



Planning the un-plannable

All futures are unpredictable, but some are more unpredictable than others. Seasonally dependent markets provide special challenges for supply chain professionals who work in certain segments of the chemical industry. Paul Beaumont, of WCI Consulting suggests that, with the right combination of supply chain agility and planning techniques, even these markets can be efficiently served with minimal levels of inventory.

Everybody knows that seasons are entirely predictable. That is to say, we all know that spring is followed by summer, then autumn, then winter. We are certain that even given the vagaries of climate change we will be wearing jumpers in the winter and tee-shirts in the summer. Easy!

At the next level of detail, it becomes a little more difficult to predict. Exactly how warm will the summer be; and how humid? When will the weather conditions become just right for aphids to breed and over what sort of area? Where will specific crop diseases break out and how virulent will they be? These may not all be questions that the average holidaymaker asks when planning a family vacation but it certainly exercises the minds of those working in the agrochemical sector.

For many companies in the chemical sector the predictability of the seasons is, in fact, very unpredictable. This is hugely important, if they get their forecasts wrong they will miss out on massive sales volumes or, just as bad, waste millions of dollars creating un-used inventory.

It is tempting to say that the solution to this challenge is to improve the accuracy of the forecasts. Many see this as the holy grail of supply chain dynamics and there are increasingly sophisticated software tools available to encourage the search in this direction. However, solving the problem of inherent unpredictability through clever technology still seems a long way off, not least because collecting the right data from diverse sources remains extremely difficult. So, while the answer isn't bad forecasting, practical solutions need to be developed that can work within the constraints of the current limits of predictability.

Meeting the needs of a volatile, seasonal business requires great agility. In reality this means developing a highly flexible, responsive manufacturing infrastructure and managing inventory throughout the supply chain using the most appropriate planning and control techniques.

Flexibility and Responsiveness

The ability to change quickly from one product to another is an obvious requirement for achieving flexibility. Although the techniques for doing this are well-proven elsewhere they have not been widely used throughout the chemical sector. Of course, it is more complicated here because of the high costs associated with cleaning and the often unpredictable nature of re-starts. But that just sounds like making excuses: nobody thinks their products can be changed over in half the time until they look at the whole process with fresh eyes and a structured methodology.



Simplify what you do



Planning the un-plannable

Maybe part of the problem is the initial plant design. If it has been developed for long runs of a single product it is hardly surprising that it takes a long time to change over. Perhaps the mindset of 'big is best' needs to be challenged so that smaller more flexible equipment can be used to make products in shorter batches in line with changing demand.

Not only must the plant be flexible, it must also be available whenever required, produce at the right level of output and to the right quality. Total Productive Maintenance (TPM) is the key methodology that creates this capability. The TPM approach encompasses equipment condition assessments; asset care routines; risk-based maintenance strategies; appropriate condition monitoring; and the training of operator and maintenance personnel to ensure preventive techniques can be effectively deployed.

Overall Equipment Effectiveness (OEE) is the key measure that will indicate how well the physical assets are performing. But care needs to be taken with the deployment and interpretation of this measure. The right answer may not be to set a target of, say, 85% for all plants. If the plant needs to be very flexible in order to serve a seasonal market it may be that the best it will ever achieve is 50%. If that is the case, a higher target will be meaningless or, worse, may drive the wrong behaviour as all plant managers will know that the easiest way to maximise the OEE performance is to run longer batches with fewer changeovers: the very opposite of what is required by a flexible supply chain. In addition, the target may actually need to be adjusted throughout the year to align with a changing supply model (see 'Inventory Management' below).

Flexible manufacturing in the chemical sector does tend to create instability in the production processes. This presents an additional challenge as key process variables are not always thoroughly controlled to begin with and the received wisdom is very much about keeping the plant running once a difficult product is being produced within tolerance. This is where Six Sigma techniques really come into their own. A toolkit of powerful statistical diagnostics with a well-structured approach to experimentation framed within a defined methodology, Six Sigma provides the means by which variability can be reduced and quality quickly assured even within an environment of fast and furious product changeovers.

Inventory Management

The ideal way to service a market is to make the products to order so that inventory holding is minimised. However, this is not always possible and, especially during the demands of high season, an ex-stock service must be delivered. After all, if a business is providing insecticide the farmer will not wait for one particular brand to be back on the shelf, if it's not available he will just buy a competitor's.

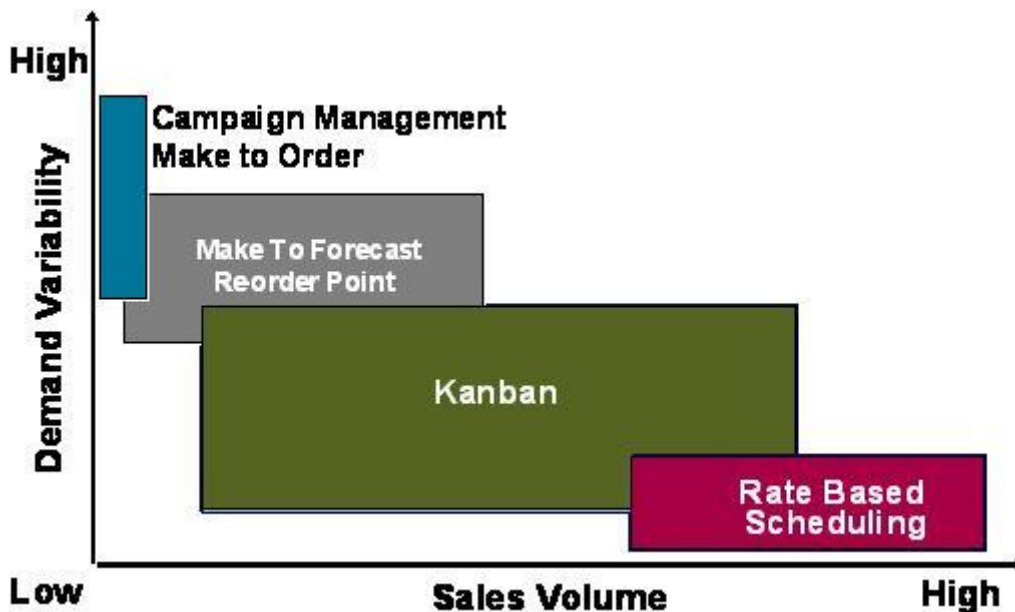
The first question to ask then, is exactly what levels of inventory should be set and how will stock be replenished? This can be answered scientifically and begins with an analysis of demand. Average volume and variability of sales demand for each individual product is calculated and when these results are plotted onto a graph the results show that products will fall into a number of natural groupings as shown in Figure 1 overleaf;



Simplify what you do

Planning the un-plannable

Figure 1: Demand Volume and Variability



Best practice planning techniques demand that the replenishment methods reflect these different groupings: inventory management never works as a one-size-fits-all approach. Essentially high volume, low variability products can be replenished using rate based scheduling or Kanban techniques, both of which become relatively self-managing. (When a product is rate based it is made at the average rate of demand week in, week out. Kanban is an inventory control technique that automatically replenishes stock in multiples of fixed quantities when one of a number of re-order levels are triggered.)

Lower volume products are typically more variable and harder to predict. They should be replenished using Re-Order Point (similar to a Kanban but with a single re-order level); forecast; or campaign (make, say, an annual quantity in one batch). Some of these products may even be made to order which, of course, requires no finished goods inventory, although to be successfully implemented both the minimum campaign size and the manufacturing lead-time must be acceptable to the customer.

Once the replenishment techniques have been selected the detailed inventory profiling needs to be determined. This is calculated by taking into account a number of factors including replenishment lead times, re-visit cycles, customer service levels, average demand volumes and variability. It is not a trivial exercise and should not be undertaken by those who have little experience or who do not understand the dynamics of the supply chain. Getting this part of the design even slightly wrong can have a devastating impact on the business by either driving down service levels or increasing inventory, or both.



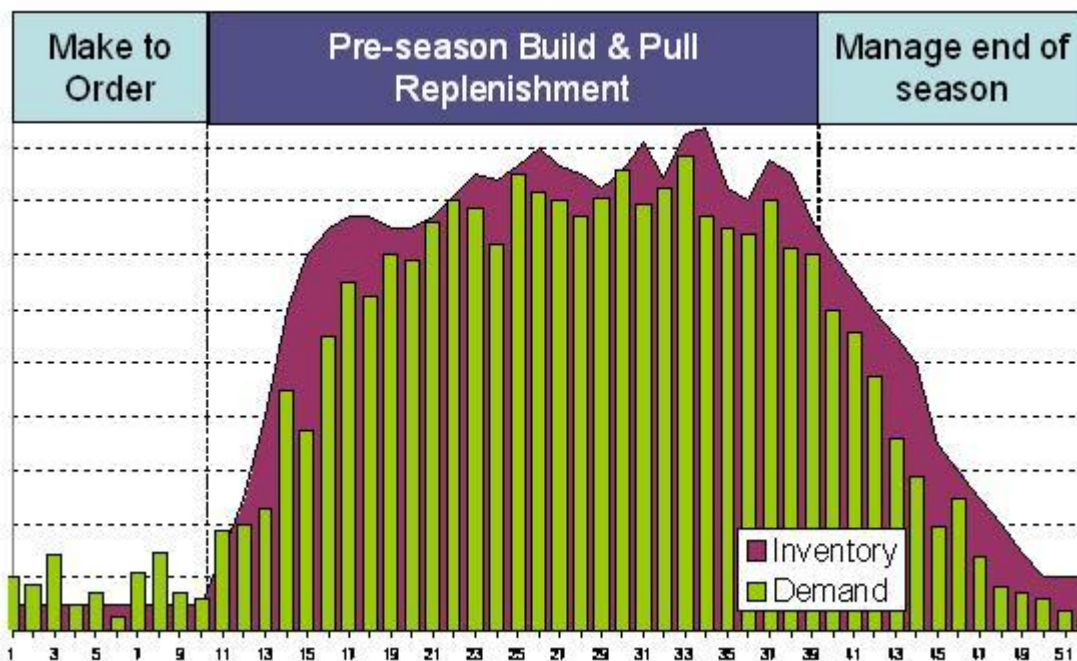
Simplify what you do

Planning the un-plannable

The extra challenge provided by seasonal marketplaces is that the service offering and, therefore, the replenishment techniques need to change within the lifecycle of the season. If we consider the agrochemical environment, for example, it may not be necessary to offer an ex-stock service in the pre-season, although many companies do. Farmers and distributors are unlikely to need high volumes of product very quickly. Most product ordered in this period is used to fill the shelves of the distributors, and is often linked to the sales re-bate system. What is required is not time critical and may be supplied on a make to order basis with the obvious benefits in lower inventory that this provides. During the season itself pull replenishment techniques (Kanban, rate based, Re-Order Point etc) can be implemented for products with a stable demand. At the end of the season stock can be micro-managed downwards so that there is no excess inventory going into the period of low demand. One technique for facilitating this is to reduce the number of pack size variations available at the end of the season, thereby reducing complexity and making it easier to run down inventory.

This change of technique is illustrated in Figure 2.

Figure 2 Replenishment Techniques Adjusted with Seasonality



An effective Sales and Operations Planning (S&OP) process is crucial in maintaining control of the optimisation of inventory and service. This establishes a permanent dialogue between manufacturing, logistics, sales and marketing so that changes in the marketplace can be responded to quickly with adjustments to inventory control parameters. Indeed, while stock is being intensely managed at the end of the season the normal monthly S&OP cycle may not be adequate and might need to be replaced by a more responsive weekly review.



Simplify what you do



Planning the un-plannable

Of course, the more flexible the manufacturing infrastructure becomes, the lower the inventory needs to be. Indeed the whole process is iterative as when progress is made in developing a more agile supply chain so the choice of replenishment techniques can change and inventory levels can be lowered.

Approach

The sensible way to approach a transformation of this type, from inflexible manufacturing with inappropriate planning and control techniques, towards an agile, low cost, high service, seasonal model, is to start with a pilot value chain. This needs to be large enough to be significant but not so complex as to be overwhelming. The programme will start with a diagnostic phase during which the following, among others, will be analysed:

- Demand and order patterns, including seasonality
- Customer service levels
- Demand volume and variability
- Replenishment patterns and reliability
- Existing inventory profiles and drivers
- Lead-time analysis

A future state 'model for success' will be developed following a review of the analysis and a visioning workshop involving the key stakeholders. A concept design and cost-benefit analysis will precede sign off of an implementation plan. Lessons learnt from the implementation will then be absorbed into subsequent transformations of additional value chains.

Conclusion

Supply chains with high levels of seasonality are more complex than those with relatively steady demand. However, the same principles of manufacturing flexibility and smart inventory profiling can combine to create agile supply chains that can serve complex, demanding marketplaces effectively and efficiently.

For further information please contact Paul Beaumont at paul.beaumont@wcigroup.com or on +44 (0)2392 268133



Simplify what you do