The inventory manager has to bridge the inventory level with the customer service requirements

AUTHOR
Gideon Hillman
FCILT

SUPPLY CHAIN

The inventory balancing act

How do you balance inventory with working capital and customer service targets? Gideon Hillman FCILT answers the question.

Do we really need inventory, and if so, how much? How do we satisfy the accountants that the level of inventory held is efficient, and at the same time satisfy sales teams that the level of inventory held will meet customer service targets? What levers will allow us to reduce inventory, but still meet customer service targets and working capital constraints?

These are questions that all businesses need to answer. All too often, inventory is treated by rules of thumb that do not provide sufficient justification for inventory levels, do not ensure working capital is minimised and do not have a clear correlation between inventory level and customer service. Many businesses talk of days' or weeks' supply; but what does that really mean in a supply chain where demand quantities, supply quantities and supply lead-times all vary from day to day or week to week?

Do we really need inventory?

Inventory ties up working capital, costs money to store, costs money to handle and can become damaged or obsolete. With the exception of work in progress, in an ideal world there would be no inventory in a business. Material would flow through the supply chain with no stops or bottlenecks, and the inbound supply rates would be synchronous with the outbound supply rates. A perfect world, but not the one many businesses operate within.

The reality is that for most businesses to remain in business they need to protect their supply. If they cannot supply when the customer wants, in the quantity it requires, then the customer will go elsewhere. So, how do you protect your supply? You could follow the Japanese and adopt the kaizen approach, simplifying and synchronising each step in your supply chain. That is great for an internal production process, but in a real-world supply chain it is unlikely your suppliers and customers will be inclined to synchronise their processes to fit with yours. Consequently, the answer is that to protect supply you need to hold inventory.

Where should inventory be held?

Now we have established that inventory is a necessary and indeed critical element in many supply chains, the

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question becomes: where should inventory be held? To determine this, first you need to establish the points in your supply chain where continuity of supply needs to be protected. There are various events in a supply chain that require inventory in order to protect supply, often referred to as decoupling points, where inbound and outbound rates do not match. These are most likely to occur between raw material supply and manufacturing process, and between manufacturing process and finished goods supply. There are increasingly few businesses that have the luxury of customers requesting finished goods at exactly the same rate as the raw materials are supplied and processed.

How much inventory should be held?

Once you understand where inventory is required to protect supply, the next step is to understand how much inventory is required. This is where many companies fall down. Inventory levels are often driven through the suboptimisation of other processes – that is, optimal production batch quantities – or driven by rules of thumb – for example, four weeks' supply. The consequence of this is often lots of stock, but it is just the wrong type and in the wrong quantity. Consequently, you continue to get customer service failures, and the stock you do have does not get used and can ultimately become obsolete.

There are two types of inventory that protect supply: cycle stock and safety stock. Of course, there are other types of inventory, such as goods in transit, work in progress or obsolete, but these are all a consequence of an activity and not specifically held to protect supply.

Cycle stock is the level of inventory held to ensure that the mean average customer demand can be met during the replenishment lead-time. So, if it takes five days to receive a replenishment, then you must ensure there is sufficient inventory to cover five days of average customer demand. Providing a business has accurate historical or forecast data for each product, then this element of inventory is relatively easy to calculate.

Safety stock is conceptually more difficult. It is in addition to the cycle stock, but at a level is designed to cover the potential for customer demand peaking above average. Consider, for example, that if it took five days to replenish your inventory, and your expected customer demand in units over that five days was: Day 1 = 5; Day 2 = 3; Day 3 = 5; Day 4 = 4; Day 5 = 6. The average demand in those five days would be five items. Multiplying those five items by five days will give you a cycle stock of 25 items. However, what happens if on Day 6 the customer orders seven items? The answer is that you will incur a stockout, and fail to supply the customer. This is what safety stock protects against.

Balancing inventory levels with customer service targets

Safety stock is based on a calculation that assesses the probability of the customer ordering more than the average. Using normal or Gaussian distribution, the inventory manager can assess the safety stock requirement based on the service level a business wants to achieve. So, if the business wants to achieve a 99% service level, then the inventory manager builds a calculation that captures 99% of eventualities outside of the mean average demand. If the business targets a 95% service level, then the inventory manager can build 95% into the calculation and consequently the safety stock will be lower. Of course, this now provides the total inventory level – cycle stock + safety stock – that is required to meet the customer service requirements.

Balancing inventory levels with working capital targets

By making these calculations, the inventory manager will have successfully bridged the inventory level with the customer service requirements. However, it is not just the supply that has to be protected, but also the cash constraints of the business. It is of no value to calculate inventory levels that perfectly meet the demands of the customer if the business does not have the working capital available to invest in that inventory. This is where the inventory manager needs to bridge the best possible service with the constraints of working capital availability.

To give an example of the relationship between working capital and inventory, consider a business that sells £10 million worth of a product – at cost – each year. The total revenue received from sales of that product is £15 million. If the business buys all £10 million worth of the product at the start of the year, by the end of the year it would have made a £5 million gross profit on an investment of £10 million. However, if the business

How do you balance inventory with working capital and customer service targets? It's a question being posed by many supply chain managers.

Case Study – Goodrich

A working example of this is the recent inventory tools implemented by Goodrich, which supplies systems and services to the aerospace and defence industry. Its Goodrich ECEPS division focuses on engine control and electrical power systems, through its in-house facilities and a joint venture with Rolls-Royce plc. In January 2012, it engaged the specialist inventory team at Gideon Hillman Consulting to undertake a complete review of its inventory planning approach, specifically within its UK spares distribution and maintenance facility.

Tony Upton, Global Spares Director, Goodrich ECEPS, says: 'Whilst we were already achieving excellent service levels, and had clear inventory targets to maintain that service, I wanted to better understand and analyse the link between the service level and the inventory cost. The Gideon Hillman Consulting team offered us a clear methodology to optimise our inventories, but also to demonstrate the exact relationship between inventory costs and service. They gave me confidence that we would be able to continue our focus on delivering excellent service, but also minimise the working capital costs associated with inventory.'

The objective of the project for the consulting team was to work with Goodrich and provide the logic, calculations and models to justify and minimise the inventory, but also ensure sufficient inventory was in place to meet the required service levels. In addition, the consulting team was tasked with helping Goodrich understand the approach adopted, so the internal team could repeat the process periodically, reflecting changes in the Goodrich demand profile.

The consulting team worked alongside the planners to develop a revised inventory policy, with clear rules for ABC classification, minimum inventory levels and reorder quantities. This inventory policy was then translated into a dynamic MS Excel model that automated all required calculations, making it quick and easy to recalculate inventory levels periodically. This not only assisted Goodrich by automating the required calculations, but also allowed the team to test the sensitivity of changes in service levels and supplier lead-times, against the cost of the inventory.

Tony Upton says: 'Not only do we now have the process, rationale and models to periodically optimise our inventories, but I can also use the models as a key management tool. I am now able to demonstrate and manipulate the links between inventory levels, service targets and ultimately operating cashflow.'

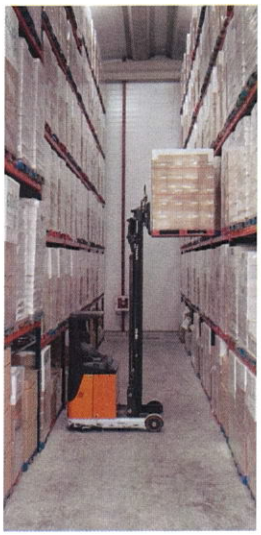
buys 50% – £5 million – of the product at the start of the year, sells it and then buys the next 50% – £5 million – with the sales revenue, then the profit will remain the same, but only £5 million is required as a total investment.

This is what the inventory manager has to consider: how to meet customer requirements, but minimise the amount of investment required in inventory. This can be a difficult task, which is often further complicated by standard measurements that businesses use. Accountants often dictate the maximum levels of inventory that can be held in stock turns. This is an accounting term that provides no indication to the type and location of physical inventory required. It is the task of the inventory manager to bridge the calculated inventory requirements with working capital constraints, as well as the customer service targets.

Balancing inventory levels with working capital constraints and customer service targets is a science, not an art. The inventory manager needs to deal with hard facts and hard data. There are no magic methods of protecting supply. If you have decoupling points in your supply chain, but insufficient capital to invest in inventory, you will fail to service your customer. The business needs to calculate accurately what service it can afford.

To do this, the inventory manager needs to ascertain the cost of the inventory calculated. This will include the purchase price of the inventory, or manufacturing cost, plus the inventory holding costs – for example, warehousing, equipment, IT, staff, deterioration and insurance. With this complete, the inventory manager now has the tools to present clearly to the business the balance between inventory levels, customer service and costs. With simple sensitivity analysis all stakeholders can be shown how, if customer service want x% service, then it will cost £y in working capital. Or conversely, if finance want £y working capital, then customer service will have to be x%.

Using this approach, the inventory manager will be presenting the business with facts on which to make decisions, not rules of thumb. Balanced inventory levels will have been balanced successfully with working capital constraints and customer service targets: the inventory balancing act.



Safety stock is based on a calculation that assesses the probability of the customer ordering more than the average

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About the author

Gideon Hillman FCILT has over 20 years' European supply chain, logistics and materials handling experience having been employed at a senior management level throughout Europe with manufacturers and global third-party logistics providers for over 12 years, prior to establishing Gideon Hillman Consulting in 2004.

Contact, tel: 01926 430883. Email: rachael@hillman-consulting.co.uk Website: www.hillman-consulting.co.uk

Further information

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