International Journal of Innovative Research in Engineering and Management (IJIREM)
ISSN: 2350-0557, Volume-9, Special Issue-8, August-2022
Innovative Projects 2022
Organized by Presidency University, Bangalore, India

Analysis of Aggregate Planning: Strategies and Performance Evaluation

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ABSTRACT:

Aggregate planning is a strategic management procedure that includes figuring out the total amount of output, the number of workers needed, and the quantity of inventory for a certain period of time. In order to illustrate the importance of aggregate planning in attaining operational efficiency and satisfying customer requests, this research examines the essential components of aggregate planning, including its goals, processes, and difficulties.Multi-service networks are the backbone that supports the IP world and, as a consequence, the world of new technologies; their infrastructures are constantly developing but are also tied to installation and building contexts.

KEYWORDS:

Aggregate Planning, Capacity Planning, Demand Forecasting, Inventory Management, Workforce Planning.

I. INTRODUCTION

Aggregate planning is a choice made for the intermediate period. It is the process of forecasting output quantity and timing across an intermediate time horizon 3 months to one year. The physical facilities are expected to be fixed for the planned period within this range. As a result, changes in demand must be accommodated by adjusting the labour and inventory schedules. Aggregate planning finds the optimal costcutting combination[1], [2].Labor, materials, and capital are the variables of the manufacturing system. More labour is needed to produce a bigger volume of product. As a result, the two important factors are employment and the usage of overtime OT. Materials aid in the regulation of production. Inventory, backordering, and item subcontracting are the options open to the firm.These controllable variables are pure solutions for accommodating changes in demand and uncertainty in manufacturing operations by taking the following steps:

1. **Change the Workforce Size:** Production is regulated by recruiting and firing personnel in accordance to variations in demand.
2. **Alter the Hours Worked:** Keep a consistent staff, but provide idle time when demand is low and overtime OT when there is a shortage.
3. **Change Inventory Levels:** Large amounts of inventory can meet fluctuating demand.
4. **Subcontract:** Demand shifts upward from a low level. Subcontractors may supply additional capacity to meet constant production rates.

Master Production Schedule

Master scheduling comes after aggregate planning. It presents the general plans in terms of particular end products or models to which priority may be given. It is advantageous to prepare for material and capacity needs.Flowchart of the overall strategy and the master production schedule. The time period utilised in master scheduling is determined by the product type, volume, and part lead times. Weekly

time periods are often employed. The master schedule's time horizon is also affected by product attributes and lead times. Some master schedules include as little as a few weeks, while others encompass more than a year.

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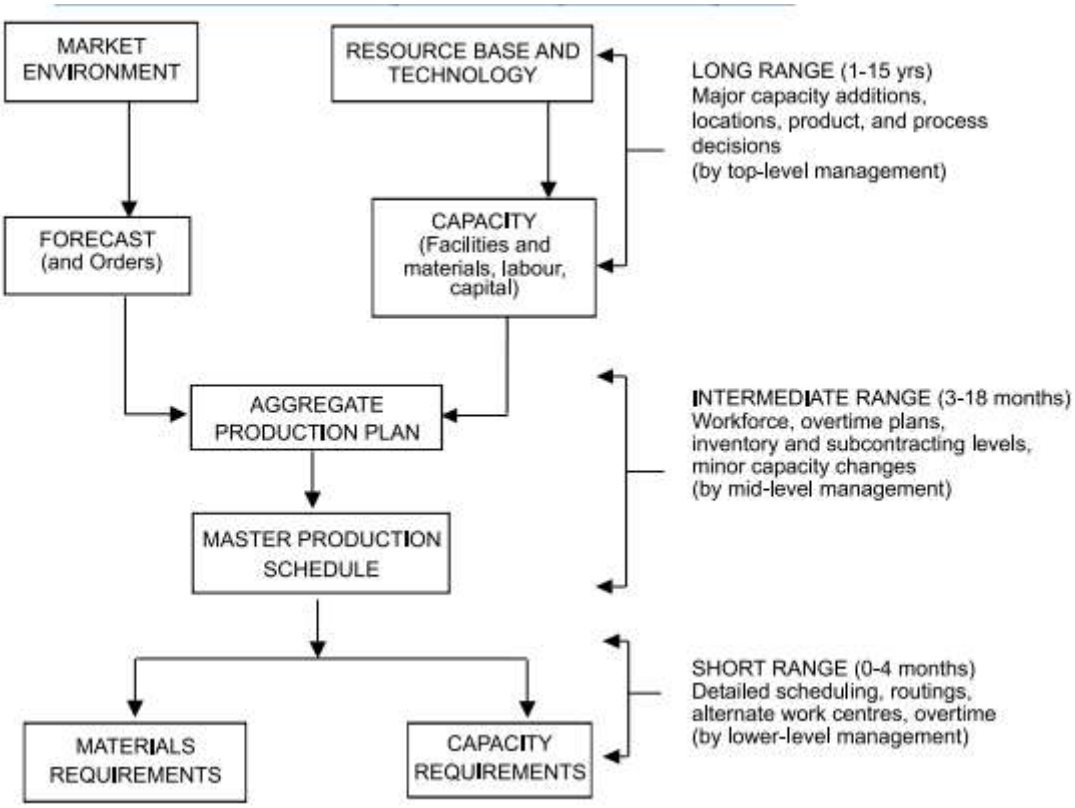

Figure 1: Represent the Flowchart of aggregate plan and master schedule [Vskills.In].

Analyze Alternate Schedules: The master schedule is created by trial and error. There are several computer simulation models available to examine alternative timetables.

Produce Material Requirements: This is the primary input for material requirement planning MRP.

Calculate Capacity Needs: Capacity requirements are generated directly from MPS.

Hence, master scheduling is required for capacity planning.Make information processing easier by regulating the plant's load. The master timetable dictates when the distribution should take place. It works in tandem with other management information systems like as marketing, finance, and human resources.

Efficient Use of Capacity: The schedule determines the load and utilisation criteria for machines and equipment by providing end item needs.

Material Requirement Planning

MRP refers to the fundamental calculations used to calculate the components needed based on enditem requirements. It also refers to a bigger information system that plans and controls industrial activities using the dependency connection.Materials Requirement Planning MRP is a strategy for estimating the amount and timing of dependent demand items required to meet master production schedule criteria[3]–[5].

II. DISCUSSION

MRP System

The MRP system requires three inputs:

1. A production planning schedule.
2. An inventory status file.
3. A bill of materials bom.

The MRP processing logic computer programme offers three types of information output for each production input using these three information sources (Figure. 1).order release requirements, order rescheduling, and scheduled orders.

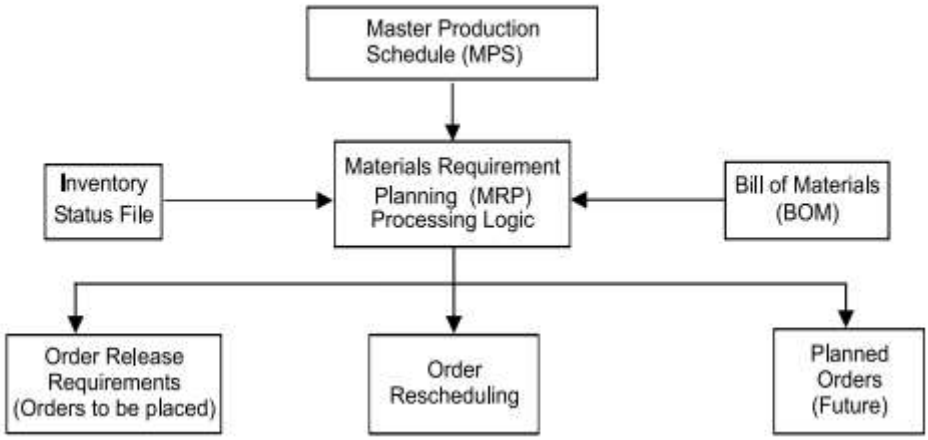

Figure 2: Represent the 5 MRP system [Wisdomjob].

Master Production Schedule

MPS is a set of timephased quantities for each item that a firm manufactures, stating how many and when they will be produced. Prior to the start of the MRP system, MPS is created from solid client orders or demand predictions. Whatever the master schedule requires, the MRP system turns MPS end items into particular component needs. Many systems do a simulated trial run to see whether the proposed master can be fulfilled.

Inventory Status File

Every planned inventory item must have a sales and inventory file that contains comprehensive and uptodate information on the item's onhand quantities, gross needs, scheduled receipts, and planned order releases. It also contains planning data including lot sizes, lead times, safety stock levels, and scrap allowances.

Capacity Planning

The design of a production system includes planning for the inputs, conversion process, and outputs of the manufacturing activity. The most critical task of production management is efficient capacity management. The goal of capacity management i.e., capacity planning and control is to match the level

of operations to the level of demand.Capacity planning must take into account future growth and expansion plans, market trends, sales projections, and so on. Planning capacity is a straightforward process when demand is steady. In actuality, however, demand is seldom consistent. The variability of demand causes issues in obtaining resources to match client demand. Capacity determinations.Are tactical in nature. Capacity is a facility's rate of productive capability. Capacity is often stated as the volume of production per unit of time[6], [7].For the following reasons, production managers are increasingly worried about capacity:

1. To satisfy consumer demand on schedule, sufficient capacity is essential.
2. The cost efficiency of operations is affected by capacity.
3. The scheduling mechanism is influenced by capacity.
4. Capacity development requires an investment.

When a company intends to manufacture additional or new items, capacity planning is the first step.

Measurement of Capacity Planning

The manufacturing unit's capacity may be stated in terms of production units per period.As a company manufactures many items, gauging capacity becomes more challenging. In such cases, capacity is indicated in terms of manhours or machine hours. depicts the link between capacity and production.

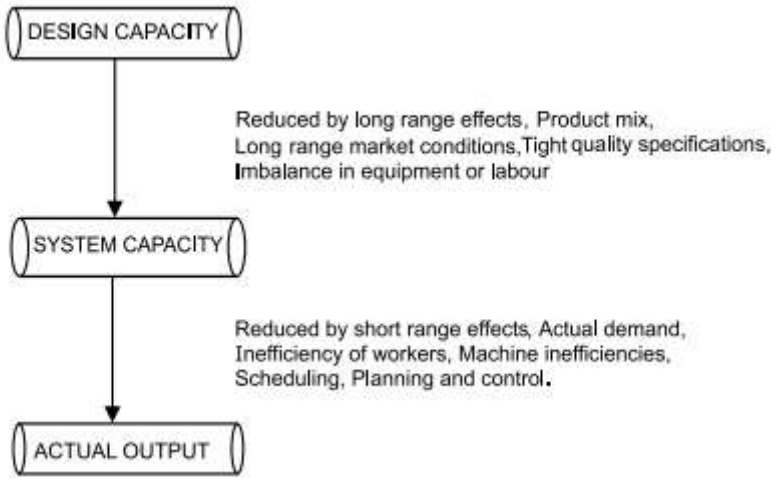

Figure 3: Represent the Capacity and output relationship [Mdpi].

1. Design Capacity: The intended or engineered rate of production of products or services under normal or full scale operating circumstances is referred to as a facility's designed capacity.For example, the cement plant's intended capacity is 100 TPD Tonnes per day.The sugar plant has a daily capacity of 150 tonnes of sugarcane crushing.

2. System capacity: The maximum output of a certain product or product combination that a system of employees and equipment is capable of generating as a whole.Because of product mix, quality specifications, and breakdowns, system capacity is less than or equal to design capacity. The real is even lower owing to several variables influencing production, such as actual demand, time due to machine/equipment malfunction, and unauthorized absence.

Because of longterm uncontrolled conditions, the system capacity is less than the design capacity. The real production is nevertheless lowered due to shortterm consequences such as equipment malfunction and labour inefficiency(Figure. 3). The ratio of actual measured output to system capacity is used to calculate system efficiency.

$$\text{System Efficiency (SE)} = \frac{\text{Actual output}}{\text{System capacity}}$$

Capacity that has been licenced by different regulatory organisations or government entities. This is the production constraint imposed by the government.

4. Installed Capacity: Installed capacity is the capacity given at the time of plant installation.

5. Rated Capacity: Rated capacity is defined as capacity based on the greatest production rate determined by real testing.

Process of Capacity Planning

Capacity planning is focused with establishing an organization's longterm and shortterm capacity requirements and deciding how those needs will be met. Capacity planning choices are made based on customer demand, which is combined with the organization's human, material, and financial resources. Longterm capacity plans and shortterm capacity strategies may be used to analyse capacity needs.

LongTerm Capacity Strategies

The future of technology is unknown. Predicting five or 10 years ahead is more dangerous and challenging. Even a company's current items may not exist in the future. Longterm capacity needs are determined by marketing objectives, product development, and product lifecycle. Longterm capacity planning is concerned with absorbing substantial changes that have a longterm impact on production levels. Management's primary tasks include marketing environmental assessments and systematically executing longterm capacity plans. The following criteria will influence longterm capacity considerations.

1. Several Products: In order to boost profits, businesses make more than one product utilising the same facilities. The production of several items reduces the danger of failure. Offering many products allows capacity planners to perform a better job. Since items are at various phases of their life cycles, it is simple to plan them for optimal capacity use.

2. Capacity Phasing: The rate of obsolescence is high in hightechnology sectors and industries with rapid technological progress. The items should be available on the market as soon as possible. The construction of the facilities will take a long time, and there isn't much time since the items must be put to the market promptly. The approach in this case is to phase in capacity on a modular basis. Some finances and personnel are committed to developing facilities over a 35 year period. This is an efficient method of capitalising on technical advances.

ShortTerm Capacity Strategies

Managers often utilise product demand predictions to assess the facility's shortterm workload. Managers forecast production needs for various goods and services up to a year in advance. Managers then compare needs to current capacity and decide whether capacity modifications are required.Fundamental capacity is set for shortterm durations of up to one year. Main facilities will remain unchanged. There are several shortterm tweaks that may be made to increase or decrease capacity.The modifications necessary are determined by the conversion process, such as whether it is capital or labour demanding, or whether the product may be held as inventory.Physical infrastructure, plant, and equipment are required for capitalintensive activities. The shortterm capacity of these facilities may be changed by running them more or less vigorously than usual. Shortterm capacity in laborintensive processes may be modified by laying off or recruiting personnel, or by paying them overtime. The tactics for modifying capacity are also determined by the length of time the product may be held as inventory.

Routing

Routing is the process of selecting the route that each component of a product will take while being changed from raw goods to completed goods. The path of the product will also indicate the sequence of operations to be used when manufacturing[8]–[10].In other words, routing is the process of determining the most beneficial route to go from department to department and from machine to machine until the raw material is finished, which includes the following steps:

1. The kind of work to be performed on the product or its components.
2. The operation necessary to complete the task.
3. Required operation sequence.

III. CONCLUSION

Organisations may maximise production levels, effectively manage resources, and meet consumer expectations while cutting costs via smart aggregate planning. Companies may achieve operational excellence and increase their competitiveness in the market by taking into account a variety of aspects, including demand forecasting, capacity planning, inventory management, personnel planning, and adopting relevant strategies.A route specifies a way for transmitting packets over the Internet network to another network's address. A route does not specify the whole path; rather, it defines the segment of the road from one host to a gateway that may send packets to a destination or from one gateway to another.

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