

A Lean Approach to Lean

BY DAVE TURBIDE,
CFPIM, CMFGE, CIRM

Lean manufacturing means shorter lead times, lower inventory, better customer service, and higher profits. But getting there can be expensive and disruptive. Is there a quick, easy way to go lean?

Most lean manufacturing success stories take place in large, high-volume factories that implement flow manufacturing techniques. That's all well and good; flow is a terrific tool for achieving lean efficiencies. But the cost and disruption of transforming the plant to cells and lines, and the complete reinvention of

scheduling and work management processes, are daunting, to say the least. And, in some cases, flow just doesn't make sense given the products and processes involved.

In the search for a suitable substitute for flow manufacturing in a lean initiative, one of the best candidates is drum-buffer-rope (DBR), the methodology for implementing the theory of constraints for controlling the movement of work through the plant. DBR has its drawbacks, too—it takes a leap of faith to rely on what is to most people a counterintuitive way of doing business. Nevertheless, companies that embrace DBR can achieve significant increases in throughput, inventory reductions, and enviable on-time shipment records.

There's a new alternative that has been getting some attention lately, called simplified market pull (SMP) scheduling. SMP is an innovative mechanism for controlling the release of work to the floor and the management of work as it flows through the plant. The interesting thing about SMP is that it implements easily and inexpensively, with minimal changes to normal business processes, and delivers outstanding results very quickly. Early adopters have cut work in process

At-a-Glance

- For companies operating at less than full capacity, simplified market pull (SMP) scheduling is a groundbreaking, new tool for going lean.
- Not only does SMP deliver outstanding results very quickly, but it also can be put into practice just as quickly, with minimal changes to normal business processes.
- With condensed lead times and increased consistency and capacity, companies using SMP discover some very powerful tools to bring in more sales.

(WIP) inventory in half, reduced lead times by 50 percent or more, and improved on-time completion to 98 percent-plus—all within a few weeks of getting started with SMP.

SMP is lean manufacturing; that is, reducing inventory and lead time, improving throughput and customer service. What's most interesting, however, is how quickly and easily companies can achieve these benefits. And SMP can be applied in any company: make-to-order (MTO) or ship-from-stock, high or low volume, simple or complex products, and plants in a mixed environment (combinations of to-order and from-stock, for instance). The only requirement is that the plant is operating at less than full capacity; unfortunately, that includes the majority of plants in the world today.

Plants with excess capacity should, theoretically, be able to complete all scheduled work on time and have resources available at the end of the day. But that's not the way it typically works. Plants running at less than their full capacity, even those as low as 75 or 80 percent capacity, often find themselves struggling to get work completed and shipped on time. The primary culprit is too much WIP inventory. The plant floor is clogged with jobs that are released too soon in hopes that the extra time gives them a better chance of getting done on schedule. In truth, the earlier jobs are released, the more WIP there is to work through and the longer the lead time. Plus, workers can become confused as to which job they should be working on next, or be more tempted to take the "easy" job rather than the one with the highest priority.

The key to resolving this impasse is to reduce the level of WIP, which will reduce lead time. Picture a plant situation in which a typical job has four operations, each of which takes a half-week to complete, and each work center has a two-week queue. The next job coming in, all else being equal (not high priority or expedited), will take 10 weeks to complete. Reduce the WIP at each work center to a half-week, and the typical lead time drops to four weeks.

Of course, a typical shop situation is a lot more complicated. Not all jobs are the same priority, not all go through the same sequence of operations, and not all have the same processing time. But the principle stands: Lower WIP and lead time is shortened. In addition, work will flow more smoothly, people will be more likely to be working on the right jobs (fewer jobs competing for resources), and it will be much easier to manage priorities and get things done on time when there is less congestion and confusion in the plant.

It's very easy to reduce WIP. Simply stop releasing new work to the plant and continue to produce at the same rate.

Of course you would never dare to do that without a plan and the proper controls in place to make sure it doesn't hurt customer service. That's where SMP comes in. SMP will control the release of work (later than you are used to releasing it now) and manage work flow through a dynamic priority system to ensure on-time completion.

Implementing SMP

THE FIRST IMPLEMENTATION step for SMP is the simplest, but perhaps the hardest thing to do from a management and peace-of-mind perspective: Continue to take orders from customers, promising the same lead time as before. Only now, you won't release those jobs to the plant until SMP says the time is right. With no new work entering the plant and production continuing, WIP will decrease, and so will lead time for the new work submitted later.

Think of the old APICS capacity planning analogy that uses a sink to illustrate input and output. Work input is the faucet pouring water into the sink. The drain is production, removing WIP. As long as input and output are in balance, WIP and lead time (water in the sink) remain constant. Shut off the faucet and keep the drain open, and the water level (WIP and lead time) will decrease. Re-open the faucet later, and the WIP level will stabilize and work flow will be restored at the same input-output rate, but with lower WIP and shorter lead time.

If lead time previously was 12 weeks, you could hold new orders for six weeks, while continuing to work through the backlog during that time. After six weeks, WIP would be cut in half and lead time would now be six weeks. You could now start systematically releasing the jobs that you have been holding and they will complete six weeks later—on time, twelve weeks from when the order was originally placed. You could then start quoting shorter lead times for new work as you fill in excess capacity. This concept can be hard to understand, so work through it with examples using your own lead times and volumes.

SMP is intended to help companies that are operating at less than full capacity, or what might be called market constrained. That is to say, the plant could produce more but the demand just isn't there. As already illustrated, high WIP levels mean longer lead time and a struggle to complete work on schedule. Further, traditional accounting methods encourage high utilization, whether or not the work is needed to satisfy immediate demand, thus encouraging workers to keep busy, regardless of real needs. As a result, that excess capacity is hidden.

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Once SMP takes effect, workers *will* be able to complete work before the end of the shift, and that's a good thing. That excess capacity that you always knew was there will become visible. It's important that you understand this will happen and be prepared to deal with it. Workers may become nervous when they see the WIP level shrink because the last time that happened, layoffs were not far behind. Be prepared to use this freed-up time effectively—training and cross-training, clean-up/fix-up, spending a bit more time on current work to do it right the first time, and, most importantly, selling this excess capacity for more revenue and profit.

You may be thinking at this point, "Sales were the problem before. After all, we were operating under capacity." True, but now you have some very powerful tools to bring in more sales. You can deliver in half the time you could before (and half the time of your major competitors) and you can guarantee that quicker delivery because your on-time completion rates will have soared to near 100 percent. That should open up new opportunities and help you take business from less nimble competitors, perhaps even at a premium price. You can also use that excess capacity to take advantage of opportunities you are currently passing up; more on this later.

Under the covers

THERE ARE TWO parts of SMP: the order release logic and the work flow prioritization system. Orders must be released to the plant floor at the proper time in order to control the level of WIP and the production lead time. In most cases, the "proper" time to release the order to the floor based on the expected production lead time is about half of what it is before SMP. Experienced SMP implementers can help you determine the proper release point for each product. This scheduled lead time will include sufficient buffer to allow for interruptions and delays.

The second part of the system is work flow management. As with a traditional production control system, SMP manages production flow through the use of a priority system that guides workers as to what to work on next. There are actually two kinds of priorities in SMP—one for MTO and another for replenishment work—but they are fully compatible and, in fact, handle a mixed environment better than just about any other method.

For MTO products, the important thing is to complete the work on time in order to meet customer expectations. The MTO priority system uses the lead time buffer that's built into the release logic to control the priority. An order's priority is recalculated as time passes and the work progresses. It is a ratio-based priority similar to critical ratio.

For replenishment, the priority is based on quantity remaining in stock (percentage of the desired stock quantity remaining, actually) and it, too, is dynamically recalculated as stock quantity changes during the life of the replenishment order. The result is a lower average inventory level while maintaining high availability.

SMP delivers lean manufacturing benefits—reduced lead time, reduced inventory, improved customer service—and it does so without an expensive and disruptive conversion to flow manufacturing. John Rogelstad, director of operations at Marena Group, particularly likes the way SMP coordinates to-order and to-stock activities. Of the company's 1,500 stockkeeping units, 20 percent account for 80 percent of sales. These items are kept in stock for same-day shipment. The rest of the products are made to order but still must ship within a day of order receipt.

Balancing to-order and to-stock priorities has always been a challenge but SMP "... actually prevents orders from being late," says Rogelstad. "This is what we always wanted our computer systems to do, but they never have been able to before." In addition, Marena can now easily work in large orders without undue disruption. "We can do that based on how we allocate WIP, without jeopardizing other work and without 'shuffling the deck' of several hundred ongoing orders," states Rogelstad. Marena was able to cut lead time and WIP in half within a few weeks of getting started with SMP.

Exploiting opportunities

WITH SHORTER LEAD times, higher reliability, and available capacity, your company should be poised to take a larger share of your market. In addition, you can take advantage of some opportunities that you might currently be passing by. Here's an example. Often, a potential customer will solicit your support for a quick-turnaround project, but will offer an unacceptable price. Let's say that your product cost is normally \$20 per unit, half for material and half for labor and overhead. A prospective customer needs 2,000 units made quickly and offers to pay \$17.50 per unit. Using normal accounting logic, you would turn away the opportunity because you would lose \$5,000 on the deal (see the traditional accounting column in Figure 1).

Consider, however, that you would be completing this work using the excess capacity that you have now made available through SMP. Because you are already paying for the labor and overhead, your incremental cost for this incremental business is only the cost of materials: \$10 per unit. Your total cost, therefore, is \$20,000 and your gross profit is

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Figure 1

	Traditional accounting	Throughput accounting
Additional units	2,000	2,000
Unit price/ Revenue	\$17.50 / \$35,000	\$17.50/ \$35,000
Cost per unit/ Total	\$20.00/ \$40,000	\$10.00/ \$20,000
Profit (loss)	(\$5,000)	\$15,000

\$15,000—certainly well worth taking this order (see the throughput accounting column in Figure 1).

Of course, you would not apply this logic for work beyond the excess capacity or against existing work from existing customers. But for using up available capacity, it's a great piece of business.

Also, once you have delivered for this new client, on time and in less time than is expected in your line of business, you can go back for a share of their regular business at regular rates or even higher because of your speed and reliability.

One SMP user had several customers that ordered monthly quantities but often called with last-minute changes. The manufacturer offered to commit to shipments every two weeks (based on their reduced lead time to produce) and guaranteed on-time shipment. The customers agreed to pay a higher price and accepted a promise of a 25 percent rebate on any late shipments. The supplier knew that they would never have to pay that penalty; their real lead time was now about one week, and they demonstrated 99 percent-plus on-time completion under SMP. And the customer considered the two week lead time to be a huge benefit, as it allowed them significant inventory reduction and increased flexibility.

SMP is truly a breakthrough idea for manufacturers operating under capacity. And best of all, it is quick and easy to implement, with no big investment in plant realignment. It could rightfully be called a lean approach to lean manufacturing. ♦

Dave Turbide, CFPIM, CMfgE, CIRP, is an independent consultant and writer working with manufacturing software developers. He can be reached at dave@daveturbide.com.