Effective Inventory Management Workshop

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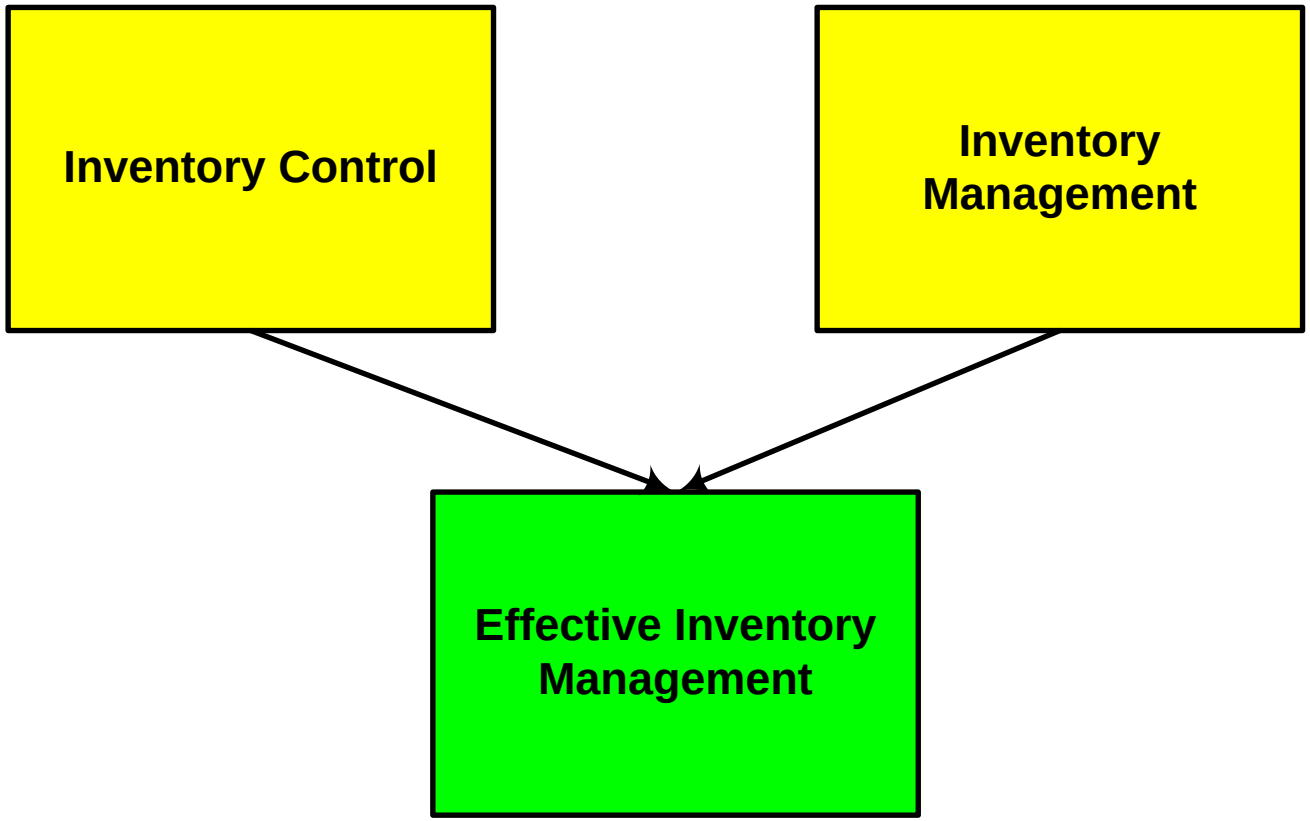
The Goal of Effective Inventory Management

*"Effective Inventory Management (**EIM**) enables an organization to meet or exceed customers' expectations of product availability with the amount of each item that will maximize net profits."*

What Prevents You From Achieving Effective Inventory Management?

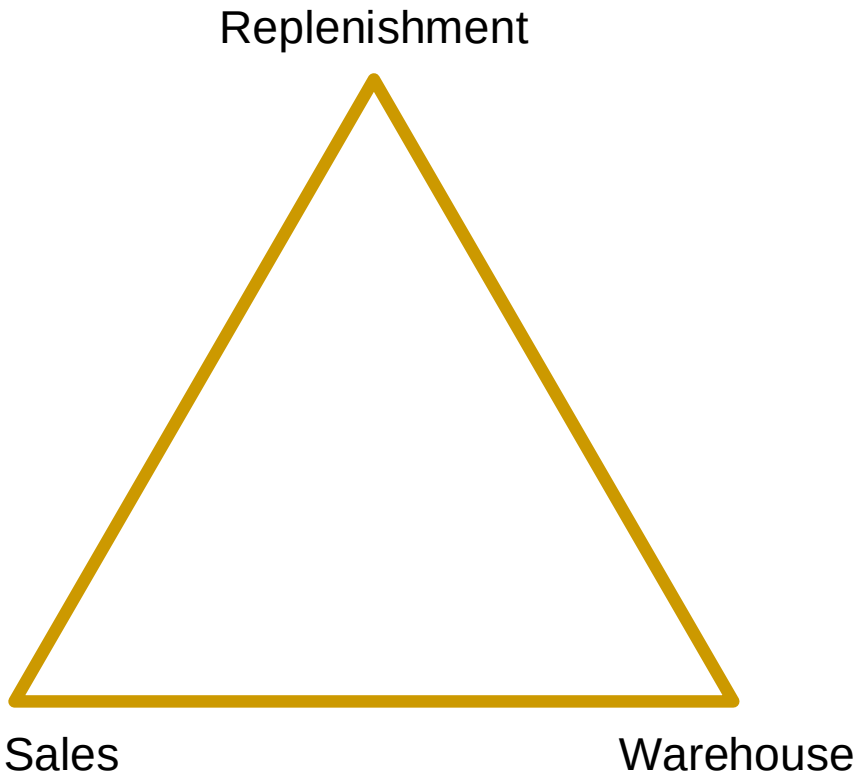
Achieving *EIM* Requires Both Control & Management



The Difference Between Inventory Control and Inventory Management

- Inventory Control – Protecting the inventory stored in your warehouse and minimizing the cost of filling orders. *Controlling what is in your warehouse or other storage facility.*
- Inventory Management – Replenishing stock inventory with the right quantity, of the right item, at the right time in the right location. *Managing your inventory investment to maximize net profits.*

The Inventory Triangle of Cooperation and Responsibility



What is Sale's, Role in Effective Inventory Management ?

- Determine what products should be stocked in each branch or warehouse
- Help develop the forecast of future sales/usage of each finished good product
- Decide what new products should be introduced to the customer base
- Help keep inventory records accurate

What is Replenishment's Role in Effective Inventory Management?

- Making sure that inventory is available in each store/warehouse/branch to meet the sales or usage forecast
- To minimize the "total cost" of inventory and maximize the firm's net profits or minimize total cost
  - Determining the most economic purchase quantities
  - Deciding the best source of supply for each product

What is the Warehouse's Role in Effective Inventory Management?

- Store products to minimize the cost of filling orders
- Maintain accurate on-hand quantities
- Protect inventory from breakage, spoilage and theft
- Maintain a clean and safe facility

Right Person in the Right Job

- Warehouse Management
  - Goal oriented
  - Organized
  - Delegate tasks
  - Inspect performance
  - Support and encourage
- Receiving, Inspection and Putaway Personnel
  - Highest level of product knowledge
  - Detail oriented
  - Methodical

Right Person in the Right Job

- Picking & General Warehouse Personnel
  - Entry level job
  - Wants to learn and advance within the company
    - Management
    - Receiving, Putaway and Inspection
- Cycle Counters
  - Detail oriented
  - Adequate math skills
  - Investigative nature

Establish a Central Replenishment Authority

- One person or group should be responsible for replenishing specific product line(s) throughout a region or your entire organization
  - Focus on your total corporate inventory performance and profitability
  - Not distracted by other tasks
- Purchasing agents negotiate with suppliers
- Buyers or inventory planners supervise & coordinate forecasting and replenishment tasks

Developing Your Approved Stock List

- When you stock a product you are making a commitment to have that product available in reasonable quantities
- An approved stock list should independently be developed for each of your stores, branches, warehouses or other facilities
- Separating the “stock” from the “stuff”

Stocking Principles

- The more times a product is sold the more reason you have to stock the product
- Some slow-moving items might have to be stocked as a service to your customers
- You are probably more willing to stock a slow-moving low cost item than a slow-moving high cost item
- Profitability also plays a factor

Summary of Mo w/Sales					
Mo w/Sales	Items	COGS$	% of Items	12-Mo-Sls$	Invty $
12	437	$2,806,171.64	3.0%	$3,933,945.81	$568,206.20
11	212	$590,193.47	1.5%	$861,377.50	$156,183.62
10	228	$580,633.70	1.6%	$820,650.74	$124,416.30
9	208	$397,991.57	1.4%	$530,181.09	$107,104.19
8	214	$400,851.92	1.5%	$494,684.23	$85,289.95
7	243	$279,543.94	1.7%	$430,809.67	$70,863.52
6	289	$356,281.22	2.0%	$495,126.83	$81,752.07
5	339	$802,965.51	2.3%	$1,125,730.95	$70,755.77
4	464	$514,495.45	3.2%	$884,844.20	$87,501.92
3	648	$312,787.93	4.5%	$544,703.34	$81,947.82
2	1157	$471,906.21	8.0%	$768,226.42	$89,029.82
1	3309	$658,793.82	22.9%	$1,272,282.04	$154,214.95
0	5235	-$9,959.23	36.3%	$48,459.07	$601,187.76
New Items	1450	$573,449.53	10.0%	$975,795.88	$68,022.39
Total	14433	$8,736,106.68	100.0%	$13,186,817.77	$2,346,476.29

Should Each Slow Moving Item Be Stocked in a Particular Location?

- Do customers *realistically* expect the product to be available for immediate delivery?
- Does the profit margin offset the high cost of carrying inventory?
- Is the item related to other profitable sales?
- Can a more popular item be sold in its place?

Types of Stocked Inventory

- The GOOD: Inventory that you stock that provides an acceptable return on your investment
- The BAD: Inventory that doesn't provide an acceptable return on your investment, but contributes to other profitable sales
- The UGLY: Inventory that doesn't provide an acceptable return on your investment, and doesn't contribute to other profitable sales

Can You Base Profitability on Gross Margin?

- Gross Margin is defined as:

$$\frac{\text{Sales (\$)} - \text{Cost of Goods Sold (\$)}}{\text{Sales (\$)}}$$

No, gross margins don't vary as the amount of inventory increases

Is This Item Profitable?

- Annual Sales = $10,000
- Annual COGS = $6,000
- Gross Profit = $4,000
- Gross Margin = 40%

But they have a $12,000 average value of inventory throughout the year!

How to Determine if Inventory is Profitable

- Calculate the Adjusted Margin:

$$\frac{\text{Annual Profit (\$)} - (\text{Avg. Invty Investment (\$)} * \text{Carrying Cost \%})}{\text{Annual Sales (\$)}}$$

$4,000 – ($12,000 * 20%) ÷ $10,000 = 16%

A 40% Gross Margin but
a 16% Adjusted Gross Margin!

Carrying Cost ("K" Cost)

Accumulation of all of the costs involved in maintaining inventory in your facility

- Cost of putting away stock receipts and moving material within the warehouse
- Insurance on 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

All warehousing expenses can be divided between the cost of carrying inventory and the cost of filling orders

Carrying Cost ("K" Cost)

Annual Sum of "K Cost" Elements

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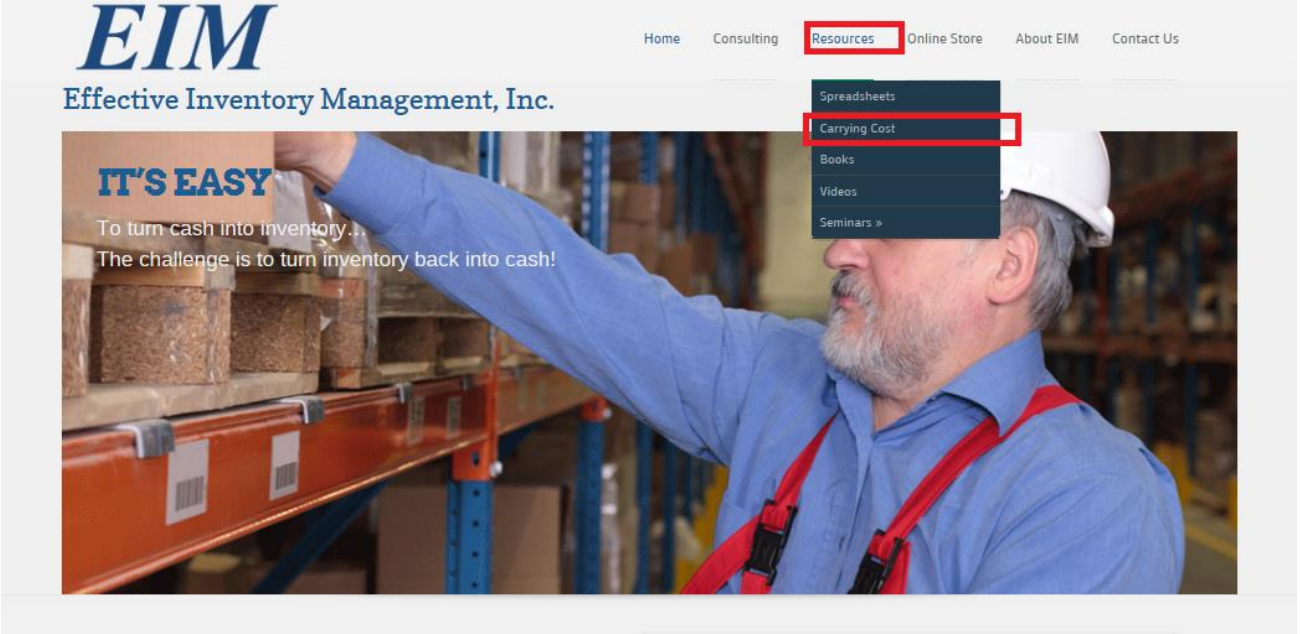
Average Inventory Investment

K Cost Questionnaire on www.EffectiveInventory.com



No Cost - Confidential

Calculating the Adjusted Margin

Sales = $1,000 Gross Profit = $150
Gross Margin Percentage = 15%
K Cost = 20%

Average Inventory = $250
[$150 – (20% * $250]/$1,000= 10%
Average Inventory = $500
[$150 – (20% * $500)] /$1,000 = 5%
Average Inventory = $750
[$150 – (20% * $750)]/$1,000 = 0%

How to Determine if Inventory is Profitable

The adjusted margin must be greater than Non-Inventory Related Expense Percentage (NIREP):

$$\frac{\text{Annual "Non-K Cost" Related Expenses}}{\text{Total Annual Sales}}$$

for the inventory to be considered profitable. The NIREP doesn't vary within a location

Profit & Loss or Income Statement

- Income or Sales
- Expenses
  - Inventory Related (used in calculating the carrying cost)
  - Non-Inventory Related (all expenses not used in calculating the carrying cost)
- Net Profits

The Adjusted Margin – NIREP Comparison

- Adjusted Margin > NIREP ⇒ Good Inventory
- NIREP > Adjusted Margin ⇒ Bad Inventory or Ugly Inventory

The Adjusted Margin – NIREP Comparison

- Bad Inventory = If NIREP > Adjusted Margin, but item(s) can be combined with other complimentary items and the combined Adjusted Margin > NIREP

- Ugly Inventory = Anything that isn't Good or Bad

A Combined Adjusted Margin for Complementary Items

- "Bad" or "Ugly" Item
  - Sales = $500
  - COGS = $400
  - GP ($) = $100
  - Avg Invty = $500
  - K Cost% = 20%
- Supported Line
  - Sales = $50,000
  - COGS = $42,500
  - GP ($) = $7,500
  - Avg Invty = $5,000
  - K Cost% = 20%

[$7,600 – (.20 * $5,500)] ÷ $50,500 = 12.9%

An Adjusted Margin for a Specific Customer

Use total sales and profitability for the customer and the average inventory investment for the inventory maintained primarily for that customer

Sales = $100,000 Profit = $ 15,000
Avg Invty = $50,000 KCost% = 21%

[$15,000 – ($50,000 x .21)] ÷ $100,000 = 4.5%

Note that the Gross Margin Percentage is 15%!

New Stock Items

- New stock items should be maintained with manually set parameters until enough usage history has been accumulated to accurately forecast demand

- New stock items are usually the source of most dead inventory. That is, it's dead on arrival

New Item Questionnaire

- Who is requesting that the item be stocked?
- What are the estimates of usage for each of the upcoming six months?
- What is the anticipated gross margin for sales of this item?
- What effect will usage of this product have on usage of other existing stock items?
- How many month's supply must initially be purchased? What investment is necessary?
- Where will this new inventory be stored?
- How can any unsold or unused stock be liquidated?

Evaluating New Item Questionnaires

- Committee of marketing, sales, management and purchasing for resale inventory
- How accurate has the source been in the past?
- Three or more members must agree to add the product (product line) to stock inventory in that location and the initial forecast

Keep Sales Focused On New Stock Items

- Produce a weekly report of new stock products (product lines) where usage < 75% of the forecast. For each item:
  - Item and Description
  - Sales and Gross Margin Projections
  - Actual Sales and Gross Margins
  - Current Available Quantity
  - Value of Available Quantity
  - Person requesting that the product be stocked

- Consider a budget for new inventory items (open to buy)

Note that P21 release 2019.1 includes feature to compare new item usage to predictions!

Working with Non-Stock Items

- If a product is needed that is not on the approved stock list:
  - Customer must buy the entire quantity that must be ordered
  - Customer must pay for the entire quantity that must be ordered
  - Any remaining inventory is expensed against the transaction

How Much of Each Stocked Item Will be Sold or Used at Each Location?

A demand forecast is a prediction of the quantity of a product that will be sold, transferred or otherwise used during a specific time period.

The Most Common Forecasting Method is S.W.G.

- Scientific
- Wild
- Guessing

Scanning usage history and manually predicting how many of a product will be sold and how many you need to buy

Problems with S.W.G. Forecasting

- Requires extensive industry knowledge
- Time consuming
- May overlook items that need attention

Accurate Demand Forecasts Are Based On Up To Six Elements

1. Past usage of the product (or products with similar characteristics)
2. Internal trends – Observed increasing or decreasing usage over time
3. External trends – Economic or environmental factors that may affect usage
4. Events – Promotions or other events that you predict will have an effect on usage
5. Collaborative information from management, customers or salespeople
6. The appropriate “forecast horizon”

Correctly Calculating the Forecast Error

[Absolute Value of (Usage – Forecast)] ÷ Lower of Forecast or Usage

Month	Usage	Forecast	Calculation	Error%
Sep	100	50	[ABS(100 – 50)]÷ 50	100.0%
Aug	50	100	[ABS(50-100)]÷ 50	100.0%
Jul	95	100	[ABS[(95-100)]÷ 95	5.3%

Calculating the Forecast Error in P21

[Absolute Value of (Forecast - Usage)] ÷ Forecast

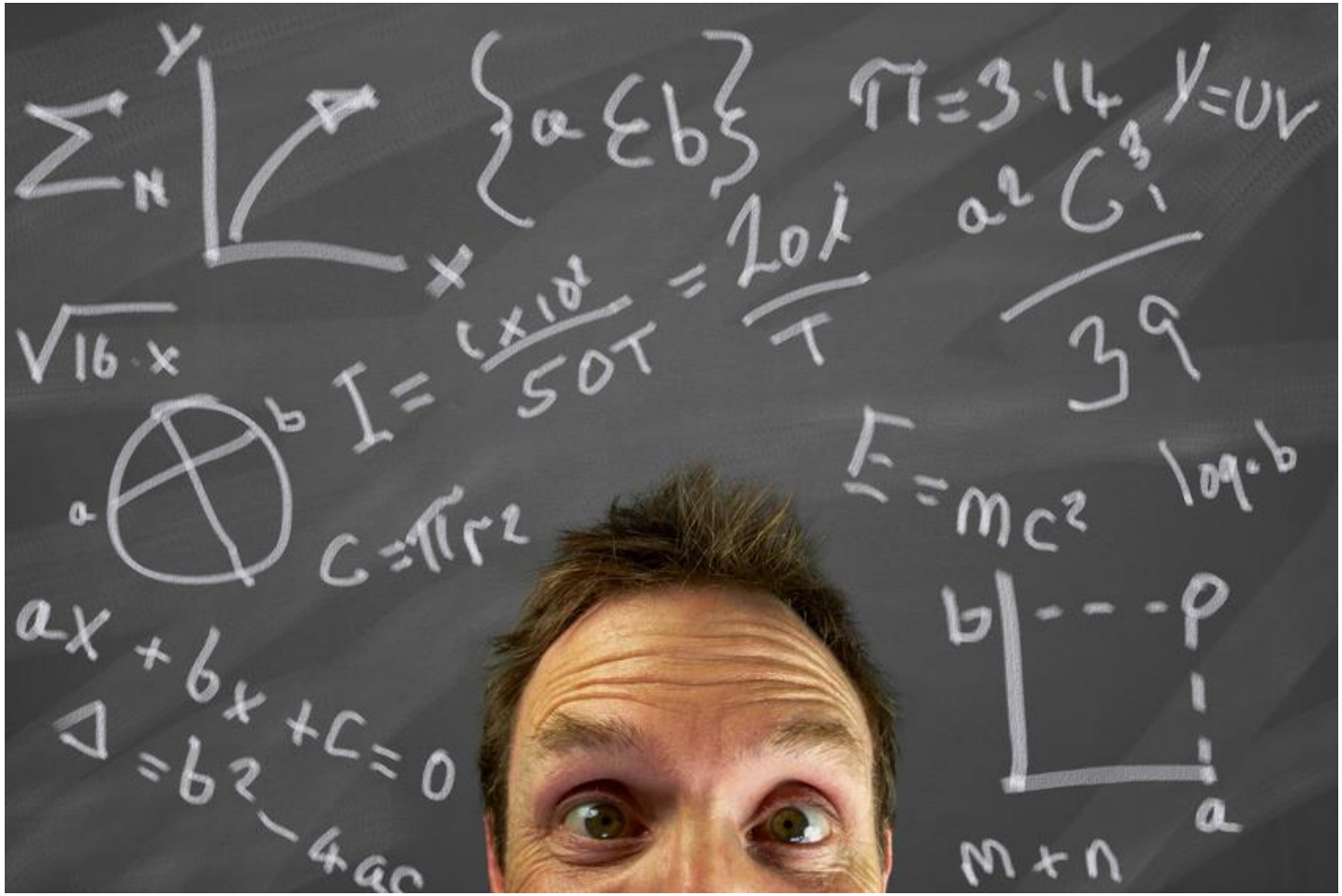
A100	Usage	Forecast	Calculation	Error%
Oct	100	50	[ABS(100 – 50)]÷ 50	100.0%
Sep	50	100	[ABS(50-100)]÷ 100	50.0%
Aug	95	100	[ABS[(95-100)]÷ 100	5.0%

Problem – Forecast Error is Perpetually Calculated from the beginning of using advanced forecasting

The "Average" Forecast Error

- In a study done by ***EIM*** of a wide range of distributors using a wide range of computer systems:
  - The mean forecast error was 682%
  - The median forecast error was 381%
- "Best Practice" companies had an error that was approximately 1/10th of these averages
- The better your forecast, the less you need to stock to maintain your desired level of customer service

Accurate Forecasting Does Not Have to Be Complicated



Buyers Should Bring Possible Unusual Usage to Sales or Users

- Salespeople or users are closest to the customers or process
- These people can best determine if possible unusual usage is:
  - Activity that will not reoccur
  - Start of a new trend

  - *Note that P21 release 2019.1 includes an inquiry that will report if usage is more than "x%" of the forecast or less than "y%" of the forecast!*

Usage This Inventory Period > "x%" of the Forecasted Demand

	June	May	April	March	February	January
Usage	1500	410	290	375	450	303
Forecast	368	420	305	368	404	334

For Example: Usage in June (1500 pieces) is greater than four times forecasted demand

Usage this Inventory Period < "y"% of the Forecasted Demand

	June	May	April	March	February	January
Usage	40	210	260	185	290	160
Forecast	224	208	274	202	269	204

For Example: Usage in June is less than 20% of the forecasted demand

Compensating for an Unusual Sales Quantity

In reviewing all of the transactions for June, the buyer notice an unusual sales of 1,000 pieces. After talking to the salesperson or customer it was decided that this transaction was unusual

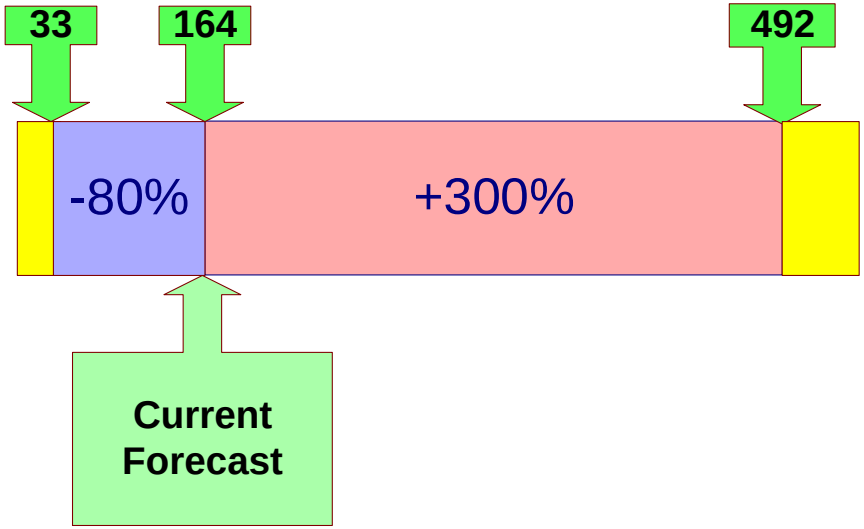
	June	May	April	March	February	January
Usage	1500	410	290	375	450	303
Adjustment	-1000	0	0	0	0	0
Filtered Usage	500	410	290	375	450	303

Compensating for a New Sales Trend

A new customer will continue to buy approximately 1,000 pieces a month for the foreseeable future

	June	May	April	March	February	January
Usage	1500	410	290	375	450	303
Adjustment	0	1000	1000	1000	1000	1000
Filtered Usage	1500	1410	1290	1375	1450	1303

Automatically Adjust Unusual Usage for Previous Months



If usage in a previous month is less than "x"% or more than "y"% of the forecast for the month, adjust usage to equal the forecast for the month

P21 release 2019.1 allows you to set percentages by ABC class!

Recurring vs. Sporadic Usage Items

Dec	Nov	Oct	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan
50	0	0	0	20	0	0	0	0	50	0	0

- Sporadic usage item have a "normal usage quantity" > the average quantity sold in a time period
- The normal usage quantity is the quantity normally sold or used in one transaction
- Sporadic usage items are not sold or used on a regular basis and cannot be forecast

Forecast would be between 10 and 16.7 pieces per month. What is the "normal usage quantity"?

P21 release 2019.2 identifies items with sporadic usage

Normal Sales or Usage Quantity

- The quantity sold or used in one transaction (if the computer system accurately records hits) or the quantity normally sold or used in one inventory period
- Consider the mean hit average, adjusted mean average, median average or mode average

Different Averages

- Mean Hit Average
  - 12 Mo Sales (Qty) ÷ 12 Mo Hits
- Adjusted Mean Average
  - 12 Mo Sales (Qty) ÷ Months with Sales
- Median Average
  - "Middle" Non-Zero Quantity
- Mode Average
  - Most Common Non-Zero Quantity

Dec	Nov	Oct	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan
50	0	0	0	20	0	0	0	0	50	0	0

Four orders placed for this item in the past 12 months

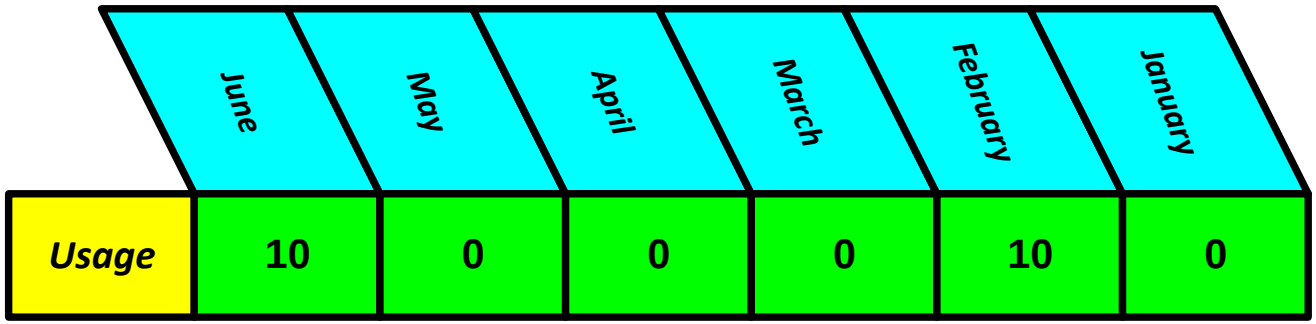
Determine Orders to Maintain for Each Sporadic Usage Item

Lead Time	≤ 30 Days	≤ 60 Days	≤ 90 Days	> 90 Days
Usage in 1 - 2 months	1	1	1	2
Usage in 3 - 4 months	1	2	2 - 3	3
Usage in 5 - 7 months	2	2 - 3	3	4

Determine Orders to Maintain for Each Sporadic Usage Item

Lead Time (Days)	Target Value < $25	Target Value < $100	Target Value <= $250	Target Value > $250
Usage in 1-2 Months	1	1	1	1
Usage in 3-4 Months	2	2	1	1
Usage in > 4 Months	2 - 3	2	1	1

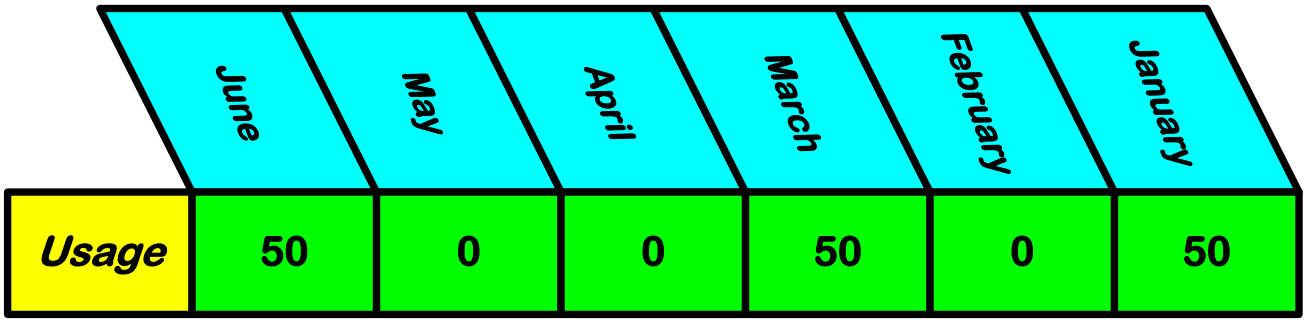
Target Stock Level = 1 Average Order



Minimum = 9

Maximum = 10

Target Stock Level = 2 Average Orders



Parameters for this item include a safety stock equal to one sale:

Minimum = 50

Maximum = 100

P21 is planning on automated sporadic item parameter calculations in release 2020.1

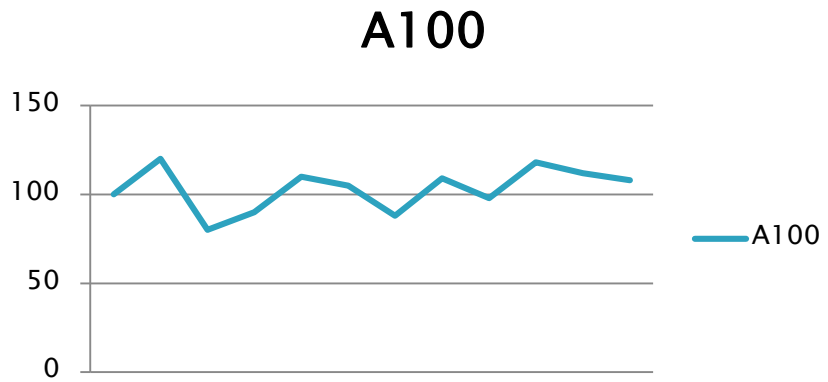
Items with Recurring Usage

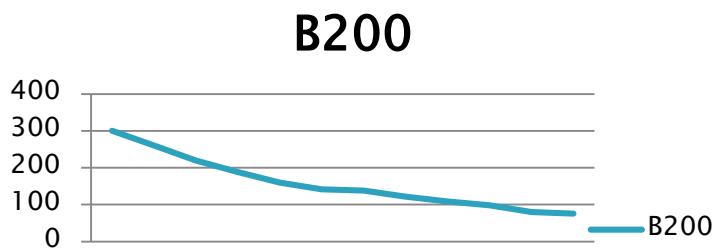
- Items with recurring usage are sold or used on a regular basis
- You can predict what you will sell or use of these products in future inventory periods
- Replenishment parameters can be determined based on the demand forecast

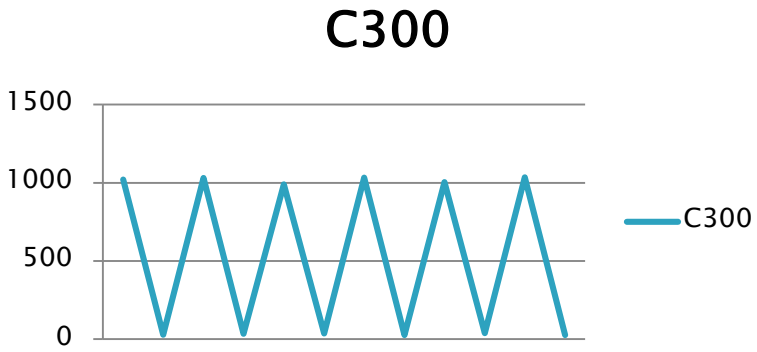
Different Patterns of Usage Require Different Forecasting Methods

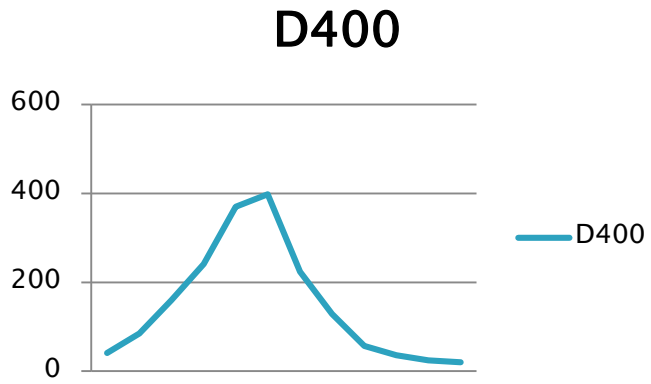
Item	Sep '19	Aug '19	Jul '19	Jun '19	May '19	'Apr '19	Mar '19	Feb '19	Jan '19	Dec '18	Nov '18	Oct '18
A100	100	120	80	90	110	105	88	105	98	118	112	108
B200	300	260	220	188	160	142	138	122	105	98	80	76
C300	1020	28	1030	34	990	36	1033	27	1004	39	1034	26
D400	41	85	160	241	370	398	224	129	57	36	24	20

Different Items Have Different Patterns of Usage……









Choosing the Best Forecast Formula for an Item

1. First determine if the item has recurring usage
2. Calculate a forecast for each item with recurring usage for each of the past several months using several forecast formulas
3. Compare each calculated forecast to actual usage for that month. Calculate a forecast error
4. The formula that results in the lowest forecast error will be used to forecast future demand

Current Replenishment of Items with Recurring Usage

Reorder Point =

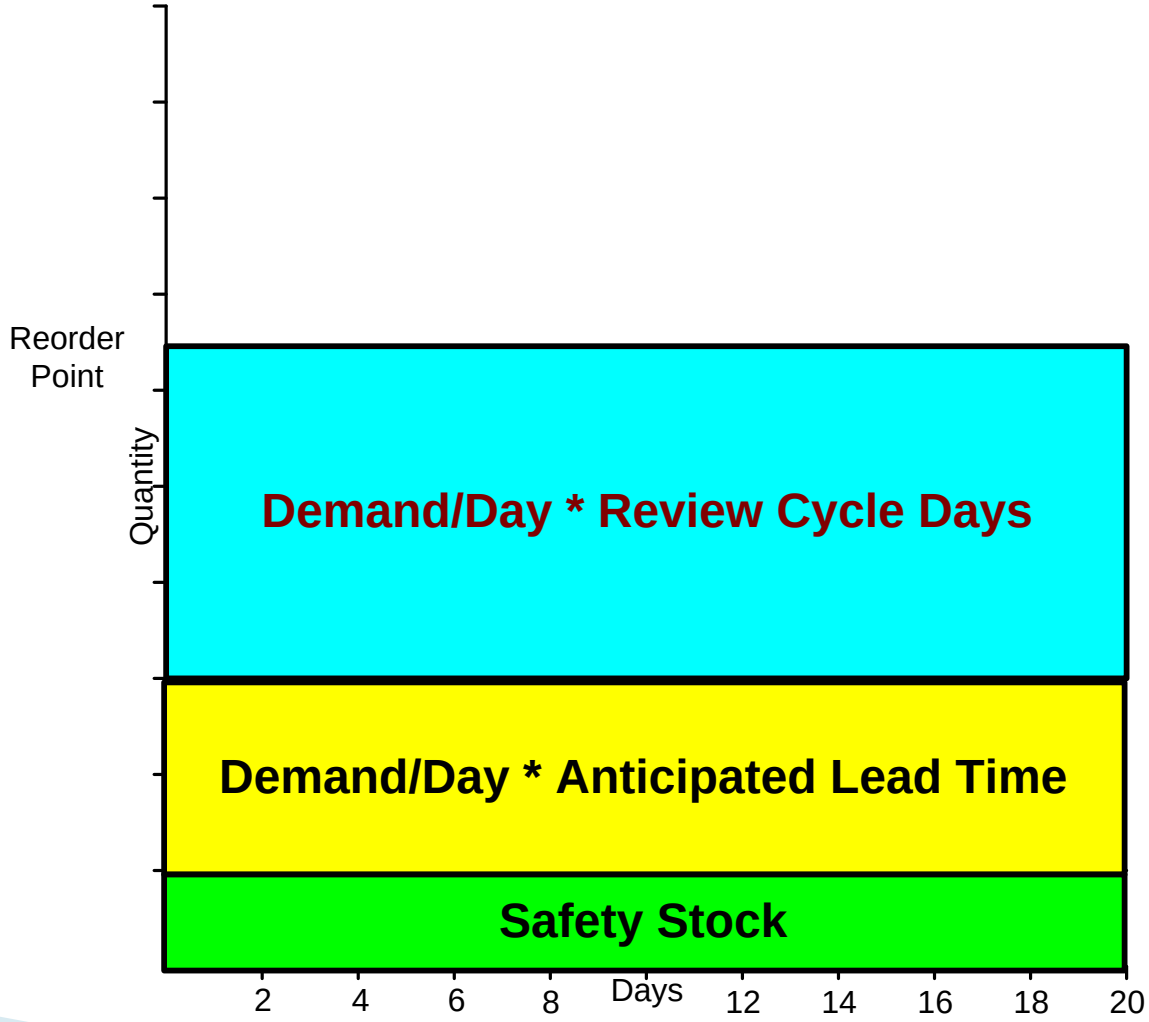
Safety Stock +

(Demand Forecast/Day * Anticipated Lead Time) +

(Demand Forecast /Day * Review Cycle Days)

A product should be reordered when its net stock position (On Hand – Current Committed + On Current Replenishment Order) falls below its reorder point

Reorder Point



Average Lead Time

- Average the actual lead times from the last "x" stock receipts (suggest two)
- Can disqualify the lead time from individual stock receipts in header record
- Purchase orders on scheduled releases are not included in the calculation

Idea – Utilize override lead times for primary vendors based on the longest normally anticipated lead time

P21's Published Lead Time

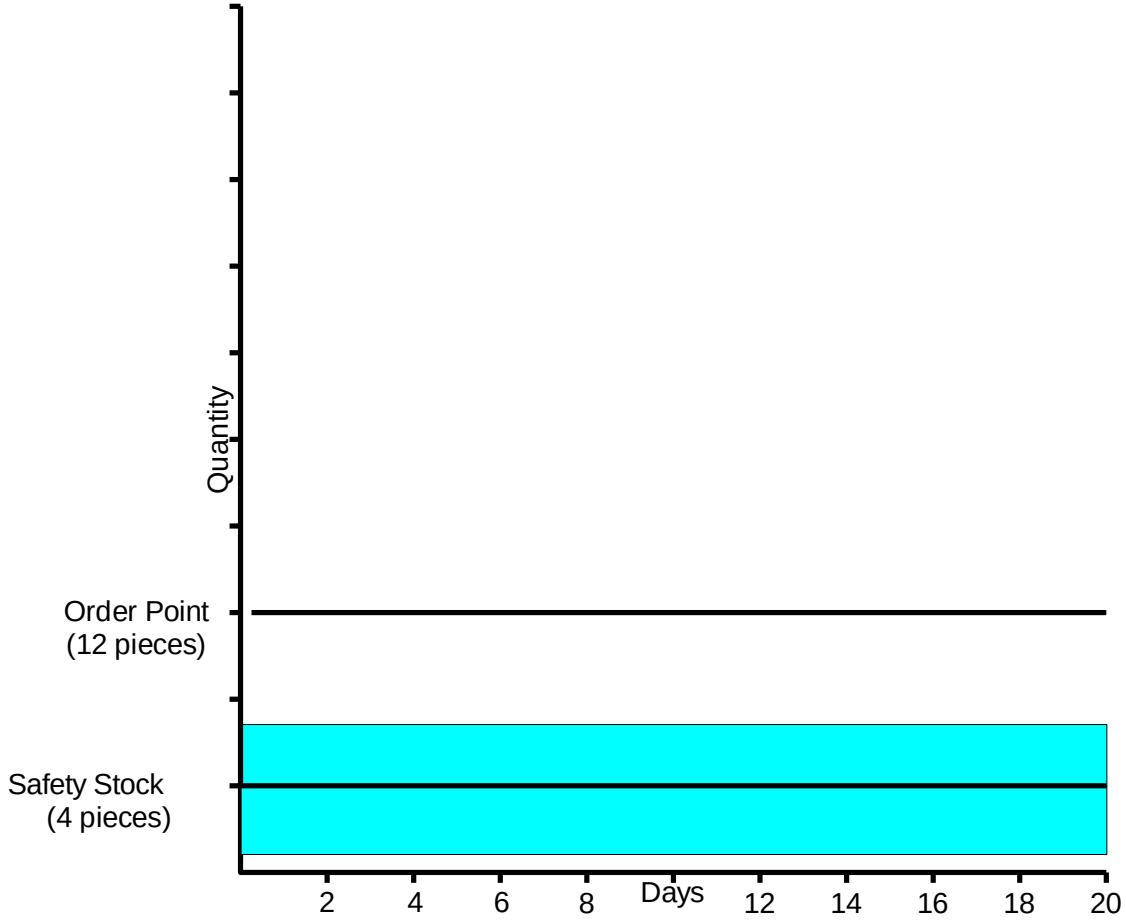
- Available in release 2019.2 users can now manually maintain anticipated lead times by location/item
- An inquiry is available to report to buyers if the lead time associated with the most recent stock receipt is greater than "x%" of less than "y" of the existing lead time for a location/item

Safety Stock

Order Point =
(Demand/Day x Anticipated Lead Time)
+ **Safety Stock**

Safety stock provides protection against running out of stock during the time it takes to replenish inventory

Safety Stock, On Average Doesn't Turnover



Items That Require More Safety Stock

- "Painful Backorder" – items (1/2% – 11/2%) of the products you stock
- Products with erratic usage
- Products with erratic lead times
- High profit items
- Stock reserved for a specific customer

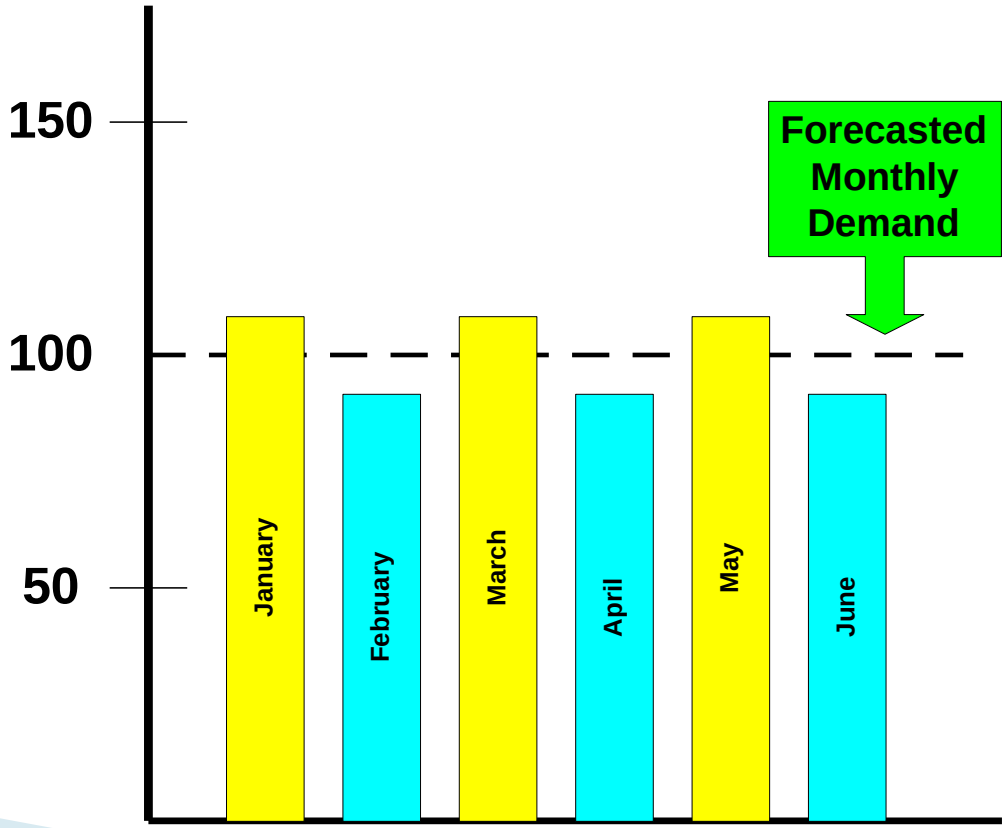
Items That Require Less Safety Stock

- Items with very consistent usage and lead times
- Products with a large number of “hits”
- Low usage items, especially very expensive low usage items

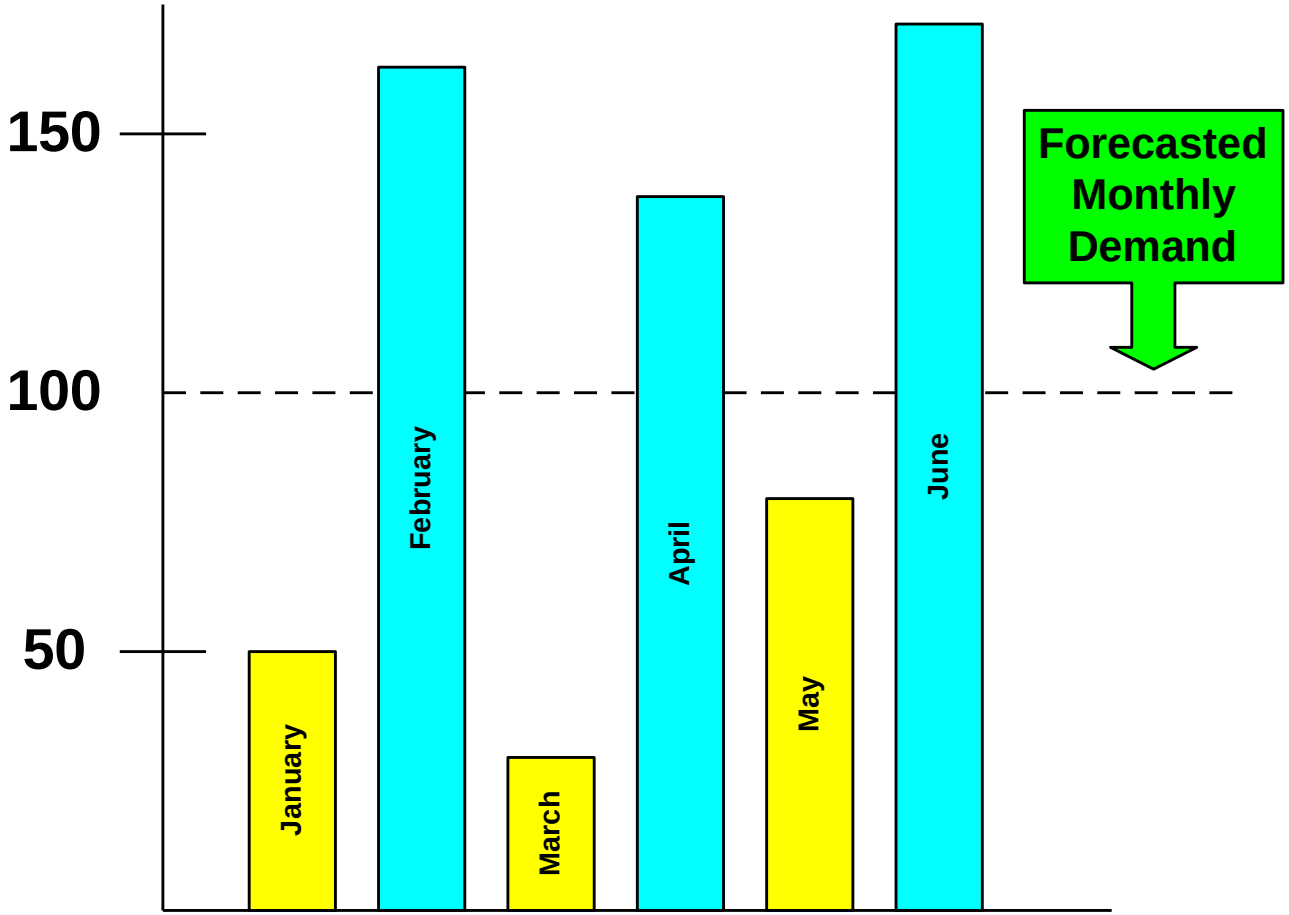
Safety Stock as a Number of Days Supply

- Demand/Day = 3 pieces
- Number of days supply to maintain as safety stock = 10 days
- Safety stock quantity = 30 pieces

Safety Stock Based on the Deviation Between Demand and Usage



Safety Stock Based on the Avg. Deviation Between Demand and Usage



Based on the Average Deviation Between Demand and Usage

	Forecast	*Usage*	*Deviation*
January	50	60	10
February	76	80	4
March	80	70	-10

Only those months in which usage exceeds demand are included in the calculation

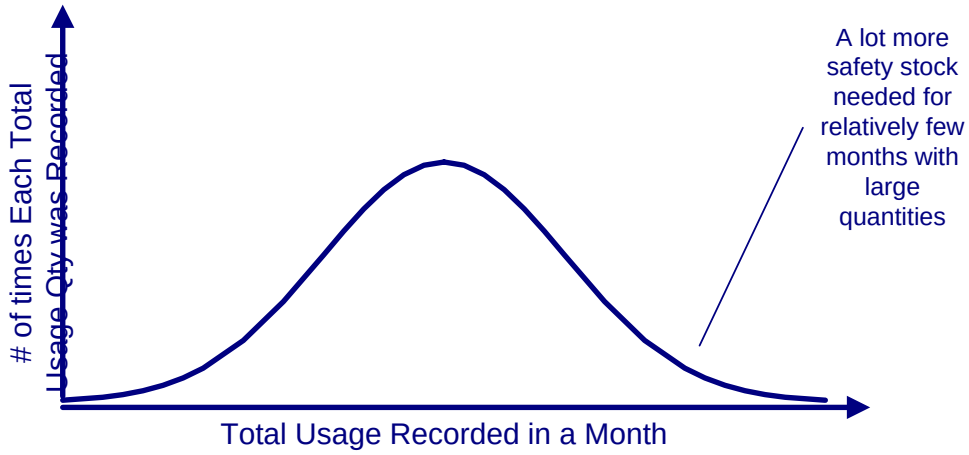
Deviation Periods = 3

Deviation Multiple = 2

(14 ÷ 2) * 2 = 14 pieces

Note that the deviation in P21 is calculated from the time of the implementation of the Advanced Forecasting Module based on both positive and negative deviations!

The Deviation Multiple



Deviation Multiple	Approx Service Lvl
1	65.0%
2	95.0%
3	97.5%
4	98.5%
5	99.0%

Converting Deviation Safety Stock Quantities into a # of Day's Supply

- Take the calculated safety stock quantity and divide it by the forecast/day
- Set minimum and maximum safety stock day's supply for both normal and critical stock items

The Lowest Unit Cost ≠ The Lowest Total Cost

- *"If we buy or build a lot, we will minimize our cost per unit and maximize our profits"*
- The fallacy of "potential profits"
- Profits aren't realized until material is sold to an end user
- Cash and Inventory are not equal assets

A company can lose lots of money by minimizing the cost per unit!

The Total Cost of Inventory

Cost of the Material
+ Cost of Replenishing Inventory
+ Carrying Cost

Total Cost of Inventory

Components of the Cost of Replenishing Inventory

- 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 and processing the vendor's payment
- In manufacturing setup and production scrap factors are part of the cost of replenishing inventory

Cost of Replenishing Inventory ("R" Cost)

Total Annual Cost of Ordering Activities for Stock Products

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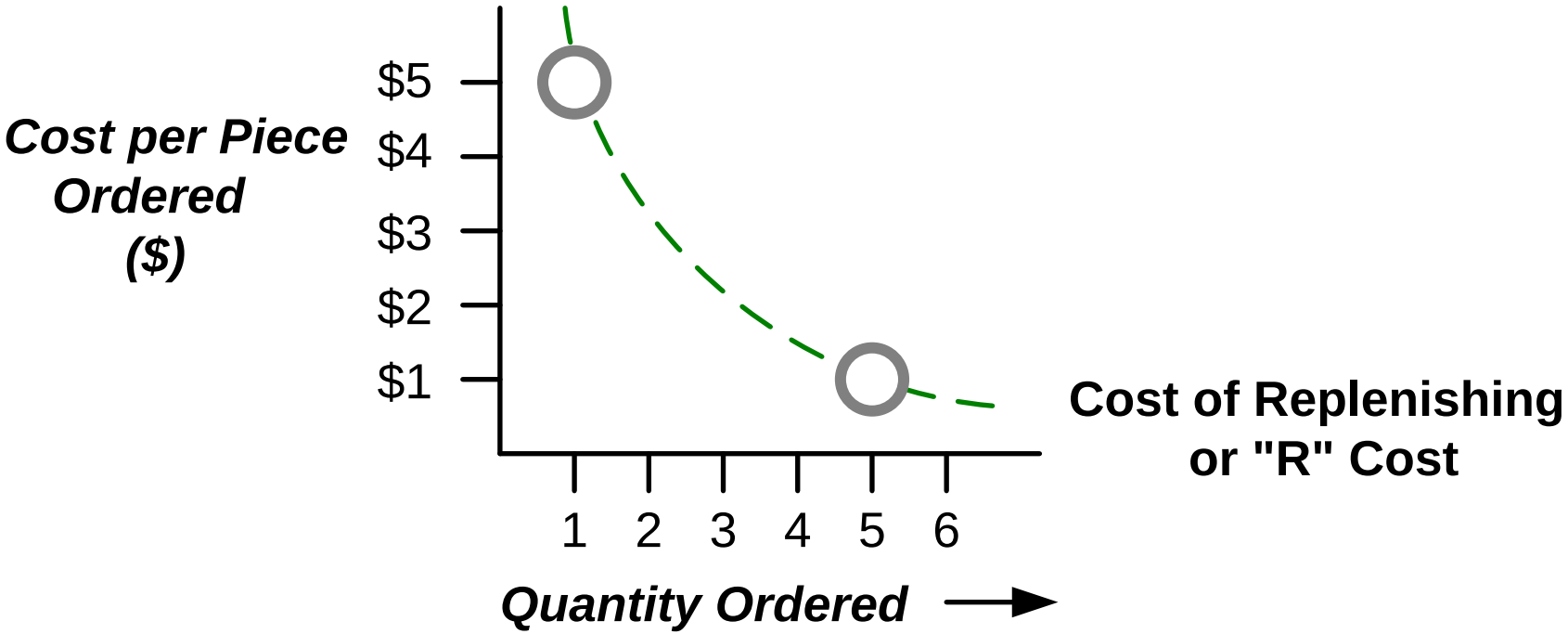
Purchase Order Line Items for Stock Products Issued in the Past 12 Months

Usually $5.00 – $6.00 per line item

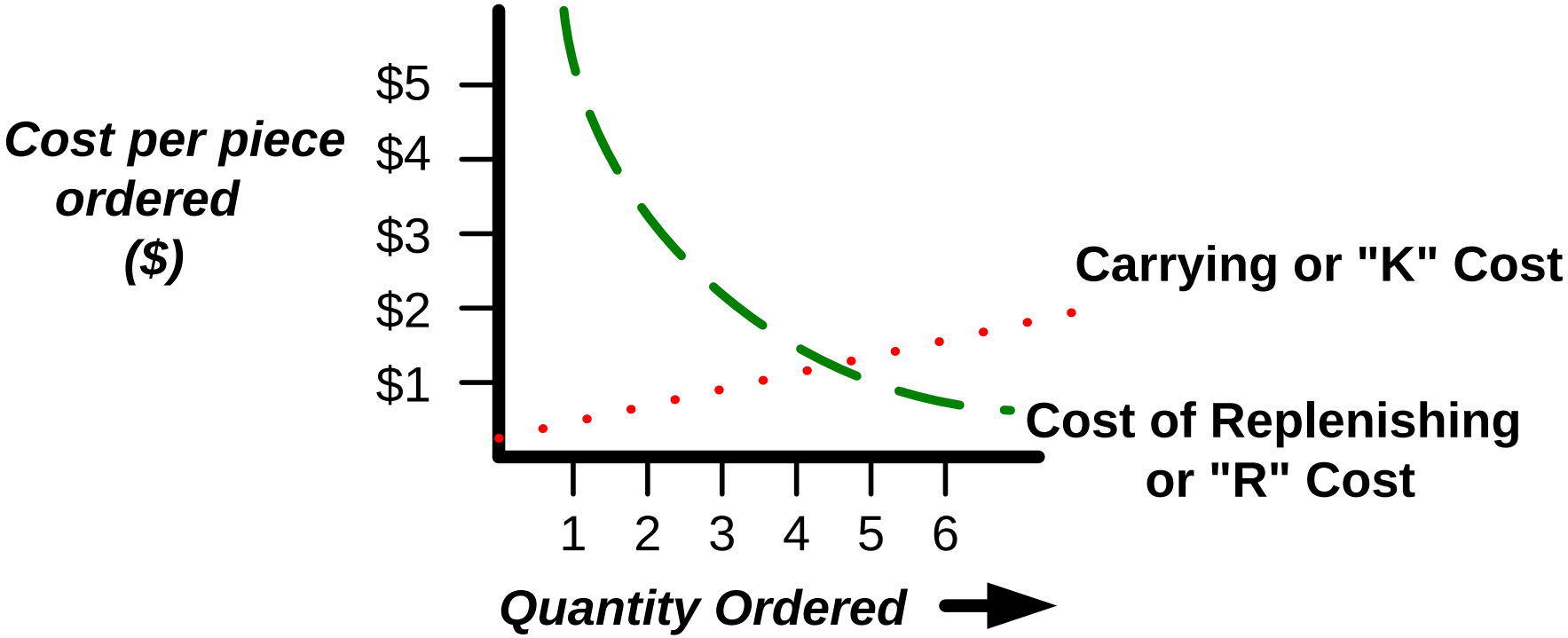
Cost of Replenishing Inventory ("R" Cost)



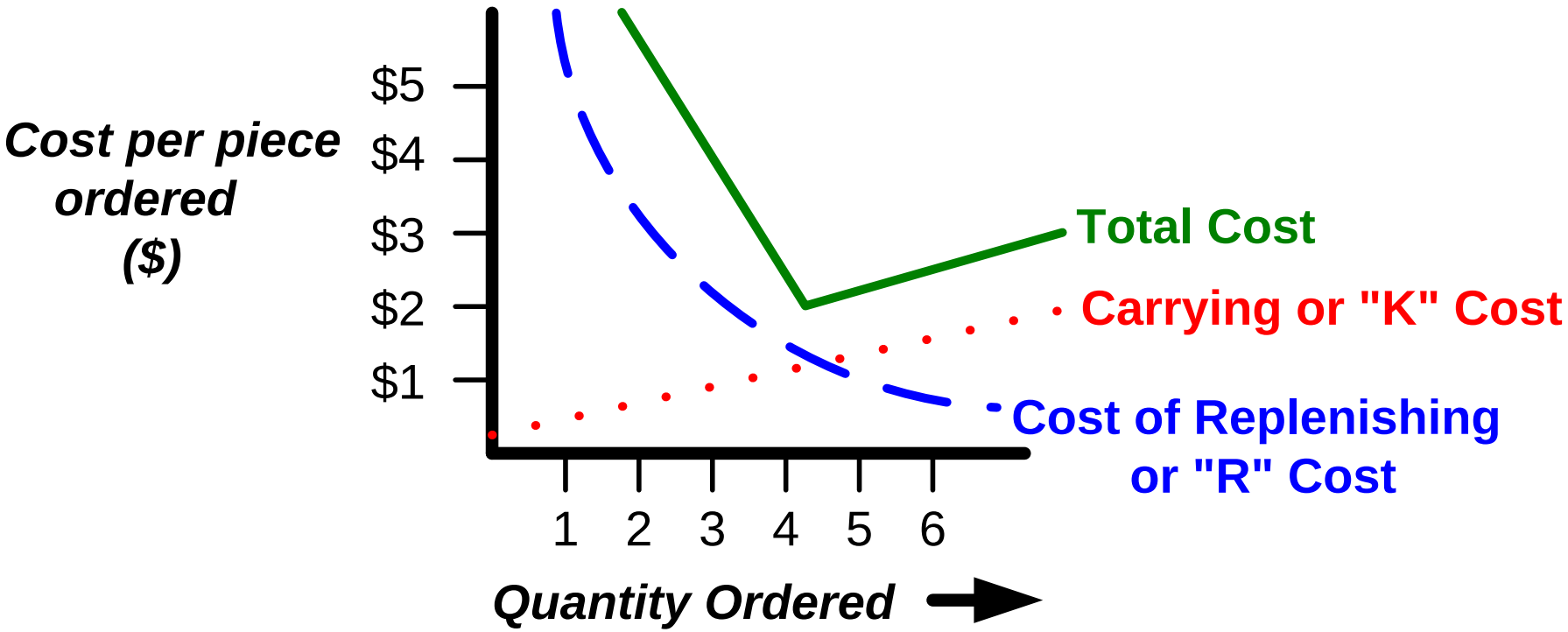
Carrying Cost ("K" Cost)

- Accumulation of all of the costs involved in maintaining inventory in your warehouse
  - Cost of putting away stock receipts and moving material within the warehouse
  - Insurance and other expenses related to maintaining 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

“R” Cost and the “K” Cost



The Total Cost of Inventory



Economic Order Quantity Formula

$$\sqrt{\frac{24 * \text{REPLENISHMENT COST (R)} * \text{MONTHLY DEMAND}}{\text{COST OF CARRYING INVENTORY (K)} * \text{UNIT COST}}}$$

Economic Order Quantity

- Forecast Demand = 25 pieces per month (0.83 pieces/day)
- Unit Cost = $10.00
- "R" Cost = $ 5.00
- "K" Cost = 20%

$$\sqrt{\frac{24 * \$5.00 * 25}{.20 * \$10.00}}$$

$$\sqrt{\frac{3000}{2.0}}$$

$$\sqrt{1{,}500}$$

EOQ = 38.7 (rounded to 39 pieces)

39 Pieces ≈ 47 Day Supply
(39 Pieces ÷ 0.83 Pieces/Day)

Economic Order Quantity

- Forecast Demand = 25 pieces per month
  (0.83 pieces per day)
- Unit Cost = $50.00
- "R" Cost = $ 5.00
- "K" Cost = 20%

$$\sqrt{\frac{24 * \$5.00 * 25}{.20 * \$50.00}}$$

$$\sqrt{\frac{3000}{10}}$$

$$\sqrt{300}$$

EOQ = 17.3 (rounded to 17 pieces)

17 pieces ≈ 20 Day Supply
(17 Pieces ÷ 0.83 Pieces/Day)

Economic Order Quantity

- Forecast Demand = 2500 pieces per month
  (83 Pieces/Day)
- Unit Cost = $ 0.10
- "R" Cost = $5.00
- "K" Cost = 20%

$$\sqrt{\frac{24 * \$5.00 * 2500}{.20 * \$0.10}}$$

$$\sqrt{\frac{300,000}{.02}}$$

$$\sqrt{15,000,000}$$

EOQ = 3,873

3,873 Pieces ≈ 47 Day Supply
(3,873 Pieces ÷ 83 Pieces/Day)

Limits of the EOQ Formula

- Reduce the EOQ to equal “x” percent of the forecast demand of the current period
- Increase the EOQ to equal demand during the order cycle
- Limit the EOQ to half the shelf life of the item
- Limit the EOQ to the available space for the product

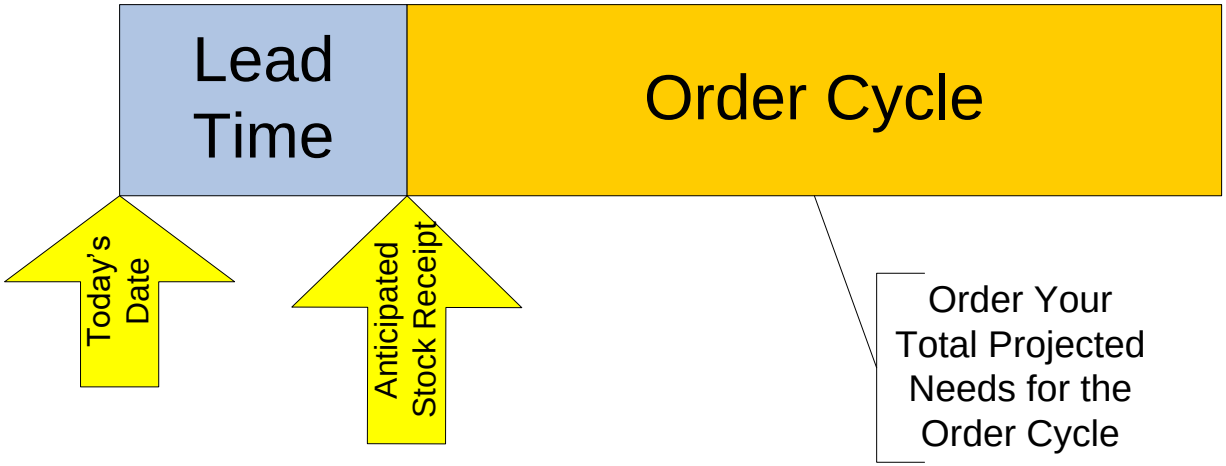
Distribution Requirements Planning (DRP) – Long Lead Times

	Jan	Feb	Mar	Apr
Beg Bal	100	60	30	35
Sch. Receipts	50	0	0	0
Forecast	90	80	95	90
End Bal	60	-20	-65	-55
Safety Stock	23	20	24	23
Stock Position	37	-40	-89	-78
Needed Rcpt		50	100	100
Order (60 Day Lead Time)	100	100		

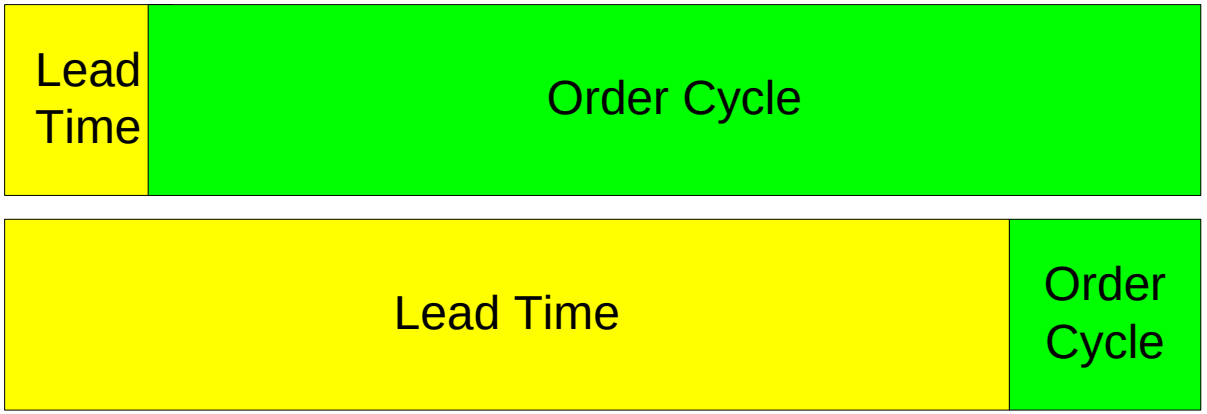
Distribution Requirements Planning (DRP)

- A DRP replenishment order should cover all of your projected needs for a time period starting at today's date plus the lead time *through the following order cycle*

DRP Replenishment Orders



Anticipated Lead Time and the Order Cycle are Independent



Short Lead Time – Long Order Cycle: A truck load of a commodity that you can only order once a month, but is delivered the next day

Long Lead Time – Short Order Cycle: A vendor line that is imported with a 90 day lead time but you can order a container once a week.

It is critical that you have both accurate lead times and order cycles!

When to Utilize a Central Warehouse/Distribution Center

- A vendor has a high target order requirement in relation to the usage at a warehouse
- A vendor's package quantity of a particular item far exceeds a normal customer order quantity
- Many products in a branch location experience sporadic usage
- The cost of moving the products between warehouses is relatively low

Transfer replenishment is commonly referred to as "Hub & Spoke", "Central Warehouse" or "Distribution Center" replenishment

When to Buy Directly from a Vendor

- A vendor has a low target order requirement in relation to the usage at a warehouse
- A vendor's package quantity of a particular item is close to a normal customer order quantity
- Products experience recurring usage in a branch location
- The cost of moving the products between warehouses is relatively high

Buying directly from a vendor is often call "Distributive" replenishment

Branch Replenishment: Transfer or Buy from Vendor?

- Potential Turnover of an Item:

  $$\frac{\text{Anticipated Annual Usage}}{\text{Vendor Package Quantity}}$$

- Group "A" items – Products with a potential turnover $\geq$ ½ half the target turnover of the branch warehouse

- Group "B" items – Products with a potential turnover $<$ half the target turnover of the branch warehouse

Branch Replenishment: Transfer or Buy from Vendor?

- Group “B” Items – Always replenished with by transfer from a central warehouse or distribution center

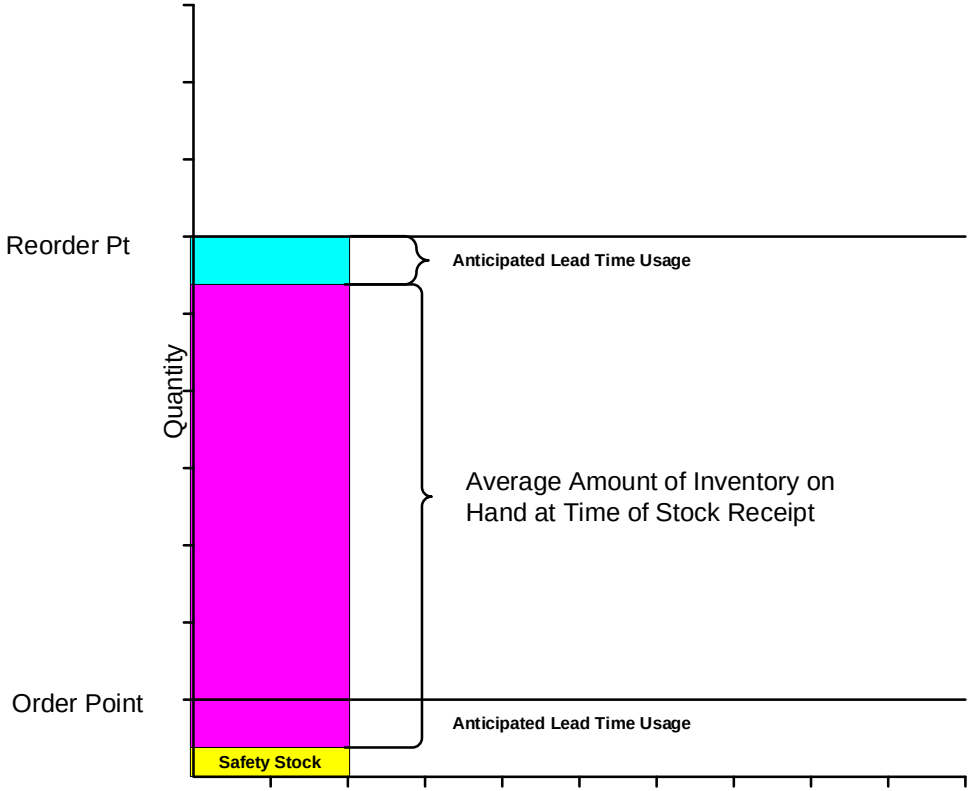
- Group “A” Items – Replenished with a purchase order if the vendor’s target order requirement can be met at least once a month. Otherwise group “A” items will also be replenished with a transfer from a central warehouse

Calculating Your Ideal Inventory Investment

- Sporadic Usage: If an item is maintained with a target stock level. Greater of:
  - Maximum Quantity * Unit Cost
  - (Minimum + Vendor Package) * Unit Cost
- Recurring Usage: If an item is maintained with an order point, line point & EOQ:
  - [(Reorder Point – Lead Time Usage) + Safety Stock ÷ 2] + (SOQ Rounded Up to the Next Vendor Pkg ÷ 2)] * Unit Cost

SOQ is the EOQ adjusted for Limits

Average Inventory of an Item with Recurring Usage on Receipt



Core versus Speculative Inventory

- Core inventory is what you need to meet your desired level of customer service
- Speculative inventory is additional inventory you buy to increase your profitability
  - Special buys
  - Buying before a price increase
  - New products requested by salespeople or customers

There are many opportunities to invest in speculative inventory. Consider a total inventory budget and a minimum anticipated return on speculative purchases

What is a Benchmark?

- A comparison of your company's performance to a standard in order to determine how well you are meeting the goals of effective inventory management
- Compare your company's results to your past performance, not industry standards

Customer Service Level

How often you have the items you've committed to stock, when your customers want them

Customer Service Level

Number of Line Items for Stocked Products Shipped Complete by the Promise Date

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Total Number of Line Items For Stocked Products Ordered

Customer Service Level

- Keys to proper measurement:
  - Stock items only
  - Line items (not pieces) shipped complete by the promise date
  - Initial shipments only – not backorders
  - Accurately recording the promise date

Service Level vs. Fill Rate

Item Type	*Item #*	*Ordered*	*Shipped*
Stock	B230	10	10
Stock	D348	100	95

- Second item:
  - 95% Fill Rate
  - 0% Customer Service Level

Typical Customer Service Goals

- Normal Stock Items – 95%
- Critical Stock Items – 98% – 99%

Inventory Turnover

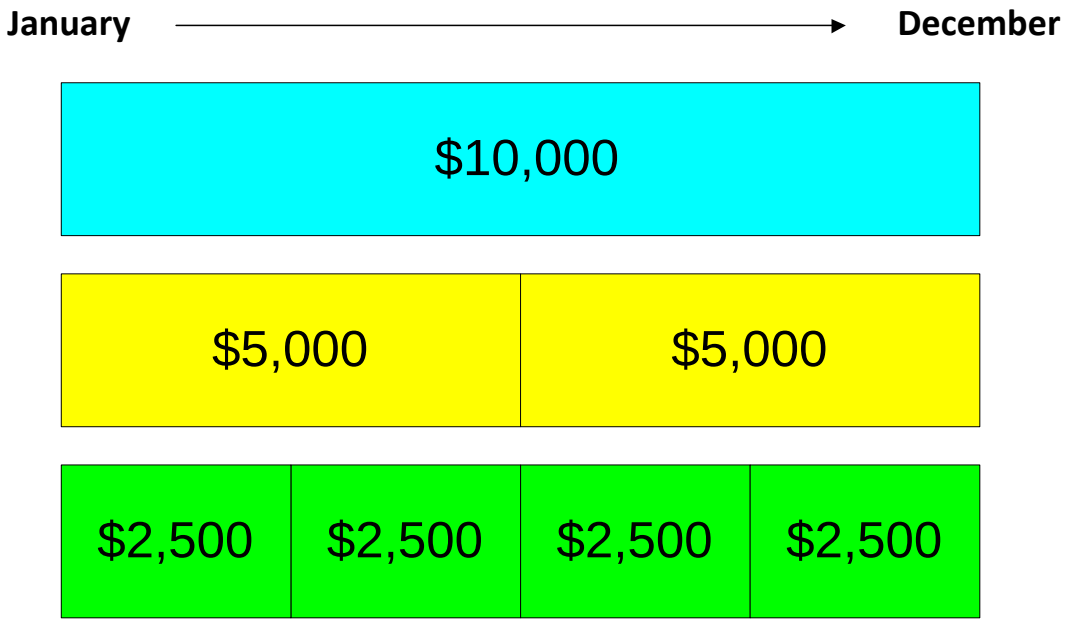
The number of times you sell or "turnover" your average investment in inventory each year

Every time you sell from inventory, you have the opportunity to earn a profit. The more you "turn" your inventory, the more opportunities you have to earn profits

Explaining the Importance of Inventory Turnover

Annual Sales = $12,500 **Annual COGS = $10,000**

Annual Gross Profit = $2,500



Inventory Turnover

Cost of Goods Sold From Stock Sales in the Past 12 Months

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Average Inventory Value

Cost of Goods Sold

- Use a “rolling 12 months”
- Measure cost of goods sold dollars
  - Not sales dollars
  - Not projected future usage times cost
- Exclude special order items and direct shipments

Average Inventory Value

- Average of the month end inventory values recorded over the past 12 months
- Average inventory value at the beginning of October 2019 = $1,976,667

Month	Ending Invty$
Sep-19	$2,000,000
Aug-19	$1,850,000
Jul-19	$1,700,000
Jun-19	$1,650,000
May-19	$1,600,000
Apr-19	$1,800,000
Mar-19	$1,950,000
Feb-19	$2,100,000
Jan-19	$2,250,000
Dec-18	$2,420,000
Nov-18	$2,300,000
Oct-18	$2,100,000

Turn/Earn Index

- Combines inventory turnover with gross margins
  - High margins can compensate for low turns
  - Multiply inventory turnover by the gross margin

Inventory Turnover * Gross Margin Percentage

Gross Margin Return on Investment (GMROI)

Annual Gross Profit Dollars

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Average Inventory Investment

Turn/Earn vs. GMROI

- Annual Sales = $2,000
- Annual COGS = $1,500
- Avg Invty = $250
- Turn/Earn =
  - [($2,000 – $1,500)/$2,000] * ($1,500/$250) = 150
- GMROI =
  - [($2,000 – $1,500)/$ 250] = 200

Turn/Earn and GMROI Goals

- Upper 50%
  - Turn/Earn Index of 120 or a GMROI of 150
- Upper 25%
  - Turn/Earn Index of 150 or a GMROI of 200
- Upper 10%
  - Turn/Earn Index of 180 of a GMROI of 223

Percentage of Excess Inventory

$$\frac{\text{Amount of Inventory in Excess of “x” Months Usage}}{\text{Average Inventory Investment}}$$

Usually no more than 5% to 10% of your inventory investment should be in excess of a one year supply.

Liquidating Stuff and Excess Inventory

- Stuff – Any inventory that is not included on the location's approved stock list
- Excess Inventory – Any portion of the available quantity of a stock item in excess of "x" months usage, the target stock level, the maximum, or the "fill up to" quantity

Liquidating Stuff and Excess Inventory

- A report should list items in descending order based on the value of the value eligible to be liquidated.
- Remember that inventory is a sunk expense. It is not worth what you paid for it, it is worth what someone is willing to pay you for it.
- "Don't get emotional about stock, it clouds your judgment" (Michael Douglas' character Gordon Gecko in the movie *Wall Street*)

The Liquidation of Unwanted Inventory

- Transfer excess stock to another company location where the inventory is needed
- Reduce the price
- Offer salespeople a “spif” to sell the product
- Advertise the availability of this material to other suppliers
- Substitute the product for a less expensive item
- Return the material to the vendor
- Donate the material to a non-profit organization
- Throw it away

Transfer Inventory to Where it is Needed

Unwanted Stock				Branches That Carry the Product with Current Forecast (Green) - Also Discontinuing (Red) - Never Stocked (White)							
Whse	Product #	On Hand Qty	Invty $	01	03	04	15	41	42	43	44
41	Prod-1079	1000	$144.52				2500				
41	Prod-1027	4250	$134.95	750	6000		750				100
41	Prod-1025	225	$133.20	110		8	56				12
41	Prod-1036	1500	$128.49	1125					666		
41	Prod-1073	1750	$120.85	4500	500				1500		
41	Prod-1111	3000	$116.09	1500							
41	Prod-1052	5500	$112.48	19500	1000		10500				
41	Prod-997	4000	$110.78	15000			12000		4000		
41	Prod-1048	29	$98.60								
41	Prod-1074	4000	$98.40				3000				
41	Prod-1075	4500	$98.28								
41	Prod-1086	500	$89.50	6000			4500				
41	Prod-1059	2500	$87.65	3999	1000						100
41	Prod-1070	1500	$84.23				1125				
41	Prod-1087	800	$82.69	8400		400	1401		800	800	20
41	Prod-1117	4	$80.32						3	2	

Your Implementation Plan

- Inventory Management:
  - Assign an individual the responsibility of replenishing product line(s) throughout your organization or a region
  - Establish a single path of replenishment for each item in each warehouse
  - Separate Items with Sporadic and Recurring Usage
  - Set target stock levels for sporadic items

Your Implementation Plan

- Work with one product or vendor line at a time
- Review and adjust for possible unusual usage
- Set replenishment parameters for items with recurring usage
  - Forecast
    - What is your current forecast error?
    - Are you considering all applicable elements for an accurate forecast?
  - Anticipated Lead Time
  - Safety Stock Quantities
  - Review Cycles
  - Reorder Quantities

Your Implementation Plan

- Begin to replenish the product line using new methods, procedures and tools
- When you are satisfied with your progress implement another product line

Your Implementation Plan

- Implement metrics to measure progress towards achieving your goals
  - Customer Service Level
  - Turnover
  - Turn Earn Index or GMROI
  - Adjusted Margin
  - Percentage of Excess Inventory

The Goal of Effective Inventory Management

*"Effective Inventory Management (**EIM**) enables an organization to meet or exceed customers' expectations of product availability with the amount of each item that will maximize net profits or minimize its total inventory investment."*

If you have questions…..

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