SUPPLY CHAIN EXCELLENCE WITH DYNAMIC REPLENISHMENT

FULFILLING TO DEMAND

Discussion Paper



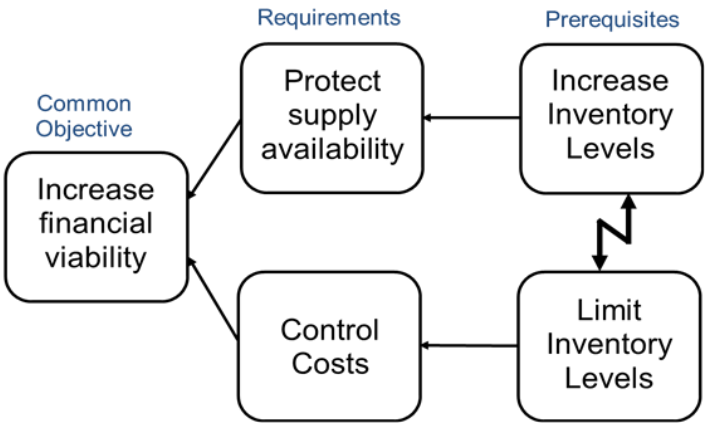


NOVACES®
Advancing Process Improvement.

Modern Supply Chain Issues

The costs of inventory management are rapidly increasing in today's global marketplace. While improvements to supply chain management have been noted in certain industries, three common factors can affect the success of any process improvement initiative: complexity, unpredictability, and risk. Linkages between critical business systems such as operations, materials management, and supply chains are often fragmented and insufficient, if they exist at all. Information may need to be manually translated from one system's format to another's, compounding wasted time, cost, and the potential for error at each exchange.

Estimating uncertainty with absolute confidence is not possible in any system, leading to potentially negative ramifications. The consequences of underestimating the appropriate inventory of "Item A" can be much different than the effects of not having enough of "Item B" on hand. Until a system that can consistently stock what is needed when it is needed, a conflict between two competing goals will arise. These goals are to protect supply availability while also controlling costs, illustrated in the diagram below:



The conflict involves either increasing or decreasing inventory. Both positions have the common goal to increase financial viability, however, the rationale and conclusions drawn are different. On one side, in order to increase financial viability we must protect supply availability, forcing an

increase in inventory. On the other side of the conflict, in order to increase financial viability, costs must be controlled by limiting the amount of inventory. The key to resolving the conflict is to focus on the impact of improved supply chain management in terms of the overall company goal, not solely on product acquisition costs. A more efficient supply chain will not only add to the bottom line, it will also reduce the amount of time spent on placing orders.

Conventional Approach

Conventional supply chain management relies on the accuracy of forecasting. Many problems arise when organizations place orders exclusively based on forecasts. A major problem is the likelihood of missing the forecast; rarely will a forecast be 100% accurate, resulting in stock outs or excess inventory.

In this conventional approach to supply chain management, organizations depend on forecasts of expected demand in what is called a "push system." In a push system, a management decision must be made far in advance, regarding the amount of supplies to be purchased and how often to re-order. Inventory is pushed downstream through the supply chain to reduce the appearance of excessive inventory, clogging the supply chain with inefficiency. It's much better to plan to a reasonable range of usage.

The Solution: Dynamic Replenishment

Based on the Constraints Management distribution solution, the key difference between Dynamic Replenishment and conventional approaches is that it is fundamentally a "pull system" rather than a push system. A pull system controls the flow of supplies by automatically adjusting inventory levels based on actual consumption, with strategic buffers of inventory. These buffers act as shock absorbers, compressing when inventory is consumed and until replenishment occurs. Each time an item is ordered, an equivalent order is placed. Replenishments occur in the smallest possible batches as frequently as possible. This causes statistical variations to be dampened instead of being magnified, reducing fluctuation of stock levels across the chain. More frequent replenishment of inventory does not

lead to increased transportation costs. Placing a variety of products in regularly scheduled shipping containers rather than a single product helps to ensure inventory can meet immediate needs.

As supplies flow downstream, a majority of the inventory remains further up the supply chain. This reduces the amount of safety stock across the supply chain. Shortages are also reduced because of constant flow and rapid response to consumption. Buffer management matches stock of each product at each location to changes in replenishment time and demand, continuously adjusting buffer sizes.

The Dynamic Replenishment solution consists of four key components:

1. *Centralization of inventories*
2. Development of inventory *targets* based on replenishment time
3. Absorption of variation in demand and supply by *strategic buffers*
4. *Synchronization of supply flow* achieved through a focus on the status of inventory pulled into the system over time

In most organizations, once a product is pushed out into a channel, it is very difficult to move it to another location if that product is required somewhere else. In the Dynamic Replenishment framework, a central warehouse is used to service regional warehouses and/or consumption points/hubs, giving organizations the ability to serve inventory to the locations that need it most based on actual consumption. Another benefit of establishing a central warehouse in the Dynamic Replenishment framework is to absorb demand variability. Variability in consumption is highest at consumption locations. By introducing a central warehouse that serves multiple locations, variability is actually reduced. Since the demand from a supply point is the aggregated consumption of all the points it feeds, statistical fluctuations average out. So, as the number of consumption points the central warehouse serves increases, the variability at the central warehouse decreases. As a result, the central warehouse

holds more inventory than at all the regional warehouses combined. However, the total system inventory is typically significantly reduced.

The next step in the Dynamic Replenishment solution is to develop inventory targets at each point in the supply chain for each item, based on both consumption and replenishment. The target should be based on maximum consumption of each item within the average replenishment time, factored by the level of unreliability of the replenishment time. The parameters used to determine the initial inventory target are:

1. Consumption rate
2. Variability in consumption
3. Replenishment time
4. Variability in replenishment time

It is important not to worry too much about determining the initial inventory targets; targets will dynamically adjust to meet demand requirements.

Once targets are in place, the move to pull inventory based on consumption and frequent replenishment can begin. To do so, the management of strategic buffers is imperative. Zone charts are used to manage buffers in order to absorb demand and supply variation, allowing the monitoring of inventory targets periodically.

A zone chart is shown in the figure at right. It is separated into three equal zones, with each zone representing 1/3 of the inventory target. There are two additional features to note: first, the bottom of the red zone equals zero, a stock out, and second, the top of the green zone represents the inventory target. The goal is to always replenish to the target.

Zone Chart

NOVACES®
Advancing Process Improvement.

The red zone represents a low inventory level, the yellow zone corresponds to an adequate inventory level and the green zone signifies a high inventory level. If during a period equal to the replenishment time, the inventory level penetrates either the red or green zones, the target should be adjusted. The target will increase or decrease by 33%, depending on which zone the inventory level is in.

Benefits

Some of the benefits of Dynamic Replenishment are as follows:

- Increased ability to fulfill all demand
- Improved overall customer satisfaction
- Improved inventory utilization (ROI)
- Improved ability to respond to upside requests
- Significantly reduced manual effort required for placing orders
- Reduced spoilage and dating

In addition, the Dynamic Replenishment approach helps to increase profits by positively impacting throughput, inventory, and operating expenses. It reduces the dependency on forecasts, allowing products to be produced closer to actual sale levels, reducing operating expenses and excess inventory. Dynamic Replenishment helps to realize new product launches at a higher rate due to holding less inventory. This can enable the expansion of an organization's portfolio of products and penetration into new markets.

Utilizing a Dynamic Replenishment-based supply chain can mitigate the

damage of slow moving products while granting an organization the ability to react to large fluctuations in demand during peak seasons. A more robust supply chain can help an organization meet unique customer needs. This is all possible with Dynamic Replenishment.

Transitioning to Dynamic Replenishment

Internal change management is required in order for the Dynamic Replenishment model to be successful. Changes include:

1. A significant portion of the organization's inventory will be held in a central location with only enough inventory to cover maximum demand within lead time and meet any requirements at the point of consumption

2. Internal metrics will be implemented to support the solution

3. Forecasts will be used for planning, not for execution

4. The organization must agree on targets set in line with consumption

5. Performance measurements will be based on replenishing to targets

6. Batching (min/max replenishment) will be eliminated

7. Staff buy-in must be established before going live

Summary

Traditional distribution systems rely upon inaccurate forecasts to push inventories through the system. Order batching is encouraged and orders are planned to occur infrequently, resulting in local optimums rather than overall supply chain improvements. Such a procurement strategy yields less than satisfactory results.

By adopting the NOVACES Dynamic Replenishment solution where inventory is pulled into the system by demand signals, the impact of incorrect forecasts is mitigated because the dependency on forecasting is diminished. With Dynamic Replenishment, inventory can reach an effective level to meet a given service requirement. While every circumstance is unique, it is not uncommon for inventory carrying costs to decrease by 30%-50% while availability flourishes at 99% levels, all by replenishing more frequently based on what is consumed and some strategic buffering. Dynamic adjustment and active monitoring not only foster a more responsive system, they alleviate risk by ensuring that inventory levels are sufficient to meet demand without stocking out.

By moving from a push system to a pull system, Dynamic Replenishment uses centralized inventories, strategic buffers and actively synchronizes supply flow. Applications in various environments, such as Naval Aviation Enterprise, Google, Nike, Amazon, Dell, Hewlett Packard, Whirlpool Corporation, Procter Gamble, Monster Cable, Seagate Technology and Pfizer demonstrate that Dynamic Replenishment significantly improves availability with as little as half the inventory. Further, automating individual processes is not the answer. Dynamic Replenishment integrates the entire supply chain, merging technology and change management into a holistic solution to meet the needs of producers, distributors, retailers and customers.

References

1. Goldratt, Eliyahu M. and Avraham Goldratt, TOC Insights into Distribution and Supply–Chain, 2009.
2. Demory, Erin F. and Henry F. Camp, The Benefits of Moving from a Push to a Pull System, IDEA, LLC., 2008.
3. Goldratt, Eliyahu M., Goldratt Satellite Program: Chevalier Media, The Netherlands, 1999.
4. Camp, Henry F., The Negative Consequences of a Conventional Supply Chain, IDEA, LLC, 2008.
5. Efficient Healthcare Consumer Response: Improving the Efficiency of the Healthcare Supply Chain (Chicago: American Hospital Association/American Society for Materials Management, 1996).
6. Camp, Henry F., How the TOC Distribution Solution Can Be Used to Increase Profits, IDEA, LLC., 2007

NOVACES®
Advancing Process Improvement.