Microsoft Business Solutions

WINNING STRATEGIES FOR **THE DISTRIBUTION INDUSTRY**

Effective Replenishment Parameters

By Jon Schreibfeder

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>> Helping Distributors Maximize Business Potential Through Education and World-Class Technology

From Microsoft Business Solutions

Our goal is to help distributors reach their maximum business potential by delivering connected solutions designed to meet unique business processes through trusted partnerships and ongoing service.

This report is the fourth in a series of white papers designed to help forward-thinking distributors increase efficiency, customer service and profitability with smart inventory management strategies based on tried and proven methods and best practices.

The author, Jon Schreibfeder, draws from decades of experience helping more than 1,000 distributors achieve better inventory management. A popular speaker at distribution conferences, Mr. Schreibfeder has literally "written the book" on this topic, with Achieving Effective Inventory Management now in its second edition.

As a leading provider of specialized distribution and business management systems, Microsoft Business Solutions is pleased to sponsor this series. We are committed to serving the success of companies in the distribution industry through education and world-class technology.

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>> Effective Replenishment Parameters

It's Tough Being A Distributor In Today's Market

Many distributors rely on their computer software to help them decide when to replenish the inventory of stock products and how much of each product to reorder. They are relying on the system to alleviate customer service problems and improve profitability. Unfortunately we've found that often management and even buyers do not understand what the actual definition and purpose of each of the application's parameters. As a result, the system is often setup incorrectly or misused and the distributor does not receive all of the possible value from this very expensive tool.

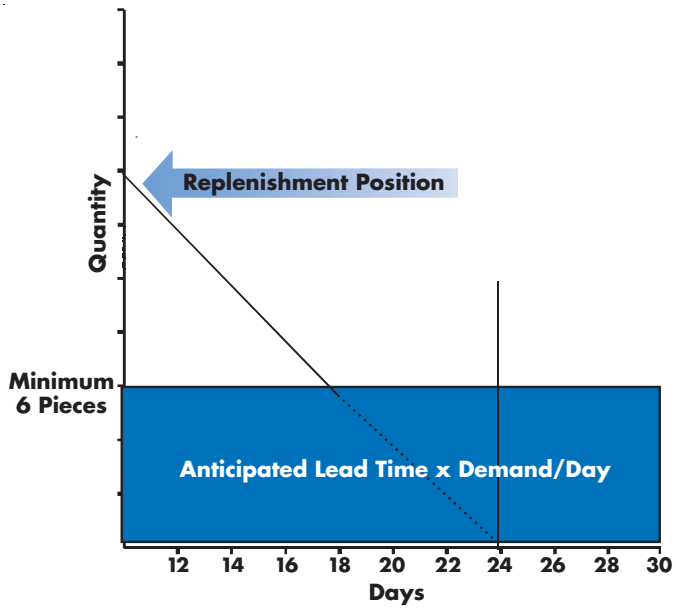
In this document we discuss some common replenishment parameters found in distribution application software packages. Please keep in mind that though the actual name of a specific parameter may be different in your system, the concepts are probably very similar or even identical. Be sure that all of your employees who are responsible for replenishing products understand these concepts. With this knowledge they will be able to maximize their productivity and help your organization achieve the goal of effective inventory management.

> **Please note that the parameters discussed in this document are designed to replenish stock items with recurring usage. That is products that are sold on a regular basis. "Target Stock Levels" of items with sporadic usage are discussed in the whitepaper, Improving the Accuracy of Forecasts, available from your Microsoft reseller.**

>> When to Order a Product

The Minimum Quantity

If you reorder a product at the right time, you will avoid stock outs and disappointing customers. For example, suppose you sell one piece of an item every day and the lead time for the product is six days. If you always reorder the product when there are six pieces left on the shelf, you will consistently receive the replenishment shipment on the day you are selling the last piece in stock



Six pieces represents the minimum quantity. If you do not reorder the product when the replenishment position equals six pieces, you will probably run out of stock. Note that in determining the minimum stock level, it is critical that the anticipated lead time and forecasted demand per day are as accurate as possible.

The Anticipated Lead Time

The anticipated lead time is the sum of four factors:

- **The time it takes you to place an order**
- **The time it takes the vendor to process your order and ship the material**
- **The time it takes for the material to travel from the vendor to your warehouse**
- **The time it takes you to receive, unpack, and prepare the stock receipt for sale or use**

Please keep in mind that when your vendors quote lead times, they are probably referring only to the time it takes to process your order and ship the material (i.e., the second factor listed above). You must consider all four elements if your lead times are going to be as accurate as possible. Forecast demands that are "on target" are just as important. We explore developing accurate estimates of future usage in Improving the Accuracy of Forecasts, another white paper in this series.

Replenishment Position

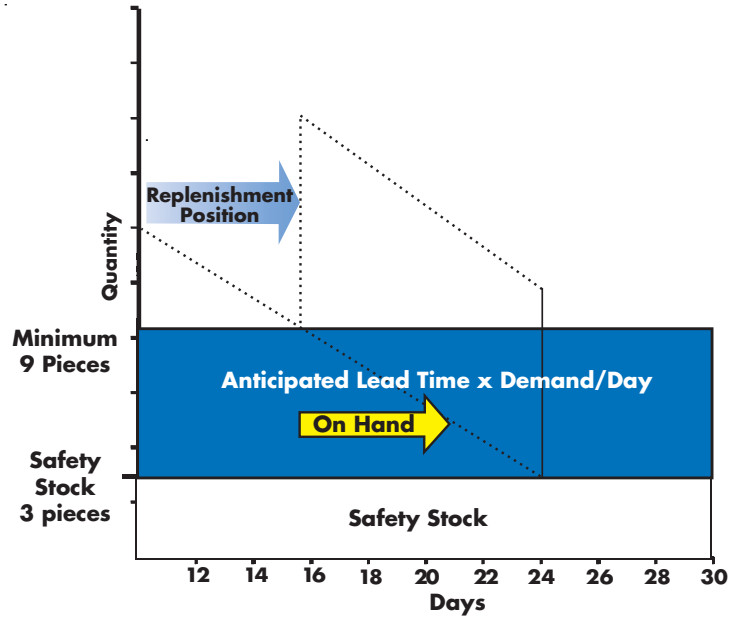
Notice in the diagram above the stock level is referred to as the "replenishment position". Is the replenishment position the actual quantity on the shelf? Maybe, maybe not. The replenishment position is equal to:

On Hand Qty – Qty Committed on Current Outgoing Orders + Qty on Current Replenishment Orders

If a customer is on his way to your warehouse to pick up two pieces, they should be committed to that customer. We want to subtract that quantity from the on-hand quantity in determining when to reorder the product. After all, what would happen if someone called and ordered six pieces to be picked up in six days? Would we want to wait to reorder the product until the customer order was picked up and there were none left on the shelf? Of course not. To maintain a high level of customer service it is important to know when the "available quantity" (On-Hand Quantity – Committed Quantity) reaches or falls below the minimum quantity.

But what if we order more of the product today? Since it takes six days to receive a replenishment shipment, the available quantity will still be below the minimum quantity tomorrow. Do we want to order more of the product? Probably not. If a replenishment shipment is already on order, we don't need to order more. This is why the Quantity on Current Replenishment Orders is added to the available quantity to equal the replenishment position.

Safety Stock



The minimum quantity is equal to the anticipated demand during the lead time. But will we always sell one piece per day? Will the lead time consistently be six days? Many distributors want to maintain some reserve inventory to avoid stock outs in case of unusually large demand or supplier shipment delays during the lead time. This insurance inventory is known as safety stock.

Notice that the safety stock of three pieces increases the minimum from six to nine pieces, and that the reserve inventory of three pieces will only be used if more than six pieces are sold during the time it takes to replenish our inventory of the item.

There are several ways distribution systems determine safety stock quantities. These include:

- **A percentage of the anticipated demand during the lead time**
- **A specific quantity or a certain number of day's supply**
- **A multiple of the average difference between the demand forecast (prediction of what you will sell or use) and actual usage over the last several months**

Like any type of insurance safety stock is an expense, not an investment. Whatever method you use to determine safety stock quantities, be sure you only keep enough safety stock to maintain your desired level of customer service.

Target Orders and Review Cycles

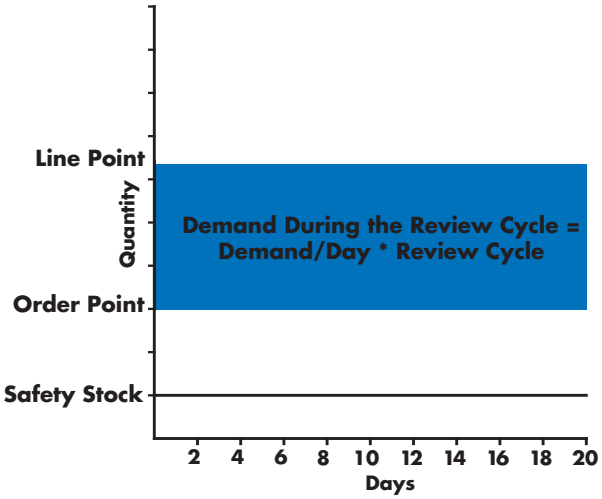
If you reorder a product when its replenishment position reaches or falls below the minimum quantity you will avoid most stock outs. Often a distributor has to place an order of a certain size to get the terms or discounts necessary to competitively sell the vendor's products. This "target order" requirement can be expressed as:

- **A minimum number of pieces**
- **A minimum monetary amount**
- **A minimum weight or weight range**
- **A minimum cubic volume or cubic volume range**

The average amount of time necessary to sell, transfer or otherwise use enough of the vendor's products to meet the target order requirement is called the review cycle. What if the replenishment position of one item in a vendor line falls below its minimum quantity but there is not enough need in that line to meet the target order requirement? Do you wait until there is enough need to meet the target requirement, causing a stock out of that one item? Do you produce a vendor purchase order making up the difference necessary to meet the target requirement with products you think you might need in the future?

The Order Point and Line Point

Whenever you are faced with a vendor target order requirement, you need two minimum quantities to ensure that products are reordered at the right time. The first minimum is equal to anticipated demand during the lead time plus safety stock. This minimum quantity (discussed above) is called the order point. The second minimum is the line point, a quantity equal to the order point plus anticipated demand of the product during the review cycle.



To understand how the two minimum parameters work, let's look at an example:

It takes a week to sell, transfer or otherwise use enough of ABC Industries' products to meet the target order requirement. That is the vendor line's review cycle is seven days. If we place a target order with ABC Industries today, February 1st, we will place the next target order seven days from now on February 8th. To protect customer service we do not want the replenishment position of an item in the vendor line to fall below its order point without being reordered. Therefore we want to place on the February 1st order any item whose replenishment position is below its order point, or will probably fall below its order point before we can place the next target order on February 8th. These are the items whose replenishment position is below the line point (the shaded area of the graph above).

In practice the replenishment position of one item falling below its order point should prompt a buyer to review a vendor line and issue a purchase order. That purchase order should include any item in the vendor line whose replenishment position is below its line point.

>> How Much of a Product to Order

If you reorder a product at the right time, you will protect customer service. How much you order helps determine your company's profitability. The objective of most distributors is to buy every item at the lowest total cost per unit. The total cost is the sum of three elements:

- **Cost of the Material - This amount includes freight and any other charges that are related to a specific shipment**
- **Cost of Reordering an Item – This is the cost of issuing, receiving and paying for a line item on a vendor purchase order**
- **Cost of Carrying Inventory – This is the cost of maintaining inventory in your warehouse before it is sold, transferred or otherwise used**

Cost of Reordering

The cost of reordering inventory (also known as the "R" Cost) includes:

- **Deciding what products need to be replenished**
- **Issuing the purchase order**
- **Expediting the purchase order (if necessary)**
- **Processing the receiving paperwork for the shipment**
- **Approving the vendor's invoice for payment**
- **Processing the vendor's payment**

The cost of reordering is calculated by dividing the total annual cost of purchasing stock line items by the number of purchase order line items for stock products issued in the past year:

$$\frac{\text{Annual Cost of Issuing Purchase Order Lines Items}}{\text{Purchase Order Line Items Issued in the Past Year}}$$

Typical R Costs range from $5 to $6 per purchase order line item. Your Microsoft dealer can provide you with a questionnaire that will assist you in calculating your organization's cost of reordering. Note that the cost of reordering is not calculated for a whole purchase order or each piece purchased. The R Cost is expressed per purchase order line item. The theory is that it probably takes the same amount of time and effort to purchase a product regardless of whether you buy 10, 50 or 1,000 pieces. But if we graph the R Cost per piece, you see that the cost per piece drops rapidly as the quantity purchased increases:

If the cost of reordering is $5.00 per line item and we buy one piece, that one piece has to "absorb" the entire $5 R Cost. But if five pieces are ordered, each piece only has to absorb $1 of the $5 R Cost.

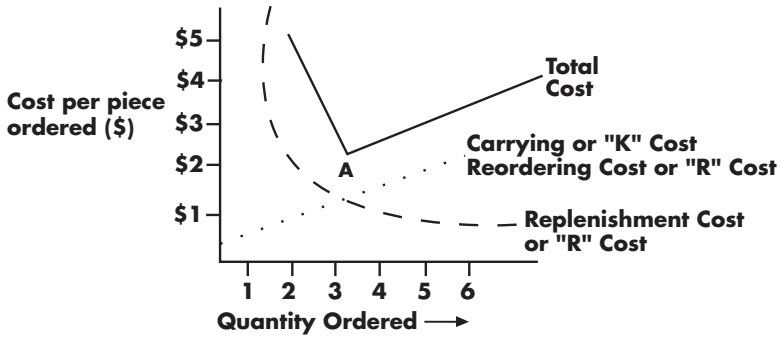
The Carrying Cost

The cost of carrying inventory (or K Cost) includes all of the costs you incur by stocking material in your warehouse:

- **Moving material from the receiving dock to the proper bin location and shifting it to other warehouse locations as necessary**
- **Insurance and possible taxes on the inventory**
- **Rent and utilities for the portion of your warehouse used to store material**
- **Physical inventory and cycle counting**
- **Inventory shrinkage and obsolescence**
- **Opportunity cost of the money invested in inventory. That is, how much could you make if the money tied up in inventory was invested in a relatively safe, income-producing investment. Or, if you finance your inventory purchases, the amount of interest that you pay the bank.**

The annual amount of these costs is accumulated and divided by the average inventory investment. The K Cost is expressed as a percentage. Think of it as the cost of maintaining a dollar's worth of inventory in your warehouse for an entire year. Typical K Cost values range between 18% and 28%. Unfortunately, while the R Cost decreases as the quantity ordered of a product increases, the K Cost behaves in the opposite fashion:

If we buy 500 pieces of an item, part of that shipment will remain in our warehouse longer than if we bought 20 pieces. As long as any part of that purchased quantity remains in our warehouse, it absorbs the elements of the K Cost (listed above) like a sponge. If we add the cost of the material to our graph, we can plot the total cost curve:



Notice that the total cost is at its lowest at point "A" and that we can draw a straight line from point "A" through the intersection of the K Cost and R Cost curves. This is the economic order quantity or EOQ.

Economic Order Quantity (EOQ)

You do not have to develop graphs to determine the EOQ for every stocked product. The "best buy" quantity can be derived from a formula. Microsoft Business Solutions distribution products use different versions of EOQ equations. Some of these are as follows:

One version is based on forecasted demand per business day:

$$\sqrt{\frac{2 \times (\text{Number of work days in the past 12 months}) \times (\text{Reordering Cost}) \times (\text{Demand/Day})}{\text{Annual Carrying Cost Percentage} \times \text{Replacement Cost per Unit}}}$$

The other version is based on forecasted demand per month:

$$\sqrt{\frac{24 \times (\text{Reordering Cost}) \times (\text{Monthly Demand})}{\text{Annual Carrying Cost Percentage} \times \text{Replmnt Unit Cost}}}$$

Which version you utilize is not as important as understanding how to interpret the results of the EOQ equation. Consider this first example:

Item #A100
Replacement Unit Cost of the Item = $7.50
Forecast = 10 pieces per month
Annual K Cost = 25%
R Cost per P.O. Line Item = $5.00

$$\sqrt{\frac{24 * 5 * 10}{.25 * \$7.50}}$$

$$\sqrt{\frac{1200}{1.875}}$$

$$\sqrt{640}$$

EOQ = 25.3 (rounded to 25 pieces)

The EOQ is 25 pieces or about a 2 month supply (25 pieces ÷ 10 pieces per month). Here is another example. The replacement cost for item #B200 is $15.00 per piece:

Item #B200
Replacement Unit Cost of the Item = $15.00
Forecast = 10 pieces per month
Annual K Cost = 25%
R Cost per P.O. Line Item = $5.00

$$\sqrt{\frac{24 * 5 * 10}{.25 * \$15.00}}$$

$$\sqrt{\frac{1200}{3.75}}$$

$$\sqrt{320}$$

EOQ = 17.9 (rounded to18 pieces)

The EOQ is 18 pieces of a little less than a two month supply. The only difference between the parameters for items #A100 and #B200 is the replacement unit cost. Let's look at one more example to see if the replacement cost alone causes the month's supply calculated by the EOQ to vary:

Item #C300
Replacement Unit Cost of the Item = $5.00
Forecast = 50 pieces per month
Annual K Cost = 25%
R Cost per P.O. Line Item = $5.00

$$\sqrt{\frac{24 * 5 * 50}{.25 * \$5.00}}$$

$$\sqrt{\frac{6000}{1.25}}$$

$$\sqrt{4800}$$

EOQ = 69.3 (rounded to 69 pieces)

EOQ of 69 pieces represents about a 5 week supply (69 pieces ÷ 50 pieces/month). Even though the replacement unit cost has dropped, this is less (in terms of week's or month's supply) than the EOQ calculated for the other two items.

The differing results from the EOQ calculations are not caused by changes in the replacement unit cost. The variations are based on what we call "dollars moving through inventory". That is, the forecast demand times the replacement unit cost. For item #A100, there are $75 (10 pc. * $7.50/pc.) moving through inventory per month and we are buying a 2 month or 10 week supply. Product #B200 has $150 (10 pc. * $15.00/pc.) moving through inventory per month and we are buying a little less than two months or about a 7 week supply. Item #C300 has $250 moving through inventory per month and the EOQ suggests you buy about a 5 week supply.

Dollars Moving Through Inventory	Week's Supply Purchased
$75	10.0
$150	7.0
$250	5.5

The more dollars moving through inventory, the fewer week's supply of the product are purchased. The EOQ suggests that you buy small quantities of items with a large number of dollars flowing through, more often. This will help maximize inventory turnover and your opportunities to earn profits.

The EOQ equation calculates the lowest total cost quantity of each inventory item. However the lowest total cost quantity does not necessarily result in a good business decision. For example, if you sold 10,000 pieces per month of an item that costs $5,000 each, $50,000,000 would pass through inventory every month and the EOQ would equal a 48 minute supply. Do you really want a shipment arriving every 48 minutes? What would your receiving clerk say? Most distributors will increase the EOQ, if necessary, to equal a one day or even a week's supply. On the other hand, if you had an item that cost two cents, and you sold four per month (eight cents moving through inventory per month) you would buy a six and a half year supply of the item. Though this is the lowest total cost quantity, the economic order quantity assumes that demand for the item, its replacement unit cost, the carrying cost, and cost of reordering the product will not change over time. Because of the probability of changing market conditions, most distributors will not buy more than a six month or one year supply of an item.

Time is a precious commodity. If the parameters in an advanced distribution system are set correctly, a good distribution system can automatically perform routine replenishment decisions and bring unusual situations to the attention of buyers, management, and salespeople. But this ideal situation requires that your employees have the knowledge to exploit your system's capabilities. A necessary step in this process is to understand how reordering parameters are calculated, so that they can be "fine tuned" to meet the exact requirements of every replenishment situation.

>> Leap Ahead with Microsoft Business Solutions for the Distribution Industry!

Microsoft Business Solutions offers an integrated set of specialized distribution and business management systems that are specifically designed to meet the needs of the distribution industry. You'll find deep functionality in our solutions such as inventory, order and purchasing management, sales forecasting, e-commerce and warehouse management. These distribution-focused modules integrate smoothly with dozens of business management systems to meet the diverse needs of your business, including accounting, customer relationship management (CRM), human resources/payroll, supply chain management, distribution and more.

It's all designed to help you improve profitability by streamlining and connecting every step of your operations – from inventory and sales order management through forecasting and financial reporting. And it comes packed with tools to help dramatically reduce costs, eliminate time-consuming processes and allow 24/7 access to information across your entire organization.

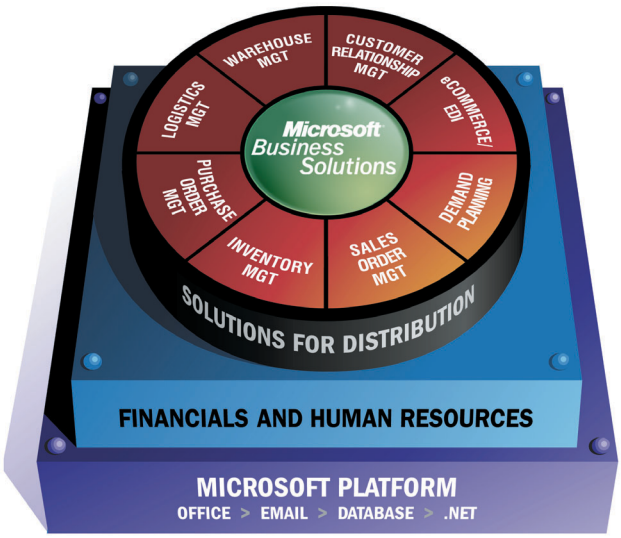
With Microsoft Business Solutions for the distribution industry, you can build a total enterprise solution that's simple and affordable. It will empower you to:

- **Make smarter, faster business decisions**
- **Improve employee and business productivity**
- **Gain a competitive advantage**

>> It's a Safe Choice – It's Microsoft.

You can rely on Microsoft to provide the foundation and resources to support your company's important goals. With more than 200,000 customers worldwide, Microsoft Business Solutions is a proven performer in thousands of distribution-focused companies.

With Microsoft Business Solutions, you no longer have to be a large organization to enjoy the big-league advantages of powerful business-driving applications. From small, networked systems to large client/server solutions, Microsoft Business Solutions can be customized to your needs. We can do this by leveraging a range of proven, world-class distribution management systems.



Microsoft Business Solutions for the distribution industry connect easily with the Microsoft platform – a highly versatile environment that scales to meet nearly any business software protocol. From Windows applications to specific industry programs, Microsoft integrates seamlessly with your existing and future enterprise systems, providing solid and reliable performance.

Backed by the finest support services in the industry, these products are based on industry-standard Microsoft technology. They share a common code set and connect easily into the Microsoft development platform, so leveraging information across applications and the Internet is now simple and effective. And they're fully compatible with familiar Microsoft productivity tools such as Microsoft Office. Easy-to-use and fully customizable, Microsoft Business Solutions products deliver superior integration capabilities with other systems to help you achieve a truly interconnected experience.

>> You don't have to wait to get a head start!

With the Microsoft Capital program, you may already qualify to have your complete distribution solution financed. There's a certified Microsoft Business Solutions partner near you – ready to customize your solution to meet your unique requirements.

Call toll-free for more information on how Microsoft Business Solutions can move your business to the head of the pack: 888-477-7989, option 1.

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