The Power of *Speed*

"One company's journey towards operational excellence"

By Jon Weldon

In today's tough economic times and changing market dynamics, the challenge is to continue to optimize costs, while maintaining high quality and providing short lead times. In a high mix, low volume manufacturing environment investment in lean techniques makes sense. "We have thousands of SKU's with a high degree of customization. For our products and our market, we need to be competitive in a creative way," stated Jeff Douglas, Director of Marketing at CIRCOR Instrumentation Technologies (CIT). For companies like this, the operational goal can be summed up in one word: SPEED.

In 2008, CIT began their operational transformation with the initiation of the Valve Model Line. The valve product line represents a significant portion of CIT's sales and is their most complex assembly. Traditionally valves had been manufactured in a batch and queue method which often led to overproduction, high inventory levels, and long lead times. The team believed that if they could streamline valves then the implementation of their other product lines would be faster and more effective. What they needed was a "model line" to apply the lean tools and techniques which would ultimately showcase the method for the entire facility.

Demand Profiling

The first step for the Spartanburg team was to understand their business and demand patterns. They needed to determine how their customers ordered their product and how repeatable these orders were. Like most manufacturers, CIT produced all products (regardless of demand type) on any capable piece of equipment. This resulted in priority scheduling, expedites, and highly variable lead times. The method they used to determine repeatability is called demand profiling. Demand profiling segments part numbers based solely on the average demand and the variability around that average. This is called the coefficient of variation (CoV=standard deviation/mean). For example, if you were a non-swimmer and someone asked you to cross a river with an average depth of 3 feet, would you? Most people would not because the average may be misleading. You could have depths from 6 inches to 10 feet and still maintain an average of 3 feet. In this case there would be high variation around the average which would result in a high CoV. If you were to measure the river and find that the depth was always between 2 and 4 feet then you could conclude that there is low variability around the average, thus a low CoV. As a general rule, the lower the CoV, the more stable the average.

When the CIT Team conducted this analysis they looked at demand over the last 12 months. When the team looked at the repeatability of the demand they found that 85% of their component volume was made of a relatively small number of unique parts. These parts also had consistent demand, stable averages thus a low CoV. The team called these parts the "runners". The remaining components had highly volatile demand, unstable averages and a high CoV. These parts were called "strangers". This step, which is often skipped in a traditional lean implementation, was perhaps the most important step in CIT's journey. They finally realized that there wasn't one strategy that would apply to both demand types. They were very different and could not be treated the same; two distinct strategies were needed.

Runners

The strategy for runner components was quite simple: keep the products on hand because we know that the customer will need them. If you run into the situation where you are out of these components the customer will ultimately suffer. The team decided to put these parts on a "supermarket" where assembly could pull the parts off the shelves based on customer demand. This "make to stock" replenishment system is quite favorable to lead times and ultimately protects the customer. This strategy also had a positive impact on the operations personnel. In the past, it had been common for a production scheduler to go to the shop floor and ask an operator to "tear down" and setup a part with a higher priority. As you can imagine, this type of behavior frustrated the operators and also had a negative impact on their productivity. In the end, whoever yelled the loudest got their parts first. With the new runner replenishment methodology, this all changed. Operators now produced the triggers (or kanban cards) as assembly pulled. This new method has dramatically improved the customer service levels for the runner components to assembly and reduced the overall variation in the runner manufacturing cells.

Strangers

On the other end of the spectrum were the strangers The design and implementation of the stranger area was the most complex step of the model line. "With runners, we didn't have to be exact. There is inventory there to protect us. The strangers do not have this luxury. The difficult part about strangers is that we may see an order today and not see another order for that part for the rest of the year" says Jeff Teague, Director of Operations. Many of the team's challenges with the stranger area have been dealing with this complexity.

> ***"While it may be challenging, we are going to focus on speed and maintaining short lead times," said Sparkes***

The biggest change the team made was going from scheduling orders based on economic order quantities to building exactly to customer demand. In the past, the minimum lot size that was released to the shop floor was twenty-four pieces. The primary reason for this was to absorb the setup cost over a more significant volume. Unfortunately, due to the nature of a stranger, this practice resulted in an abundance of slow moving inventory with little to no customer demand.

The new scheduling method made speed and flexibility the two most important components of the stranger area. This area needed to have the best of the best; the fastest equipment, little to no setup time, the

A Supermarket

most experienced workers, the most skilled engineers and the newest technology. This concept was backwards thinking for some members of the team. "The strangers only represent a small portion of our volume but that's where we assigned our most valuable resources," said Mike Evans, Valve Manager. "The part that made us all believers is that when we truly separated runners and strangers we quickly realized that the small volume represented most of our challenges."

Although the strangers area has many issues due to their complexity, they are now isolated to a specific group of assets and the problems can be resolved in a controlled area. The fact of the matter is that these problems always existed we just worked around them by building excess inventory or moving the "hot" job to another asset. When the machines were shared between runners and strangers this not only had a negative impact on the strangers but on the runners as well.

Assembly

The final step in the valve value stream is the assembly process. Assembly of a valve is a complex process, and the valve model line led the transition from a batch process to a continuous flow process. This allowed the cells to produce a stable amount of work (in terms of pieces) with a stable amount of operators. After completing the transformation of the assembly area, there was still one main challenge: how can the cells be expected to hit takt time (customer demand rate) if they don't have all of the parts when needed?

Bringing the Graveyard to Life

In early January the team made the decision to implement what they called the "Graveyard". Simply stated, the graveyard is where flow stops and dies. The process for the assembly scheduling is this: an order is scheduled to assembly on a certain date; then the components are pulled and placed at the appropriate assembly cell to be built. This makes perfect sense. The real question was what do you do when all of the components are not available? Do you wait to release the order? Today the answer is NO. The order is pulled on the day it is scheduled, whether all of the components are there or not. If a component is missing it is placed in a special, highly visible holding area called the graveyard. This method eliminates the bull whip effect on the other components and most importantly drives visibility to the shortages. "We meet at the graveyard daily to discuss shortages. This is a key indicator on the performance of the valve model line," says Graham Sparkes, VP and GM. "The new process drives a sense of urgency that resonates to the shop floor. Any employee can walk to the graveyard area and see all of the delivery issues related to valves. It is the ultimate visual tool." Since inception, the graveyard has helped drive customer on time delivery from approximately 60% to better than 95%.

The Graveyard

Results and Next Steps

While the CIT team believes that speed (lead time) is the most important metric, there are others that have been impacted by the model line. Safety, Scrap, Rework, Productivity and Cost have also improved drastically throughout the implementation. "We have made a step change improvement to our business, and we know there is still a long way to go to achieve our vision" said Teague. "The results so far in Spartanburg are encouraging, but we are not satisfied. The motto for the team is 'stay humble and hungry.'" A lean implementation is ultimately a journey, not a destination, and the CIT team knows that they have only scratched the surface on the amount of improvements that can be made.

The model line project is not complete (and it never will be, hence *continuous* improvement), the results thus far have been exceptional. From the beginning of the year to present, valve runner lead time has decreased by 87%. Stranger lead time has been reduced by 59%. "When our customers buy, they look for a variety of products and they want them as quickly as possible. While it may be challenging, we are going to focus on speed and maintaining short lead time," said Sparkes.

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CIRCOR Instrumentation Technologies (CIT) manufactures the HOKE brand of valves, tube fittings, and other highly engineered products serving the oil and gas, chemical, petrochemical, and energy markets headquartered in Spartanburg, SC. The 200,000 square foot facility employs 350 people and features a variety of CNC Lathes and Mills, Grinding Operations, Product Assembly, Test Lab and a Research and Product Development Center.