Synchronous Solutions

The continuous pursuit of excellence

Capacity Planning

By
Ed Hill

Spring is here! For most companies, this means a dramatic increase in sales. Homeowners are interested in upgrading both inside and out. Remodeling kitchens, baths and laundry rooms as well as installing outdoor kitchens are common projects in the Spring of each year. New construction builders for homes and commercial projects are ramping up again. Countertop fabricators can get really busy.

> Having too much business is a nice problem to have. But it is still a problem!

Being prepared for this increase in business volume is a smart (and essential) business management practice. Capacity planning is often done with just common sense. You may know what can be produced through the primary steps in your process. Most likely, in the countertop industry, this is an expected amount of square feet per day. You can compare that to your expected demand for square feet from your market. Then, you would plan for the number of hours needed per day to get it done. If your demand exceeds your capacity, your fallback position is lots of overtime.

> Overtime might help, but…
> - It is expensive
> - It has diminishing returns
> - It is usually reactive in nature
> - It can create a dependency
> - It adds to the chaos

That could be called a “seat-of-the-pants” approach. It might work, but it might not. The overtime need could cause distress among your people. You could experience some turnover as a result of this. Excessive overtime also increases the chance of errors and it definitely increases the chaos. Moreover, this approach does not provide a plan for “Murphy” (aka stuff happens). Unexpected machine breakdowns, poor quality materials, turnover of key employees, and myriad other issues could disrupt all your plans.

There is a better way.

First, let's consider the reality of "Murphy" (aka statistical fluctuations and normal variability, also called "anything and everything that could go wrong"). If you design your capacity with just enough to meet the expected demand, you will always experience unpleasant surprises. In fact, just enough capability is called a Balanced Capacity State and such a system will *never* produce to its expected result.

The balanced capacity system is one in which the capacity for each process step is planned with the necessary equipment and staffing to be about equal to the market demand. In such an idealistic system, there would be no bottlenecks and no attacks by Murphy. Orders would flow through the system without accumulating excess inventory at any place. *The problem is: That is a practical impossibility.* Machines do break down, key people are sometimes not present at work due to myriad reasons like vacations, sickness, jury duty, bad weather, etc. Even through careful capacity planning, "Murphy" still exists and can appear at the most inopportune times.

While Balanced Capacity may seem to be a logical approach for an efficient operation and to make the most money, the reality is that this is simply not true. The fact is that attempting to achieve and maintain a balanced system is not only a practical impossibility, it is a guaranteed failure of management philosophy. Your managers will spend their time trying to regain the balanced status after every visit by Murphy, while they should be managing the flow of materials and information through your plant.

The alternative to the approach is called *Protective Capacity.* This is an intentionally unbalanced system that maintains a planned level of capacity at each operational step to *recover* from the inevitable attacks by Murphy. One or more natural constraints always exist within your business.

Given that one or more constraints always exist, you already do have an unbalanced system. That is a good thing, not a bad one. Don't fight it by constantly chasing the constraint around, embrace it instead. Manage the constraints all day, every day. Establish the necessary *Protective Capacity* at the appropriate locations and use it to respond to the effects of Murphy.

Protective Capacity is defined as the capacity to overcome variability. This additional capacity is designed to absorb the normal variabilities that exist every day. Further, the amount of *Protective Capacity* should be variable across the manufacturing system. More of it should be planned for those operations that experience lots of "Murphy" and less at steps that are more stable.

> Protective Capacity is not a cost factor; it is a strategy to assure continued value added and profits.

Two basic phenomena, dependency and variability, exist in all manufacturing systems which result in serious consequences. Because of dependencies, variances in the product flow, caused by statistical fluctuations and random events, disrupt the planned flow of product for the plant. And because of the numerous disruptions, common attempts to balance the capacity of a plant will end up being counterproductive. The conclusion is that the focus should be on synchronizing the flow of products through the plant and not on balancing capacities. Like water flowing down a mountain river, the orders should flow at a consistent rate. The boulders that interrupt that river flow are not unlike the "Murphy" events that interrupt your process flow. The water always finds a way around those boulders. Your managers need to do the same thing to address the "Murphy" events. To do that, they will need a planned level of Protective Capacity.

The opportunity to create value ($T) is infinite.
The opportunity to reduce costs is quite finite.

The Solution

Effective capacity planning must consider the three most important elements in a business plan:

- The **projected market demand** in the coming months for each product line.
- The calculated **daily/weekly capacity** needed to produce that demand including a planned level of *Protective Capacity* to overcome the normal statistical fluctuations that will inevitably occur.
- The resulting **financial expectations and goals** for your company over the entire planning period.

There are basically three types of capacity that should be considered in your planning:

- **Productive Capacity.** This is the pure capacity it takes to meet the projected market demand. This is the minimum needed to satisfy orders and has no accommodation for Murphy.
- **Protective Capacity.** This the Productive Capacity plus an accommodation for Murphy. The accommodation for that variability is calculable, meaning that where there is little variability there is little need for Protective Capacity. Where there is high variability, there is need for more Protective Capacity. With adequate records on production and variability, this can be planned accurately. Protective Capacity does not mean higher costs. This *cushion* of additional capacity is essential to meeting the market demand given the known levels of variability (aka Murphy). Business is all about creating value (Throughput), not only reducing costs.
- **Excess Capacity**. This is the amount of capacity over and above the needed amount to meet the demand including accommodation for Murphy. Excessive capacity, which is also calculable, means excessive costs and should be avoided.

Synchronous Solutions has developed a tool to accomplish this objective. It is called the Protective Capacity Planner (PCP). It coordinates those three important elements of business planning (market projection, needed capacity and financial goals) into one tool. Updating it monthly to reflect the new knowledge of market demand and changes in internal capacity is all that is necessary to assure proper planning.

The PCP is a planning tool. As with anything looking into the future, it is expected to be a projection, based on your best knowledge, of the demand in the coming months. Based on that demand, the software can project the hours per day required at the primary functional steps. The report will tell you the $T goals each month and the amount to schedule each day to meet those goals. It will also alert you to high (or low) demand in the coming months. With that knowledge, you can be better prepared for the needed capacity.

The chart below is a portion of the PCP indicating the projected hours needed per week at each process step. Red font indicates some overtime will be needed. Red background indicates significant overtime may be needed.

Capacity		Hours required per week at the projected demand.				
Protective Capacity Multiplier		15%	Red font suggests overtime required			
Installation		5%	RED FILL SUGGESTS EXCESSIVE OT.			
HARD SURFACE	Projected SF Capacity	Projected $T Capacity	April	May	June	July
Project Management	400	13,513	39.2	40.2	48.9	35.2
Scheduling	400	13,513	39.2	40.2	48.9	35.2
Template	415	14,019	37.8	38.7	47.2	33.9
Program	445	15,033	35.3	36.1	44.0	31.6
Receiving/SlabSimth	500	16,891	31.4	32.1	39.1	28.1
Cut	360	12,677	36.4	32.0	41.9	30.0
CNC Routing	400	14,086	32.8	28.8	37.7	27.0
Polish	396	13,954	33.1	29.1	38.1	27.2
Mitered Apron 0.06	20	704	39.3	34.6	45.3	32.4
Install	400	13,513	39.2	37.6	48.9	35.2

Without an appropriate amount of Protective Capacity, the ability to create Throughput ($T) value will be negatively impacted. As the schedule begins to deteriorate, the inevitable result will be more overtime and growing chaos. The reality is that ultimately, all manufacturing systems are unbalanced. Given that, it is a much better strategy to plan for that reality than to fight it.

Planning for the needed capacity is an essential business strategy. With the expected increase in sales now that Spring has arrived, now is the time to revise those plans.

For more information on how to effectively plan for the needed capacity, contact:

Ed Hill
Synchronous Solutions
www.SynchronousSolutions.com
704-560-1536