

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Step 3: Develop a standard process plan for each part family based on the common features of the part types. This process plan can be used for every part type within the family with Suitable modifications.

3. Explain the three phases of shop floor control. (Apr/May 2017), (Nov/Dec 2016).

The three phases of shop floor control

i) Order release

ii) Order scheduling

iii) Order progress

Order Release:

The order release in shop floor control provides the documentation needed to process a production order. The documents in the shop floor order may consists of the following documents

i) Route Sheet

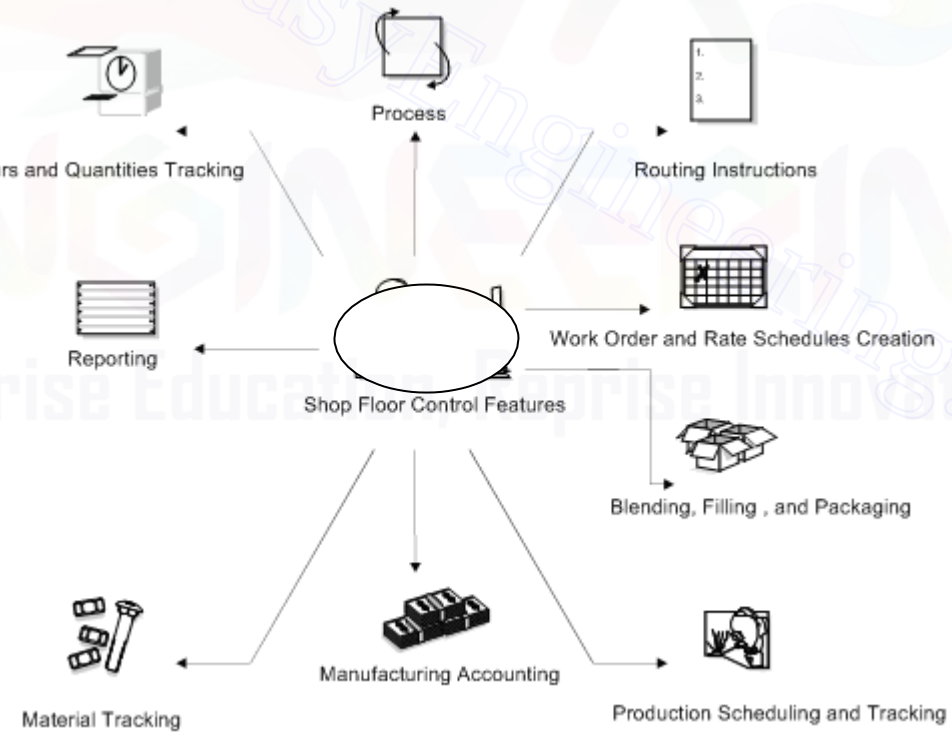
ii) Material requisition to draw necessary materials from the stores

iii) Job cards or other means to report direct labour time given to the order.

iv) Instructions to material handling personnel to transport parts between the work centers in the factory

v) Parts list for assembly, in the case of assembly operations.

In a typical factory which works on manual processing of data these documents move with the production order and are used to track the progress through the shop. In a CIM factory, more automated methods are used to track the progress of the production orders. The order release is connected with two inputs. Authorization proceeds through the various planning functions (MRP, capacity planning). These provide timing and scheduling information. The engineering and manufacturing database provides the product structure and process planning information needed to prepare the various documents that accompany the order through the shop.



Order Scheduling:

This module assigns the production orders to various work centres, machine tools, welding stations, moulding machines etc., in the plant. It follows directly from the order release module. Order scheduling executes the dispatch function in production

planning and control. The order scheduling module prepares a dispatch list that indicates which production order should be accomplished at the various work centers. It provides the information on the relative priorities of the various jobs by showing the due dates for each job. By following the dispatch list in making work assignments and allocating resources to different jobs the master schedule can be best achieved. The order schedule module addresses to two important activities in shop floor production control.

(i) Machine loading

(ii) Job sequencing.

Allocating the orders to the work centers is termed as machine loading or shop loading, which refers to the loading of all machines in the plant. In most cases each work centre will have a queue of orders waiting to be processed. This queue problem can be solved by job sequencing. This involves determining the order in which the jobs will be processed through a given work centre. To determine this sequence, priorities are given to jobs in the queue and the jobs are processed according to the priorities. Several queuing models are available in operations management to solve this problem. This control of priorities is an important input to the order scheduling module. Rules to establish the priorities are:

(i) Earliest due date: These are given high priority

(ii) Shortest processing time: Shorter processing time orders are given high priority.

(iii) Least slack time: Orders with least slack time are given high priority.

Fluctuations in market demand, equipment breakdown, cancellation of the order by customer and defective raw material or delay in the receipt of materials affect the priority. The priority control plan reviews the relative priorities of the orders and adjusts the dispatch list accordingly.

Order Progress:

The order progress module in the shop floor control system monitors the status of the various orders in the plant work-in-process and other characteristics that indicate the progress and performance of production. The function of the order progress module is to

provide the information that is useful in managing the factory based on the data collected from the factory. The order progress report includes:

(i) Work order status reports: These reports indicate the status of the production orders. Typical information in the report includes the current work centre where each order is located, processing hours remaining before completion of each order, whether the job is on-time or behind schedule, and priority level.

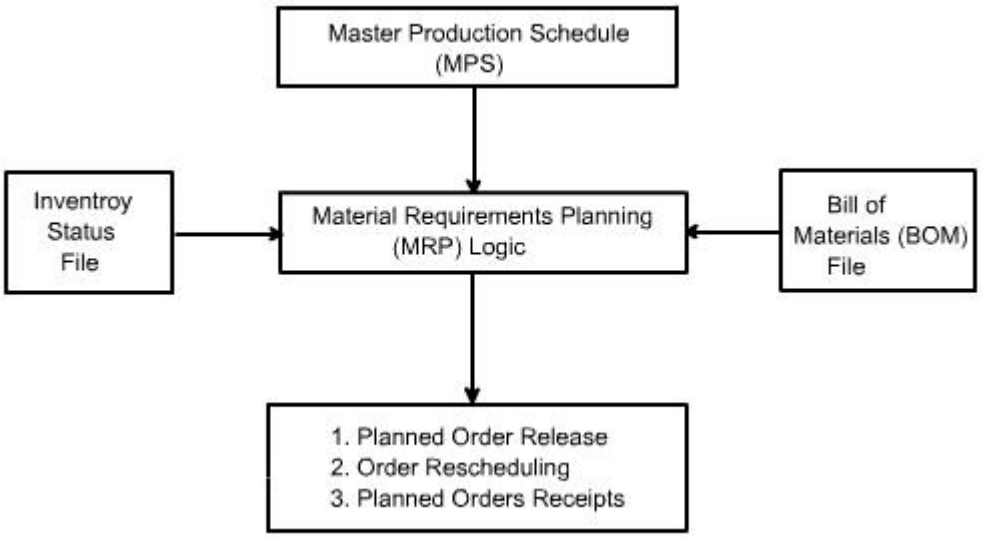
(ii) Progress report: A progress report records the performance of the shop during the period of master schedule and reports the number of operations completed and not completed during the time period.

Exception reports: These reports bring out the deviations from the production schedule (ex. overdue jobs). The above reports are useful to production management in making the decisions about allocation of resources, authorization of the overtime hours, and other capacity issues, and in identifying areas of problems in the plant that adversely affect the implementation of the master production schedule.

4. What is MRP? Explain the inputs to MRP and various MRP outputs. Also list the various benefits of MRP. (Nov/Dec 2016)

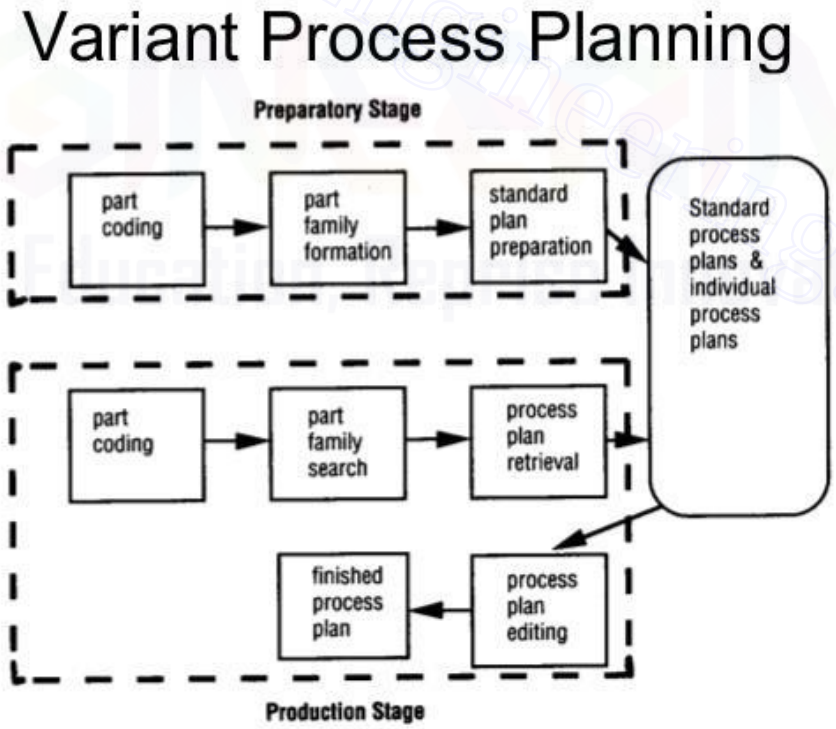
Material requirements planning (MRP):

It is a production planning and inventory control system used to manage Manufacturing processes. Most MRP systems are software-based, while it is possible to conduct MRP by hand as well.



Inputs to the MRP System:

Function of the MRP program must operate on data contained in several files. These file server as inputs to the MRP processor They are: MPS, bill of materials file and other engineering and manufacturing data. An inventory record files the flow of data into the MRP processor and its conversion into useful output reports.



In a properly implemented MRP system capacity planning also provides input to ensure that the MRP schedule does not exceed the production capacity of the firm. The MPS lists what end product, and how many of each are to be produced and when they are to be ready for shipment Manufacturing firms generally work toward monthly delivery schedules, but the master schedule in our figure uses weeks as the time periods MRP makes its computations of materials and parts requirements in terms of time buckets The bill of materials (BOM) file is used to compute the raw material and component requirements for end products listed in the master schedule. It provides information on the product structure by listing the component parts and subassemblies that make up each product.

INPUTS TO A STANDARD MRP PROGRAM

Demand for Products:

Product demand for end items stems from two main reasons. The first is known customers who have placed specific orders, such as those generated by sales personnel, or from interdepartmental transactions. The second source is forecast demand. Demand from known customers and demand forecast are combined and become the input to the master production schedule.

Bill of Materials File:

The bill of Materials file contains the complete product description, listing materials, parts, and components but also the sequence in which the product is created. The BOM file is often called the product structure file or product tree because it shows how a product is put together. It contains the information to identify each item and the quantity used per unit of the item of which it is a part.

Inventory Records File:

Inventory records file under a computerized system can be quite lengthy. Each item in inventory is carried as a separate file and the range of details carried about an item is almost limitless. The MRP program accesses the status segment of the file according to specific time periods. These files are accessed as needed during the program run.

OUTPUT REPORTS

Primary Reports:

Primary reports are the main or normal reports used for the inventory and Production control. These report consist of

i) Planned orders to be released at a future time.

ii) Order release notices to execute the planned orders.

iii) Changes in due dates of open orders due to rescheduling.

iv) Cancellations or suspensions of open orders due to cancellation or suspension of orders on the master production schedule.

v) Inventory status data.

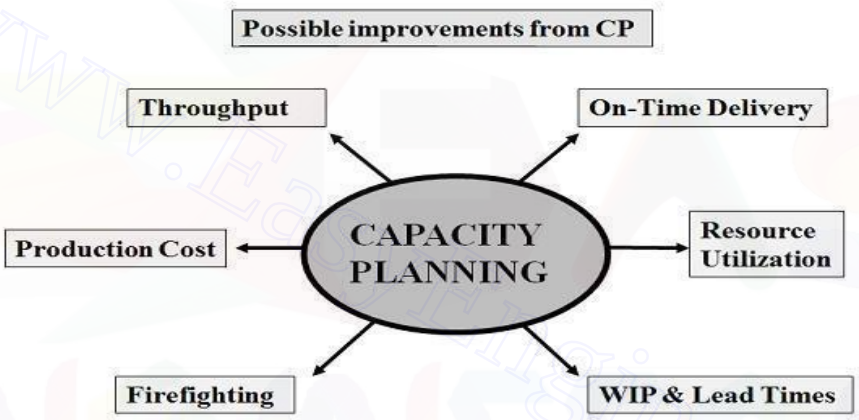
Secondary Reports

- Planning reports to be used, for example, in forecasting inventory and specifying requirements over some future time horizon.
- Performance reports for purposes of pointing out inactive items and determining the agreement between actual and programmed item lead times and between actual and programmed quantity usage and costs.
- Exceptions reports that point out serious discrepancies, such as errors, out of range situations, late or overdue orders, excessive scrap, or nonexistent parts.

5. Briefly explain Capacity Planning.

A realistic master schedule must be consistent with the production capabilities and limitations of the plant that will produce the product. Accordingly the firm must know its production capacity and must plan for changes in capacity to meet changing production requirements specified in the master schedule. we defined production capacity and formulated ways for determining the capacity of a plant Capacity planning is concerned with determining what labor and equipment resources are required to meet the current MPS as well as long-term future production needs of the firm Capacity planning also serves to identify the limitations of the available production resources so that an unrealistic master schedule is not planned. When the MRS is established: and second, when the MRP computations are done. A rough-cut capacity planning

calculation is made to assess the feasibility of the master schedule. Such a calculation indicates whether there is a significant violation of production capacity in the MPS. On the other hand, if the calculation shows no capacity violation, neither does it guarantee that the production schedule can be met a second capacity calculation is made at the MRP schedule is prepared. This detailed calculation determine, there is sufficient production capacity in the individual departments and work cells to complete the specific parts and assemblies that have been scheduled by MRP. If the schedule is not compatible with capacity, then adjustments must be made either in plant capacity or in the master schedule Capacity adjustments can be divided into short term adjustments and long-term adjustments.



• Employment levels. Employment in the plant can be increased or decreased in response to changes in capacity requirements,

• Temporary workers. Increases in employment level can also be made by using work a temporary agency. When the busy period is passed, these workers move to Positions at other companies where their services are needed.

• Number of work shifts. The number of shifts worked per production period can be increased or decreased.

•Labor hour. The number of labor hours per shift can be increased or decreased, through the use of overtime or reduced hours.

• Inventory stockpiling. This tactic might be used to maintain steady employment levels during slow demand periods

• Order backlash deliveries of the product to the customer could be delayed during busy periods when production resources are insufficient to keep up with demand.

• Sub contracting this involves the letting of jobs to other shops during busy periods.

Capacity planning adjustments for the long term include possible changes in production capacity that generally requires long lead times. These adjustments include the following types of decisions'

• New equipment Investments. This involves investing in more machines or more productive machines to meet increased future production requirements, or investing in new types of machines to match future changes in product design.

• New plant construction. Building a new factory represents a major investment for the company. However it also represents a significant increase in production capacity for the firm.

• Purchase of existing plants from other companies.

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