



Capacity Planning Fundamentals

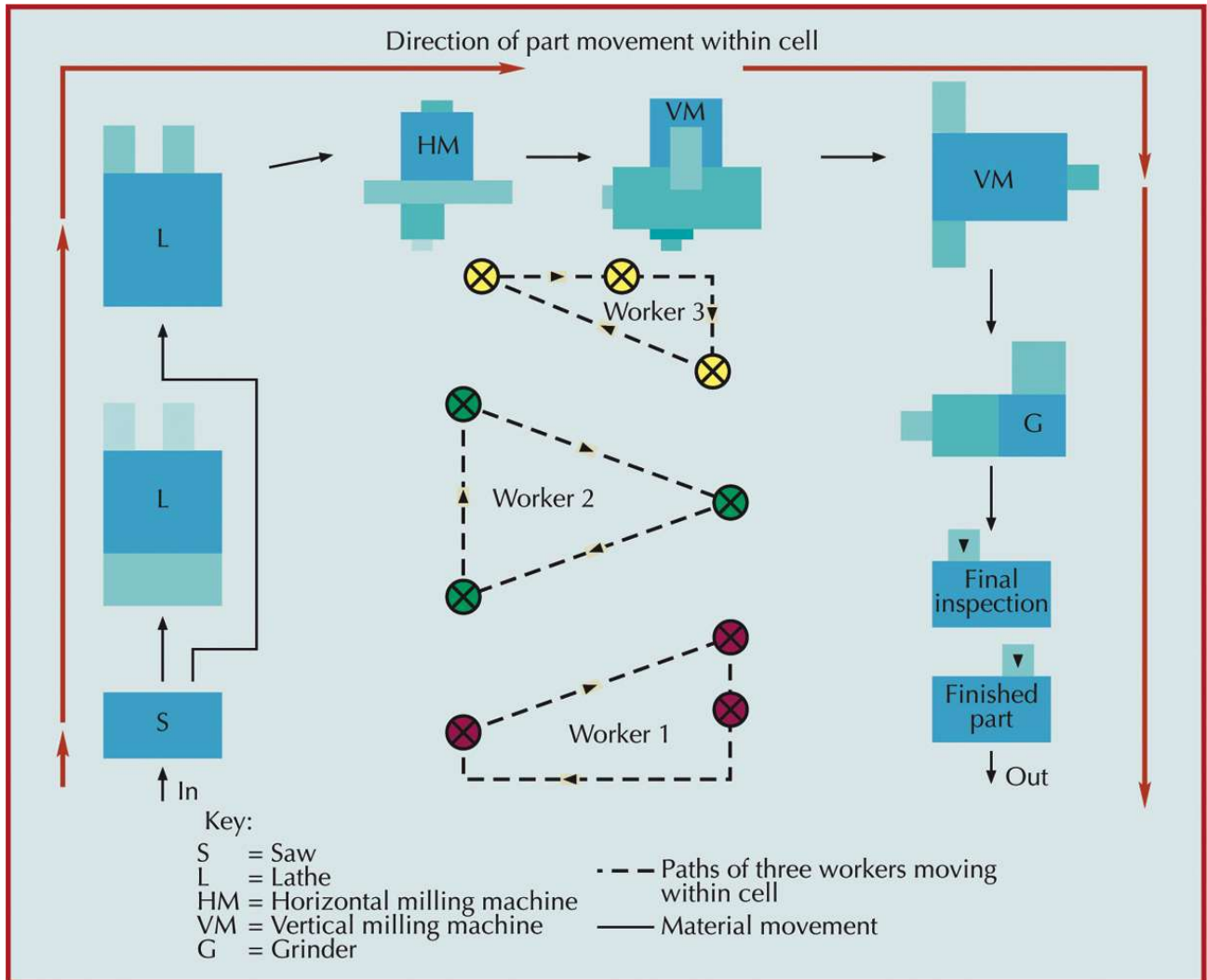
An Online Continuing Education Course for Engineers

Course Number: BS-2044

Credit: 2 Hours / 2 PDH / 2 CPD

Capacity Planning Fundamentals

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Overview

Long term capacity planning is a strategic decision for a company that must be carefully researched before implementation. The placement of equipment and its related work and maintenance access, material and work flows, plus potential expansion is critical because plant design and construction are normally tied to it. Clearly, this is an example of form following function.

This course identifies the fundamental considerations associated with capacity planning, so a student can converse more knowledgeably with plant designers, industrial engineers, and representatives of operations, procurement, human resources, and safety.

Learning Outcomes

Participants in this self-study course will learn to:

1. Analyze floor plans for optimal work flow
2. Analyze work flows to determine their current efficiency
3. Explain and apply the principles of 'line balancing'
4. Determine work process flow adequacy
5. Revise workflows to improve efficiency
6. Explain the concept of 'flow time'
7. Create optimal production cycle timing
8. Apply three capacity planning strategies effectively.
9. Apply the skills learned to practice exercises within the course

Intended Audience

This course is designed for project managers, operations managers and supervisors, or anyone involved in the process of converting raw materials into finished products who want to have a fundamental understanding of the factors that influence planning the capacity of a production process.

These products can also be finished documents and not only hardware or durable goods.

Concepts of Capacity

Capacity is about an organization's *capability of producing something*. Planning for this capacity typically happens at a variety of levels and detail. This course will focus on the basics essential to a fundamental understanding of the process.

An organization's capacity is *pulled* by customer demand (if they didn't want it, why would you make it?) and *pushed* by the receipt of raw materials from suppliers.



In a perfect world, the demand would be constant, the supplies on time and in the exact quantities and quality we need, while our machines would hum along at peak efficiency. [Remember, also, that we are not just talking about the industrial world here: “production” also applies to assembling complex documents such as all the paperwork associated with buying a home or serving customers at the drive-up window of a fast-food outlet.]

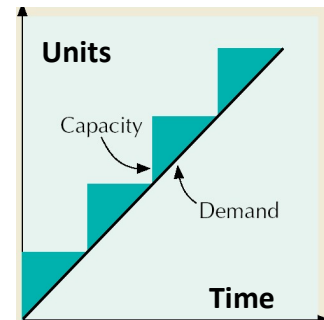
Taking this a step farther, our customers would pay early, and we would pay our providers (suppliers) at the last possible minute before incurring penalties so we can hold on to the cash if possible and maximize our cash flow.

Unfortunately, this is not a perfect world and many factors can impact the ability of our assembly lines to hum along at peak efficiency. Companies who enjoy greater success in producing, selling, and delivering products focus on the demand side of the equation. **In other words, they more they can understand their customers' needs and meet them, the greater their success.** This contrasts with companies who focus primarily on their suppliers by fighting hard for the best prices, quantities, qualities, and delivery dates.

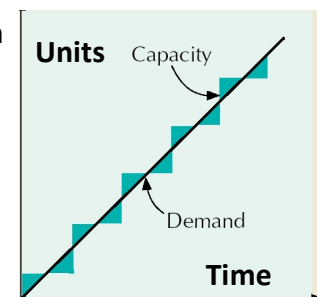
Although it is certainly important to fight for the best prices, etc. from your supplier, it is only through a strong relationship with their customers can a producer make sure they buy the right kinds of raw materials in the qualities and quantities they need to meet demand. It is surprising but true that many manufacturers have money tied up in inventory that is either obsolete or just not part of what customers are demanding currently.

We will begin our learning by looking at three strategies to plan capacity: *lead*, *average*, and *lagging*.

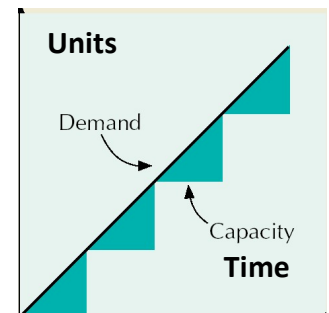
1. **Lead capacity strategy** – capacity is expanded in *anticipation* of a growth in demand. This anticipation may result from a marketing plan to lure customers away from another or by entering a market by offering special pricing or quantities. It also helps companies plan for anticipated surges in demand or to provide high levels of customer service during specific periods.



2. **Average capacity strategy** – we expand capacity to coincide with an *average of what we expect* knowing there will be times when we cannot meet all the demand as well as time when we have too much capacity for a lowered demand. We expect that about 50% of the time, capacity will lead demand and lag it at about 50%, too.



3. **Lagging capacity strategy** – capacity expands *after* an increase has been documented. Although customer service suffers initially, it assumes they will be back because there are few (if any) other places where they can obtain this product after our capacity has increased.



Once a capacity strategy is identified, then the extent of the increase is based upon:

- The volume and certainty of anticipated demand
- Strategic objectives in terms of customer service, anticipated growth, and anticipated competition
- The cost of anticipated expansion and operation to meet the company's strategy

We will address the issues of anticipating demand and production planning in the rest of this course. *[Please see our course on this website entitled “Supply Chain Management 101” for topics about getting the best work flow from your planned capacity.]*

How would these various strategies be used in higher education?

Suppose that a state is experiencing a large increase in population which means there will be a demand for higher education in just over a decade. This is how the three different strategies would be applied:

- An established university that is guaranteed applicants even in lean years may follow a **lag strategy**
- A new university may use a **lead strategy** to capture applicants who cannot get into the established university
- A community college may use the **average strategy** because there is little risk when considering its mission to admit all eligible applicants.

Laying Out the Facility

The art (or science depending on how you look at it) of laying out a facility has changed over the years because of changes in:

- 1) our concepts of how to produce (do we keep extensive inventory on hand because we are supplier driven or small amounts -“just-in-time” - because we are customer focused).
- 2) what to produce (markets have changed in demand and location); and,
- 3) the constant evolution of technology plus a shrinking, ageing workforce can change our long-term strategy.

Some thinking associated with the machinery we will use must consider:

- Minimize material-handling costs
- Utilize space and labor efficiently
- Eliminate bottlenecks
- Facilitate communication and interaction
- Reduce manufacturing cycle time and customer service time
- Eliminate wasted or redundant movement
- Increasing capacity
- Facilitate entry, exit, and placement of material, products, and people

- Incorporate safety and security measures
- Promote product and service quality
- Encourage proper maintenance activities
- Provide a visual control of activities and flexibility to adapt to changing conditions

Types of Layouts

We will look at three basic types of layouts. Please remember that capacity planning is not confined to just “making things”, it is also related to customer service processes and retail outlets where customers serve themselves. The three types are:

1. **Process layout** - According to the product flow.
2. **Product layout** - Stations for a product.
3. **Fixed layout** - Be moved.

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Process (or



This layout is characteristic of intermittent operations where a wide variety of customers with wide-ranging needs are served. In a process layout, like a machine shop or automotive repair center, the equipment is general purpose and the workers are skilled at operating their machines in their departments or areas.

The advantage of this is flexibility and can meet customers’ needs easily and quickly but, since work doesn’t flow smoothly through it and may ‘backup’ from down-line stations, or cross the flow of other work, this is also a disadvantage.