Intermittent demand and service levels hold the keys to solving inventory planning woes

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Do you overstock because you don't want to risk running out? Are you under-stocking critical or expensive items? How can you know how much you need to stock to cover demand and satisfy demanding service levels without breaking the bank?

The key is finding the balance point, or the "sweet spot," where you have just the right amount of inventory to meet your service level needs over a replenishment lead time. If you've been trying to do this manually, using spreadsheets or the forecasting module that came with your ERP system, you probably haven't been too successful.

According to David Vollenweider, Vice President of Operations at a St. Louis-based PVF/HVAC/Plumbing distributor, National Sales Company (NSC), the two most important factors in solving the problem are recognizing the roles of intermittent demand and the service levels in inventory planning.

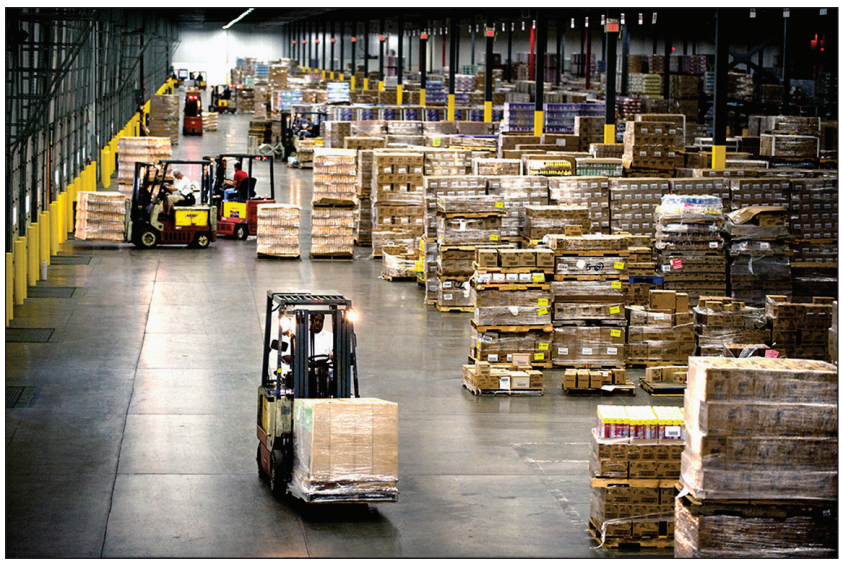
Managing Intermittent Demand

Practically every distributor must, at some point, grapple with planning for intermittent demand. This slow-moving, seemingly random demand is characteristic of service parts or items that are demanded only occasionally, but are essential to the business. There are many periods of zero or very low demand interspersed with highly variable demand. This lack of a clear demand pattern makes the inventory planning challenge quite different and more difficult than planning for items with classic volume demand.

You may have hundreds or thousands of items that fit this demand profile. Vollenweider found that 75% of the 16,000+ items NSC regularly carries in stock have zero demand 30% of the time.

A 95% overall fill rate might sound great, but what did it take to get there? What percentage of the demand was filled from stock compared to having to jump through hoops, expedite, etc.?

Forecastable or not, you still need to plan. Most organizations use ballpark, rule-of-thumb methods to plan for intermittent demand, such as multiples of prior period consumption. Some even use traditional statistical controls. Unfortunately, these approaches don't account for intermittent demand and usually yield imbalanced inventories, with quantities that are significantly too high or too low. To avoid the possibility of running out, distributors may simply "bulk-up" on inventory. This is usually costly, and runs the ultimate risk of increasing obsolete inventory.



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Specialized software is available to take the guess work out of intermittent demand planning. However, be aware that most forecasting solutions do not specifically address the skewed, non-normal array of possibilities found with intermittent demand. Make sure you know how a solution works and whether it will solve your problem.

Managing Service Levels

When planning your inventory, begin with your forecast of demand that you will need to fill. To this you will add safety stock in varying degrees, depending upon how critical it is that you not run out. The higher your required service level – the percentage of the time you can go to the shelf and fill your demand – the greater your required safety stock. Making this trade-off, inventory investment vs. service level, is how distributors find that inventory 'sweet spot' mentioned earlier.

This is the purpose of Service Level-Driven Demand Planning (SLDP). SLDP starts by determining the likely service levels you will achieve with your current inventory policies. Knowing this, determine where you are over- and under-stocked, and then adjust your inventory by making informed trade-offs between the service levels you need to achieve and the costs associated with reaching those goals.

With SLDP, you will get a real number identifying the current service level you're delivering for every part. You can look across your inventory and pinpoint which items you have too much of, and others where you're short. Knowing costs, the service levels you need, the lead times from your suppliers, minimum order quantities, as well as your budget, you can evaluate every inventory decision and assess your risk of a stock out.

There are four basic steps to SLDP:

1. Look through a common lens

Before you start, make sure everyone shares a common definition of service level and how it relates to your operations. At one distributor we visited, the operations team and sales team had wildly different estimates of the company's service level because they defined service levels differently.

Service level is measured in many different ways. Some companies measure order fill rates, or the percentage of orders being filled. Other companies compare service levels within a quoted customer replenishment period with their ability to ship the same day.

Given your current inventory policies, you need to know what service level you're achieving on aggregate levels, as well as at the item level. Companies often lack a definitive answer because they usually look at and measure the wrong things.

2. Determine current service levels

In order to measure success you need to start with a benchmark. If you don't know where you are, you can't know how to get where you want to be.

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(Turn to page 114.)

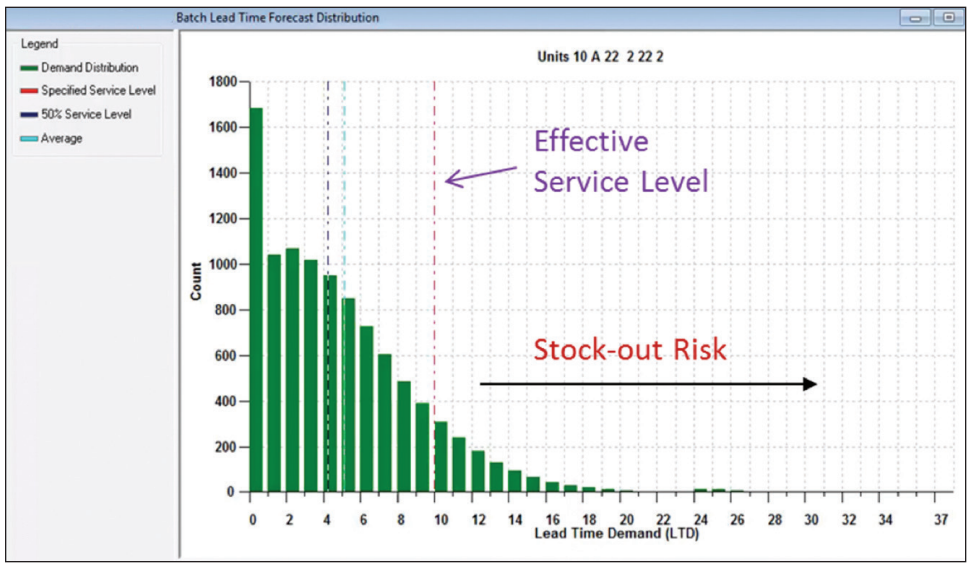
Make service level planning work for you

(Continued from page 112.)
a definitive answer because they usually look at and measure the wrong things, such as:

• Considering the demand forecast, the supply position, and whether the forecast can be met without a deep understanding of how much the forecast and supply will vary. Too often, the missing element is a discussion of how much inventory is needed to support the service level required, or any discussion of what accounts for variability and uncertainty in the demand.

• Focusing exclusively on aggregate fill rates, which often mask poor service performance at lower levels. A 95% overall fill rate might sound great, but what did it take to get there? What percentage of the demand was filled from stock compared to having to jump through hoops, expedite, etc.? Were there certain items that never stocked out while others did routinely? Diving a bit deeper is the key to unlocking opportunities for service improvement and inventory reduction.

3. Identify overstocked and understocked items



Technology lets us conduct sophisticated analyses across thousands of items to determine which items run the risk of stocking out and which ones may be overstocked relative to our service level goals.

Let's take a look at the demand distribution for an item with intermittent demand, calculated in step 2 above, with a service level of 91%(91% of the time the item should be in stock). We can see in the graph above that nearly 20% of the time, the demand for the item will be zero (represented by the tallest bar to the far left of the graph). The graph also shows us that, given the current inventory policy, the average demand (represented by the blue line) is 5 units, and that the reorder point for this item (the red line) is 10 units to cover the replenishment lead time.

Everything to the right of the red line represents demand that would not be covered given the reorder point — it's the risk of stocking out. Whether or not this is acceptable depends on the item. Knowing information like this allows you to move on to the next step.

4. Make rational inventory stocking decisions

Technology also allows you to play with the service level and do "what if" calculations to see the impact of changing the targeted service level.

Let's take the same example above where you're stocking 10 units to cover a lead time. We've already learned that the service level for this is 91%. If this is a critical item, a 91% service level may not be a good enough.

In this case, if you decide to increase the service level for the same item to 99%, and re-run the calculation, you will need a reorder point of 18 units and an increase in inventory of more than 50%. Armed with this information, the planning team can look at other factors such as whether it's critical, how difficult is it to get replacements, its cost, and then decide what service level is acceptable for the stock-out risk your willing to take and the cost of the change.

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An Example: Why Service Level Demand Planning Works for Distributors

David Vollenweider, introduced earlier as the Vice President of Operations at NSC, struggled with intermittent demand for years. The forecasts generated by NSC's ERP system proved inadequate, so Vollenweider started stocking more to make sure that NSC was able to meet customer demand. In the years since 2008, NSC carefully scrutinized every investment, and yet Vollenweider knew they were overstocked in many areas, and potentially at risk in others. Understanding how to make key inventory / service level trade-offs would require more capable tools.

Vollenweider came across a promising demand planning solution, SmartForecasts, that is based on the concept of service level-driven planning and offers a unique capability to forecast intermittent demand. Budgets were tight, but because the software was available as a cloud-based subscription service, NSC was able to start using it for a reasonable monthly rate.

NSC wanted to raise service levels by having the right item in stock when a customer needed it, without incurring additional inventory costs. They took a measured approach to implementing SmartForecasts and SLDP, beginning with two product lines. After a short time, the benefits of the SLDP approach became evident, and NSC extended its use of SmartForecasts across all product lines. While it is still too early to quantify results, Vollenweider is enthusiastic about the cash reallocation/recovery opportunities along with improved strategic service level adjustments across product lines.

"One of the things I like about this new tool, beyond intermittent demand forecasting and service level driven approach, is that I can evaluate the consequences of inventory stocking decisions before I implement them. With other systems, I'd have to make individual changes in the production environment, and then wait to see the consequences over time," said Vollenweider.

Vollenweider expects SmartForecasts to significantly improve NSC's gross margin return on inventory investment (GMROII), reducing inventory, increasing turns, and improving service levels where warranted. He believes that the tool will enable NSC to become more strategic about how and what it purchases, and better optimize order frequency and timing. Longer term, Vollenweider sees opportunities to improve collaboration in the supply chain, enabling suppliers to reduce lead-time variability, improve planning for intermittently demanded items, and increase fill rates.

"Vendor-managed inventory is a frequent topic of discussion with our suppliers," added Vollenweider, "I view service level-driven demand planning as an essential element of a successful VMI program."

Greg Hartunian serves as Smart Software's president and is a member of the Board of Directors. Greg joined the company in 1999, beginning as sales manager and rising to become VP Sales and Operations. He brings unique perspective to his role, combining a comprehensive understanding of the company's customers and business opportunities with a profound regard for the culture of innovation instilled by the company founders. Greg holds a Master's Degree in Business Administration from The F.W. Olin School of Business at Babson College and received his BA from Syracuse University.