Constraints Are Opportunities

How recasting a bottleneck can add green to your bottom line

by Philip J. Zurawski

These are unprecedented challenging times for the structural component industry and for homebuilding in general. Every corporation, company and stand-alone operation in our industry is looking for answers. What makes it even tougher is that most of us don't even know the questions that are driving this search for elusive answers. We all seem to be looking outward to the government, to world leaders, to crystal balls for those ethereal questions and answers. But, history has taught us that when times get tough the first place to look is inward, not outward. Real change always starts from within. Ideas, attitudes, even the basic fabric of our motivating spirit needs to change; and that always comes from within. Along the same lines, we need to look inward at our companies to better understand what needs to change and how we go about changing it. That means dissecting every person, process and procedure comprising the system that is my company.

In his landmark book, *The Goal,* Eli Goldratt introduced a concept that he calls *The Theory of Constraints*. This theory implies a direct correlation between maximum output coming off the end of a production process and the throughput at the primary constraint on that process. In other words, I can only expect to produce the same number of widgets that can pass through the narrowest bottleneck in my entire production process. Goldratt's idea does not seem to be rocket science. Experience and simple observation prove the point every day. A simple example puts his theory into practice. If we try to funnel the output of a hose through a straw to fill up a swimming pool, the time it takes to fill the pool will be limited by the volume the straw can handle, regardless of the aggressive flow coming out of the hose.

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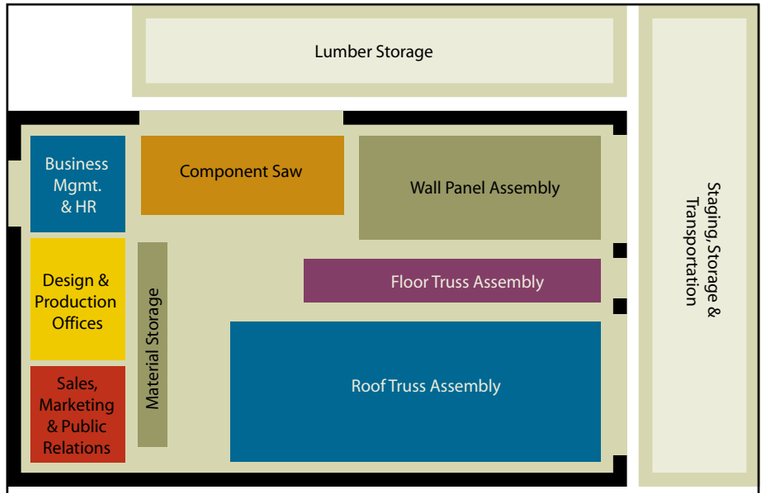

The scientific solution and the answer to the dilemma of permanently eliminating bottlenecks is to first examine the constraints that are causing the bottleneck, then minimize those constraints, releasing the bottleneck. Use this sample layout to visualize your own operation and mark the existing bottlenecks. Then make a list of the constraints surrounding these problem areas. How can the constraints be minimized?

It all seems simple and logical, until we apply Goldratt's second idea. In logical sequence, Goldratt profoundly states that the only true measure of throughput (rate of flow at a specific station in a process) is dollars—revenue. It makes total sense, because dollar value, not the number of widgets produced, is what directly affects the bottom line. Measures like feet per man-hour or units per shift, though easy to discern, are only inferences of profitability. They are abstract representations of value. Measurements of dollars produced per shift may be more elusive, but they are the only true assessment of the profitability of any production process. Taking it one step further, we can assert that net margin measured as throughput is the only true measure of a process's profitability. At the end of the day, it is revenue minus cost to produce that revenue that tells us if we're making money.

So why do so many companies continue to dutifully record their production statistics in terms of abstract measurements rather than concrete dollars? Usually, the answer is because they don't know their real costs of production. In this age of computerized accuracy and precision, there's no excuse for not knowing precise costs right down to the pennies spent to sweep the shop floor at night. At any moment in the day, if I knew that a particular crew, station or bottleneck was losing $2 per minute, wouldn't I immediately do something to stop the bleeding? If I think they should produce 100' per man/hour to break even, and they're producing 110' per man/hour, can I really be sure that I'm making money without knowing the cost and revenue related to that volume? The answer is a bold, loud no! Feet per man/hour is just an abstract estimate of my profitability. Plus or minus dollars per man/hour is "in your face" concrete.

Looking at roof truss production, throughput for a truss line is traditionally measured in board feet, lineal feet, number of trusses or number of pieces per minute, hour, man/hour or shift. Through trial and error (sometimes called experience), the industry has established unscientific standards that estimate the ideal level of throughput required to achieve profitability. I say these standards are unscientific because no two companies are the same in terms of their cost structure, nor should they be. Cost controls, relative to revenue produced on the line, are what make us profitable. It's the real stuff that produces a competitive edge.

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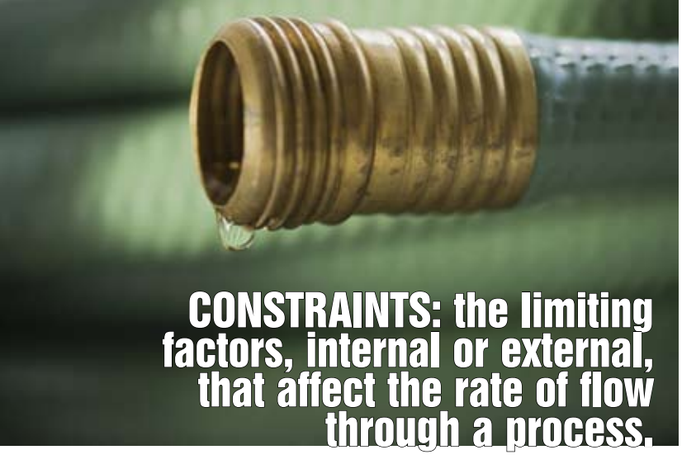

an attempt to increase flow through the affected station in the process.

This effectively doubles the constrained flow so output may increase, but the problem still exists. The other downside of bottleneck logic is that costs are also increased. As efficiencies ahead of and behind the bottleneck increase, the replicated problem station becomes a bottleneck once again. Another bottlenecked station is added to the process, and so it goes.

The scientific solution and the answer to the dilemma of permanently eliminating bottlenecks is to first examine the constraints that are causing the bottleneck, then minimize those constraints, releasing the bottleneck. Get at the root cause and fix the problem. That's why I think of constraints as opportunities. Process constraints almost always exist. The trick is to deal with the constraint before the flow becomes obstructed.

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Bottlenecks Are Not Constraints

It's important here to note that there is an important distinction to make between "constraints" in Goldratt's theory and "bottlenecks." Constraints are the limiting factors, internal or external, that affect the rate of flow through a process. If the constraints restrict flow at any point in the process so flow at that point is restricted to less than the average across the entire process, a bottleneck occurs. This distinction is important because the common track for fixing bottlenecks is to focus on the bottleneck. We often replicate the bottleneck in

Truss Design as an Example

Here is an example from the wood truss industry. It's generally agreed that the design process can be a bottleneck in truss production. Constraints on flow through the design process run the gamut from inexperienced truss technicians and antiquated design tools all the way to the technician's mental capacity on any given day. But, nothing flows down

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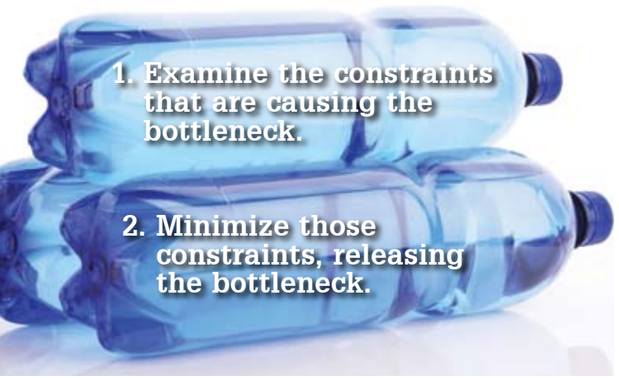

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stream until the truss designs are completed, sealed and sent to the production floor. These three factors—design, seals and delivery—represent the primary constraints on design flow. A common, logical remedy is to add more designers to the process. That's expensive and risky, since no two technicians are alike; and you really don't know how productive a specific technician can be within your operational flow until they actually get to work. A better solution is to develop a single technician into a truss design superstar. Training and empowering that person is far more effective than using bottleneck logic. Ongoing, convenient training (at the desk, online training), whole house design software, supercharged computer hardware and elimination of procedures through integration all dramatically improve productivity at the design station. Before adding additional technicians, I want to make sure that my existing technicians are as productive as they can possibly be.

Another example of constraint as opportunity can be seen at the truss table. Suppose I have a couple of fully empowered, stellar technicians that can pump out accurate designs faster than I know what to do with them. I've got a servo-powered, fully automated robotic saw continually fed by an overflowing live deck that in four hours pumps out all the parts I need for eight hours of truss building. But, carts loaded with parts are backing up in the staging area. I can't build trusses fast enough. The congested staging area is constricting flow to the tables, so my table production is less than ideal. Bottleneck logic implies that we should add another table to accommodate the flow from the saw. If I have the floor space, adding another line will indeed facilitate flow of the bottlenecked parts in my staging area; but, I have more than doubled the cost and have done nothing to relieve the constraints at the tables. Casual observation of the work flow on my tables reveals that set-up is a serious constraint.

There are numerous other constraints on flow through the tables. Paper drawings, continual jumping on and off the line to retrieve tools and parts, waiting for the truss to be transferred to the conveyor, clearance time for the gantry head, etc. are all manageable constraints. It's just a matter of applying the right technology that works for my specific company. Then, I need to re-engineer my processes and procedures to accommodate the increase in flow. By focusing on the constraints, not the bottleneck, I can retrofit my single line to flow equal to the saw output. That's where the solution lies, and the increased efficiency drops right to the bottom line.

Incidentally, there's no need for paperwork on the shop floor anymore. There's no need to manually measure anything, other than to confirm accuracy from time to time. Laser projections of truss patterns and fully-automated setup tables directly address the constraints and release the bottleneck. Simple networking technology used in many homes today can help facilitate the elimination of paperwork on the shop floor. Integration of data throughout the plant is the key.

This can be an exciting time in the building components industry. The sky is the limit. We can crash through bottleneck logic like "we've done it this way for twenty-five years, so why change now?" We can leave that kind of antiquated thinking in the dust by forging ahead with lean thinking and just-in-time sensibilities. We have to blow away stagnant old ideas. The current economic climate demands it. Our industry is poised on the threshold of unprecedented productivity at a time in history when every dollar must be spent wisely. Nurtured by the success of applied technologies, innovative ideas are simmering the brains of engineers around the world. It's exhilarating to think of the possibilities lying just around the corner, and it all had its genesis in a simple idea – production systems produce dollars, not statistics.

Understanding and relieving constraints before they become bottlenecks is the key to ensuring production efficiency. The primary constraint might just be in our minds. SBC

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