

**Smart Inventory Management:**  
***A Solution for Ensuring a Steady Supply of Custom Parts***

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In trying to comply with the concepts of lean manufacturing, many custom parts manufacturers have come to equate low inventory levels as good, and high inventory levels as bad. Under pressure to appear lean, they drastically reduce their inventory levels, and then struggle to keep up with daily demand changes—perhaps even failing to meet them. This strategy can be detrimental to one of the most important goals in custom parts manufacturing: to ensure that the customer never runs out of parts.

What many suppliers fail to realize is this: lean manufacturing may result in lowering their inventory levels, but lowering their inventory levels does not result in lean manufacturing. In fact, it may result in a failure to meet supply. Reducing inventory levels is not a good business solution if it means the customer runs out of parts.

Perhaps the underlying issue is that systems such as lean manufacturing, ERP, and Kanban need to be better customized to the world of custom parts. It is faulty to assume that a system that works perfectly within a customer's environment will work perfectly within a supplier's environment. The businesses are vastly different—one being a producer of finished products, the other being a supplier of multiple unrelated and highly customized parts. While similar processes and systems may work, they might also need to be modified in order to fit the unique needs, goals, products, and capabilities of the supplier.

So, what is the answer? Lean manufacturing, ERP, and Kanban, tempered with smart inventory management. The phrase “smart inventory management” will be used within this article to describe an approach for managing inventory. The approach is similar to Kanban, but it goes a step further in that it takes into account maximum consumption rates. Thus, it is better equipped than Kanban to handle erratic fluctuations in demand—something that is quite common in the world of custom parts manufacturing.

This article will explore 1) the concept of smart inventory management and the advantages of using it; 2) how to determine (and who should determine) inventory levels for custom parts; and 3) how custom parts suppliers can use smart inventory management to drive their production schedule.

## **Part 1: What is Smart Inventory Management, and Why Use It?**

Understanding smart inventory management merits a quick discussion of Kanban, a pull production system based upon demand. There are several forms of Kanban, but most set a minimum inventory level that, when reached, sends a signal to produce more. In one of its simpler forms, Kanban sets the minimum inventory level at zero. When inventory reaches zero, the signal to produce more is activated.

Another form of Kanban sets the minimum level to reflect replenishment times. For example, if it takes 1 day to make 1,000 more, the minimum inventory level might be 1,000. Thus, the signal goes off when inventory drops to 1,000.

In this example, the supplier would still have to respond immediately, which is not always practical when the supplier has many different parts going through the same machine. The supplier may have to disrupt a production run and create another set-up, which involves material preparation, changing over the tool, and ensuring that all documentation is in place.

Reducing set-up times is not a cure-all for such disruptions. It is very difficult for a custom parts manufacturer to standardize their process, since they do not have the liberty

to modify part designs, material requirements, or tooling. Thus, they often cannot reduce set-up times to the same extent as a company making their own products can do.

Another form of Kanban uses both replenishment times and demand forecasts to set the minimum inventory level. This is done in the hope that inventory will not reach zero on the day that more are being produced. In reality, though, demand forecasts are not always accurate, and unexpected changes can still occur.

Here is where smart inventory management departs from Kanban. Rather than using forecasts, it uses **maximum consumption rates** plus replenishment times to establish the minimum inventory level.

The premise behind smart inventory management is simple. If a supplier knows: a) *the maximum production rate for a part* (and thus the replenishment time) plus b) *the maximum consumption rate* for a part, then the supplier could determine the minimum inventory level needed to ensure a steady supply during unexpected periods of high demand.

This may sound both impossible and scary to someone who manufactures and sells finished products. Who could predict the greatest possible consumption, and who would want to carry that much inventory? However, it makes perfect sense in a supplier's world of custom parts.

Consider this scenario. Company Z makes small appliances. One of their products is floor fans. Supplier Y makes a small custom part that is used to make the floor fans. No one could predict with certainty what the consumer demand for floor fans might be at any given time. However, there is one piece of information that can be stated with more certainty: *Company Z, running at maximum efficiency, is capable of consuming up to 5,000 of the custom fan parts in a single day.*

If this information is shared, Supplier Y can establish the minimum inventory level needed to meet the greatest possible consumption of 5,000 parts per day. Thus, on any given day, they would be prepared to keep up with Company Z's production.

This does not imply warehouses overflowing with inventory. Custom parts are relatively small, relatively inexpensive, and relatively quick to make when compared to an entire finished product. They tend to be made and used sporadically throughout the year. In addition, inventory levels are defined in days supply. Thus, inventory could be anywhere from a supply of 1 day up to several weeks, but definitely not a year's supply.

Smart inventory management fits the parameters of custom parts manufacturing better than traditional Kanban (which is usually used for regular, on-going, and fairly steady production). Because it fits the parameters better, smart inventory management has many advantages over traditional Kanban and other production on-demand systems. Here are some of its main advantages.

### **#1: Smart inventory management means a steady supply of parts for the customer.**

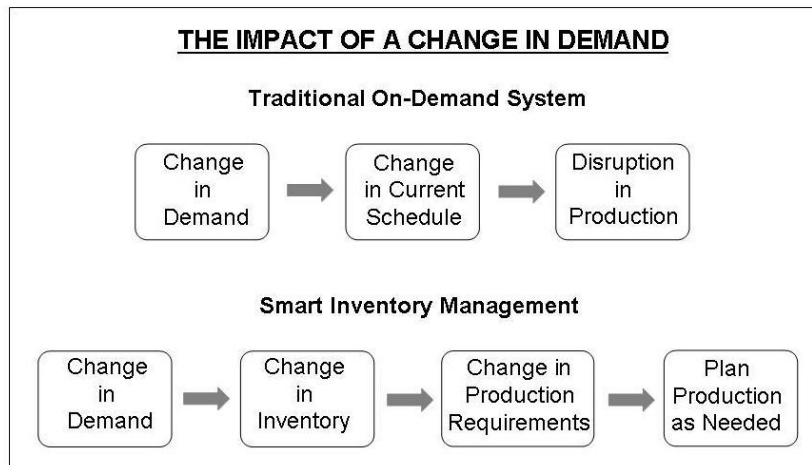
Imagine if, in the previous example, Company Z had planned to use 2,500 parts. On Monday, they decide to change their production plans. They call Supplier Y to tell them that they now intend to start using 5,000 parts per day beginning on Tuesday and continuing for several more days.

Supplier Y, using smart inventory management, already has at least 5,000 parts in inventory—enough to keep Company Z running for a day. Perhaps they even have a 2-day supply or more. In any case, they have sufficient inventory to meet their customer's

change in demand, and sufficient time to change their own production plans as needed to ensure a steady supply.

**#2: Smart inventory management means fewer last-minute production disruptions.**

In a traditional production-on-demand system, last-minute changes cause a disruption in production. In contrast, smart inventory management can handle last-minute changes, since inventory absorbs the impact. The following diagram demonstrates this concept.



Using smart inventory management, suppliers will have more time to react, and then plan their production accordingly.

**#3: Smart inventory management means better efficiency.**

Because smart inventory management means fewer disruptions and more time to plan, it makes for better efficiency. Let's face it; interruptions in business flow are inefficient, whether or not lean manufacturing processes are in place. Sure, there are processes that make the transitions easier and faster, but an *uninterrupted* workflow will always be more efficient than an *interrupted* workflow.

How efficient is it for someone to revise a current schedule? This task can be like taking apart a puzzle and then re-fitting all the pieces together in a new way that still works for everyone (i.e. for production, for shipping, and for other customers). How efficient is it to halt a long run, log where the project left off, and move the old components aside? How much time is lost when a production team has to stop their thought processes and physical motions, start a new routine, and then return to the interrupted routine later?

Smart inventory management buys a little extra time—time to finish current runs, time to react to the requested change, and time to find the most efficient plan for production and delivery.

**#4: Smart inventory management means better quality.**

Because smart inventory management means fewer disruptions and fewer last-minute rushes, it also means less room for miscommunications, mistakes, defective parts,

overlooked variables, or possible errors in judgment. Thus, smart inventory management helps to safeguard quality.

**#5: *Smart inventory management means better logistics planning.***

Consider this scenario. A customer needs Part A delivered on Tuesday and part B by Thursday. The supplier plans to run both parts on Monday and deliver both on Tuesday, since together they comprise a full truckload of materials to the same place.

The phone rings. A different customer has changed their plan from a half-day run (2,000 on Tuesday) to a 2-day run (5,000 on Tuesday, and 5,000 on Wednesday).

If the supplier is NOT using smart inventory management, he may have to start producing the extra Part Cs immediately. To do this, he decides to postpone part B, since it is not actually needed until Thursday. However, he will still have to deliver Part A on Tuesday—minus the half-truckload of part Bs. A half-loaded truck is not cost-effective—especially when one considers the rising cost of transportation and fuel.

Conversely, a supplier using smart inventory management would have at least 5,000 part Cs already in inventory, which could be sent immediately. With enough part Cs to keep the customer running all day on Tuesday, the supplier now has until Wednesday to make and deliver the additional part Cs. Thus, he has time to finish running part A and B and ship them together as originally planned—the most cost-effective logistics solution. He also has time to find the most efficient logistics solution for the extra Part Cs.

**#6: *Smart inventory management means better ability to set reasonable prices.***

Think about all the wastes and inefficiencies mentioned thus far: disruptions to production, increased room for mistakes, inefficient logistics solutions, and extra time spent halting, tracking, and moving current projects aside. These are the hidden costs associated with on-demand production and last-minute changes to production.

Such costs can be hard to pinpoint and manage, but they are certainly felt by the supplier, who ends up eating them at the end of the year or changing prices to reflect them.

Since smart inventory management reduces the impact of last-minute changes, it helps to reduce these hidden costs. Thus, it helps enable the supplier to set and maintain reasonable prices.

Even though there is a cost to carrying inventory, these costs can be controlled and kept to a minimum if inventory is managed smartly.

**#7: *Smart inventory management means a less stressful work environment.***

A supplier's environment is a fast-paced environment, even under normal conditions. Last-minute changes only add to the complexity, requiring more rushing, more switching between tasks, and more keeping track of additional details. While this is not a huge deal for machines and computers, it can be extremely stressful for people.

Common sense and personal experience should be enough to tell us about the stresses and inefficiencies of multitasking—a hot topic in today's media. One recent article points to mountains of studies about multitasking and its effects on stress, concentration,

and productivity.<sup>1</sup> Another article raises questions about its efficiencies.<sup>2</sup> Whatever the case may be, from an employer's perspective it makes sense to keep multitasking to a minimum, for the sake of their employees' well-being and for the sake of productivity.

In manufacturing, some last-minute changes (such as those due to machinery and tooling failures, weather factors, etc.) are beyond one's control. A change in demand is one variable that can be controlled through smart inventory management. Thus, by reducing last-minute changes and creating adequate time to respond effectively, smart inventory management contributes toward a less stressful work environment.

### **#8: Smart inventory management just makes sense.**

Remember, one of the main goals of a supplier is to ensure a **steady supply** of **high-quality** and **reasonably priced parts** to customers. Smart inventory management is a practical solution for meeting this goal. It helps to ensure a steady supply. It helps to circumvent the risks associated with last-minute changes in production. And it helps to control hidden costs, thereby contributing to reasonable prices.

*It may not be practical for every part—especially for expensive or very large parts, which may require special orders instead. However, for many other custom parts, smart inventory management makes a lot of sense.*

## **Part 2: How to Determine (and Who Should Determine) Inventory Levels**

Determining appropriate inventory levels requires cooperation between both the supplier and the customer, as each party holds key pieces of information. The two most critical factors are: 1) the supplier's maximum production rate; and 2) the customer's maximum daily consumption rate.

The supplier's **maximum production rate** is defined as *the maximum number of parts the supplier can produce (per hour or per day)*. For example, if Supplier Y can make 100 parts per hour, and the company operates 8 hours per day, the maximum production rates are 100 per hour and 800 per day. These rates are not likely to change, unless impacted by an issue with quality, tooling, or equipment. Every supplier should know their maximum production rates for every part they produce.

The customer's **maximum daily consumption rate** is defined as *the greatest number of parts that the customer could possibly consume in a single day*. It is important to stress that the maximum consumption rate is NOT a daily average. It is not a guess about how many parts are probably needed. Rather, it is a fixed number that answers the following question: *How many parts would be used if the customer ran non-stop under perfect conditions for one full business day?*

Only the customer knows the answer to this question, and it is the customer's responsibility to provide this information to the supplier. Without it, the supplier may not be able to meet the customer's needs. The customer should also let the supplier know if this

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<sup>1</sup> Herman Miller, Inc. (2007). "The Siren Song of Multitasking" [White Paper]. Retrieved from [http://www.hermanmiller.com/hm/content/research\\_summaries/pdfs/wp\\_SirenSong.pdf](http://www.hermanmiller.com/hm/content/research_summaries/pdfs/wp_SirenSong.pdf)

<sup>2</sup> Rosen, Christine. (2008). "The Myth of Multitasking." *The New Atlantis*, Number 20, Spring 2008, pp. 105-110. Retrieved from <http://www.thenewatlantis.com/publications/the-myth-of-multitasking>

number changes (for example, due to the addition of assembly lines or extended work shifts.)

Once the maximum production and consumption rates are identified, proper inventory levels can be determined. Look at the following table.

SUPPLIER INFORMATION			CUSTOMER INFORMATION	INVENTORY INFORMATION (SUPPLIER/CUSTOMER)				
PART	MAXIMUM PRODUCTION RATE (HOURLY)	MAXIMUM PRODUCTION RATE (DAILY) <sup>1</sup>	MAXIMUM CONSUMPTION RATE (DAILY)	MINIMUM INVENTORY LEVEL <sup>2</sup>		MAXIMUM INVENTORY LEVEL <sup>2</sup>		TIME NEEDED TO REPLENISH ENTIRE MAX. INVENTORY
				NO. OF PARTS	EQUIVALENT TO:	NO. OF PARTS	EQUIVALENT TO:	
Part A	1,000/hr	8,000/day	500/day	500	1-day customer supply	4,000	8-day customer supply	4 hours
Part B	5,000/hr	40,000/day	1,000/day	5,000	5-day customer supply	10,000	10-day customer supply	2 hours
Part C	100/hr	800/day	200/day	400	2-day customer supply	800	4-day customer supply	1 day
Part D <sup>2</sup>	150/hr	1,200/day	2,000/day	10,000	5-day customer supply	20,000	10-day customer supply	16.67 days

<sup>1</sup> Supplier's daily maximum production rate assumes an 8-hour day.

<sup>2</sup> Part D poses a potential capacity constraint if the customer plans to run longer than 5 days in a row at maximum consumption rates.

The table shows inventory levels that take into account both the supplier's maximum production rate and the customer's maximum consumption rate. These rates help to define minimum and maximum levels of inventory, but there are other variables involved in making the decision.

### **Considering Other Variables**

Other variables could include the size of the parts, set-up time, and the cost of producing the parts. For example, if a part is very large, the inventory levels will need to reflect available storage space. If a part is expensive, the supplier must decide how much inventory they are comfortable carrying. If a part has a high production rate but a long set-up time, the supplier must determine a run time that makes the most sense.

### **Defining Minimum Inventory Levels**

Look at the table. The minimum level for Part A is 500 parts—a 1-day customer supply. In this case, the supplier felt confident that additional parts could be provided on-demand within one day if needed.

Now look at the data for Part B. The data shows that the machine is capable of running 5,000 parts per hour. From the supplier's perspective, it does not make sense to set up and run the machine for less than an hour for this particular part. And since it is a small and fairly inexpensive part, the supplier determines that 5,000 parts, or a 5-day supply, is a reasonable minimum level.

Now look at the minimum inventory level for Part C. The supplier has determined that since the part takes longer to produce (100 per hour) it would be better to set the minimum level to a 2-day supply. This will give the supplier more time to respond to a sudden rise in demand.

The minimum inventory level for Part D is even higher. That is because the maximum consumption rate is greater than the maximum production rate. The entries for part D show that while the supplier can make 1,200 parts per day, the customer can consume even more: 2,000 parts per day. This means that some inventory must be in place before the customer begins a run.

Part D poses a potential capacity constraint if the customer continues a high-production run for longer than 5 days. This is best understood by looking at the last column for Part D, which shows that it will take 16.67 days for the supplier to make a 10-day supply for the customer.

### ***Defining Maximum Inventory Levels***

Next, let's look at maximum inventory levels. These are also determined by a variety of factors (time to produce, cost of part, size of part, etc.). For example, Part B shows a maximum inventory level of 10,000 (a 10-day supply for the customer). This is due to the same reason stated earlier—the machine is capable of running 5,000 parts per hour. In addition, it is a small and fairly inexpensive part, so the supplier determines that a 10-day supply is a reasonable amount to carry.

### ***Making Inventory Decisions***

Since many variables need to be considered when determining minimum and maximum inventory levels, the best candidate for making the decision is the supplier, in consultation with their in-house team, their customers, and their available technology resources. Customers hold one piece to the puzzle: their own potential needs. While outside consultants can offer advice, they do not know all the variables and could not possibly learn them all in just a few days. Technology, such a useful tool for evaluating and assessing inventory, is not equipped to make judgment calls. The supplier holds the most pieces to the puzzle. Thus, the supplier is best suited for finding the most practical inventory levels.

### ***Taking Delivery Time into Account***

If a customer is more than one day away from the supplier, the customer should consider delivery time in establishing their own in-house inventory levels. For example, if transit time is 2 days, the customer may want to consider having a 2-day (or more) supply in-house to avoid unnecessary expedited delivery costs.



### Part 3: Using Smart Inventory Management to Drive Production

Once minimum and maximum inventory levels are defined, the supplier can customize his ERP system to reflect them. The customized daily inventory report might look something like this.

PART	WARNING SYSTEM DEFINITIONS				CURRENT INVENTORY REPORT			
	MINIMUM	INTERMEDIATE	MAXIMUM	ABOVE MAXIMUM	ACTUAL CURRENT INVENTORY	PRIORITY LEVEL	CALCULATED QTY & TIME TO RESTORE TO MAX LEVEL	
	PRIORITY = 1 URGENT	PRIORITY = 2 CAUTION	PRIORITY = 0 NO ACTION NEEDED	PRIORITY = 3 OVERSTOCK			QTY	TIME
Part A	≤ 500	501 – 3,999	4,000	> 4,000	400	1	3,600	3.6 hr
Part B	≤ 5,000	5,001 – 9,999	10,000	> 10,000	8,000	2	2,000	0.4 hr
Part C	≤ 400	401 – 799	800	> 800	1,000	3	0	0
Part D	≤ 10,000	10,0001–19,999	20,000	> 20,000	20,000	0	0	0

Next, the supplier can sort by priority levels and then plan daily production accordingly. Obviously, priority 1 requirements would take precedence, as they are the most urgent. If for some reason, the supplier were unable to fill all of the priority 1 inventory requirements on that day, he would contact the customer to determine which parts they actually plan to start using immediately, and which parts may not be needed until a later date.

Priority 2 requirements would be addressed next. Depending on the inventory level of each part, the supplier would determine whether to run the part or whether to watch the inventory levels for another day or two. Perhaps the supplier would also call some of these customers as was done for some of the priority 1 items.

Even if the supplier does not have time to address any priority 2 items, they will still be ahead of the curve simply by addressing priority 1 items. By the time they finish addressing the priority 1 items, the priority 2 items will have become priority 1 items as their inventory levels drop to minimum levels. Addressed priority 1 items will become priority 0—meaning inventory levels are at the acceptable maximum and no action is required.

Priority 3 requirements represent overstock. Technically, overstocks should not occur. If an overstock occurs, it may signal an error somewhere along the line (i.e. too many parts were made during the last run, inventory is being logged incorrectly, there is a shortage of incoming orders, etc.). Depending on the amount of overstock, the supplier can determine the appropriate action to take—whether it is to investigate, to assess their exposed risk, or to keep an eye on overstocked items to see if there is a trend.

Thus, by customizing the ERP system to reflect smart inventory management, the supplier will have an easy-to-use system for evaluating inventory levels and taking the appropriate action. An additional bonus is that the warning system definitions (i.e. the minimum, intermediate, and maximum inventory levels for each part) will rarely need to be changed, since they are based on maximum production and consumption rates for the part. This means less data entry and system maintenance work, and thus less room to

introduce user errors. In contrast, if the supplier had used a form of Kanban based on forecasts, he would have to adjust the definitions every time the forecast changed—a data-entry nightmare for most people. In today’s data-based world, who would not appreciate one less data-entry task?

## **Conclusions about Smart Inventory Management**

Let’s assume *a)* that the supplier’s total machine capacity for 1 year exceeds the total demand for 1 year, and *b)* that no quality or machine problems will affect the capacity. Then theoretically, if the supplier could decide what to run and when to run it, they would never be late on deliveries. In reality, though, priorities and customer demands change, and so this theory does not work.

With smart inventory management, a change in inventory level (rather than a change in customer demand) drives the schedule, allowing the supplier to plan more efficiently. As inventory changes, priorities will change, so the supplier always knows what is most important to run.

Custom parts suppliers need to move away from the notion that inventory in and of itself is a bad thing. Yes, there are costs involved in having inventory, but there are costs involved in all sectors of a business—production, scheduling, logistics, administration, etc.—and no one would propose eliminating these areas. In fact, as revealed in Part 1 of this article, these sectors often grow more costly when inventory is reduced too much.

Inventory should be viewed as just another tool for running a supply business efficiently. If properly managed, it should act as a buffer, absorbing the impact of a sudden spike in demand and giving the supplier adequate time to respond.

In today’s busy world, “lean and mean” is the motto. Business owners often forget the old maxim, “Haste makes waste,” and they often fail to recognize its manifestations. Instead, they scratch their heads and wonder why, with all of their fast technology, improved processes, and constant multi-tasking, they are not seeing huge returns at the end of the year. They gape at the gigantic budgets for logistics and administration, gawk at the lower-than-expected yearly production rates, and then hire more managers, logistics coordinators, and task administrators to remedy the situation.

Perhaps they just need to slow down for a moment and ask themselves, “Is the on-demand approach actually creating some of these hidden costs and inefficiencies? Would it make sense to temper this approach, even just a little, with a different system?”

The missing element in today’s world really might be time. Time to communicate. Time to respond. Time to plan. Smart inventory management gives suppliers a little extra time when they need it the most. Even if it’s just a few hours, it can be crucial in making the most informed and most efficient business decisions—and that means better service for every customer.

## Footnotes/Endnotes

<sup>1</sup>Herman Miller, Inc. (2007). "The Siren Song of Multitasking" [White Paper]. Retrieved from [http://www.hermanmiller.com/hm/content/research\\_summaries/pdfs/wp\\_SirenSong.pdf](http://www.hermanmiller.com/hm/content/research_summaries/pdfs/wp_SirenSong.pdf)

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