SAP Solution Extension
SAP Enterprise Inventory Optimization (EIO) by SmartOps

Multistage Inventory Optimization, Supply Chain “Intuition Building”
June, 2011
Introductions

**SmartOps**
Leon Dixon, Training Manager
Seven Muda, or “Seven Deadly Sins in Lean”

1. Defects / Quality
2. Transportation
3. Motion
4. Waiting
5. Overproduction
6. Over Processing
7. Inventory
Which Muda is NOT actually a “deadly sin”?

10% 1. Defects / Quality

24% 2. Transportation

29% 3. Motion

10% 4. Waiting

0% 5. Overproduction

0% 6. Over Processing

29% Inventory
Seven Muda, or “Seven Deadly Sins in Lean”

1. Defects / Quality
2. Transportation
3. Motion
4. Waiting
5. Overproduction
6. Over Processing
7. Inventory

- Strategic Decisions
- Tactical Choices
- Risk and Uncertainty
Enterprise Inventory Optimization

**Inventory** is the consequence of many different strategic and tactical choices across the organization

**Inventory Optimization** is the science of making these choices more rational, more profitable, and automatic

**Enterprise Inventory Optimization** is the encapsulation of these algorithms into software that integrates into planning systems and handles large-scale, complex supply chains
Instead of this…
Supply Chain Complexity has Exploded

You have this...

Increasingly complex supply chains are the price of admission in today’s global market
However, the unforgiving arithmetic is the same

Customer Pressures
- Too little inventory frustrates customers

Financial Pressures
- Too much inventory frustrates finance

Internal Pressures
- Right item in the wrong place frustrates everyone

Executives who master their supply chain complexity will prosper... Those who don’t will fail
Even for one site...
…things rarely go exactly as expected on the demand side

**Demand Factors**
- Simultaneous internal and external demand
- Forecast error
- Seasonal, time-varying
- Intermittent demand
- Over- and under- forecasting
- Outliers
...nor do things go exactly as expected on the supply side

**Supply Factors**

- Batch size requirements
- Lead time uncertainty
- Schedule attainment
- Reliability
- Supply quantity limitations
- Frozen forecast windows
- Multiple supply sources
- Seasonal supply sources
Now take all those uncertainties…
...and multiply!

Inventory decisions at every point in the enterprise-wide supply chain are linked.

Traditional systems ignore this complexity.
Oversimplified planning wastes resources and puts your business at risk

Oversimplified Supply Chain Planning

- Single-Stage Logic
- Insufficient Granularity
- Ignore Variability
- Infrequent Updates
- Improperly Characterize Uncertainty
- Constant Inventory Targets
- Simplified Data Models

If supply chain complexity and uncertainty are not addressed, your business will over-buffer inventories and miss sales

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Session Goals

Learning experience

• Understand SmartOps approach to EIO
• Quantify benefit of simultaneous multistage inventory optimization
• Build intuition on impact of key drivers on inventory targets
• Discuss SmartOps best practice recommendations on measuring and managing uncertainty
Agenda

Introduction

Heads-On Training

- Multistage Concepts
- Fundamentals and Uncertainty
- Demand Uncertainty
- Supply Uncertainty
- Key Inventory Factors

Review
Agenda

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Review
Inventory Optimization

Inventory Optimization is the science of calculating inventory targets
• to meet desired service goals
• at the lowest total inventory cost possible
• across the entire supply chain

Inventory Optimization is an essential step in Supply Chain Planning
• Targets are calculated at the item-location-period granularity
• Inventory targets fill the gap between planning and execution by providing planning parameters for APS systems
Inventory Components

**Cycle Stock**
Needed to meet current demand until the next order can be placed

**Pipeline Stock**
Needed to meet *future* demand until the next order can be received

**Pre-build Stock**
Needed to anticipate demand peaks greater than capacity

**Minimum Required Stock**
Needed to satisfy strategic marketing or merchandising requirements

**Safety Stock**
Needed to hedge against risk and uncertainty
Business Problem 1

What is the value of simultaneous multi-stage optimization?
Safety stock ($) savings
Total inventory ($) savings

What is the change in the safety stock targets at the item-location-time granularity?

Single Stage Calculations:
Isolated planning results in over-buffering of inventory across the supply chain
Determining postponement strategy is challenging (To stock at upstream or downstream warehouse)

Multistage Optimization:
Coordinated planning eliminates over-buffering of inventory and ensures services objectives are met
So, remember this guy?

**Single-stage supply chain, multiple Demand and Supply uncertainties.**
Tandem or Series Supply Chain

- Simplest model
- Node vs Stocking Point
- Single vs Multi-Stage (Echelon)
- Upstream vs Downstream
- “Pull” and demand propagation

- Calculation (single stage)
- Optimization (multi stage)
Multi-Stage Dilemma

Customer-facing (CF) node satisfying external demand
- Service Level is 95% (NSP)
- Forecasts are moderately good

Internal warehouse (WH) staging inventory
- Holding cost is half as expensive as CF

How should we allocate safety stock buffers across the stages?

Demand = 100 +/- 50
Multi-Stage Dilemma

Customer-facing (CF) node satisfying external demand

- Service Level is 95% (NSP)
- Forecasts are moderately good

Internal warehouse (WH) staging inventory

- Holding cost is half as expensive as CF

How should we allocate safety stock buffers across the stages?

1. As much as possible to WH
2. Shared, more to WH
3. Shared, more to CF
4. As much as possible to CF
5. I have no earthly idea

\[
\text{Demand} = 100 \pm 50
\]
Multi-Stage Dilemma

Customer-facing (CF) node satisfying external demand
- Service Level is 95% (NSP)
- Forecasts are moderately good

Internal warehouse (WH) staging inventory
- Holding cost is half as expensive as CF

How should we allocate safety stock buffers across the stages?

Different stages should optimally share the risk
- Propagate demand from downstream to upstream
- Model the impact of internal service level (ISL) decision of the upstream stage at the downstream stage

Demand = 100 +/- 50
Capturing Interactions Between Stages

In multi-stage supply chains, stages are all linked together.

Upstream service level problems make it more difficult to meet service level downstream.

Orders placed by the customer-facing node create demand for product upstream.

Multi-stage models allow the internal service level of the upstream stage to be modeled at the downstream stage and ensure that service level targets are met.
**Multi-stage Example**

### Two Single Stages

- **LT=2**
- **PBR=1**
- **SS= 267 units**
  - ISL=99.9%
  - Cost=$267
- **LT=1**
- **PBR=1**
- **SS= 0 units**
  - ISL = 50%
  - Cost=$0

### Cooperative Multi Stage

- **LT=1**
- **PBR=1**
- **Decrease of 156 units**
- **SS= 111 units**
  - ISL=90%
  - Cost=$111
- **Variability from Internal Service Level Causes Shortages of 4 +/- 16 units**
- **Increase of 8 units**
- **SS= 124 units**
  - Cost=$248

### Ultra Lean WH Node

- **LT=1**
- **PBR=1**
- **Decrease of 111 units**
- **SS= 0 units**
  - ISL = 50%
  - Cost=$0
- **Variability from Internal Service Level Causes Shortages of 34 +/- 50 units**
- **Increase of 54 units**
- **SS= 178 units**
  - Cost=$356

**Total Cost**

- **Total Cost = $499**
- **Decrease of $140**
- **Total Cost = $359**
- **Decrease of $3**
- **Total Cost = $356**

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Two-Stage Example: Internal Service Level Impact on Safety Stock Costs

Optimal ISL = 0.72
Example: Optimal

**ISL=99.9%**

- **LT=2**
- **PBR=1**

**WH**

- SS= 267 units
- Cost=$267

**CF**

- SS= 116 units
- Cost=$232

**Total Cost = $499**

**Optimal ISL=72%**

- **PBR=1**

**WH**

- SS= 50 units
- Cost=$50

**CF**

- SS= 144 units
- Cost=$288

**Variability from Internal Service Level Causes Shortages of 15 +/- 33 units**

- Increase of 28 units

**Total Cost = $338**

- Decrease of 217 units

- Decrease of $161

**Demand = 100 +/- 50**
Multi-Stage Logic for Complex Supply Chains

Simple search works well for simple supply chains

For complex supply chains, complete enumeration of all possible combinations is simply not practical

Simultaneously searching for all optimal internal service levels requires refined optimization mechanisms

SmartOps tools embed and employ fast and sophisticated optimization techniques
Internal Service Level Optimization

SAP EIO by SmartOps uses Multi-stage logic to evaluate the inventory cost of different internal level service combinations.

Proprietary algorithms to search through the possible internal service levels for the calculated combination resulting in the lowest inventory cost.

![Graph showing the relationship between different internal service level combinations and the total safety stock holding cost.](image-url)
Multi stage in the EIO by SmartOps Solution

Muesli (cereal) supply chain:

Input ISL vs. ISL being calculated using EIO by SmartOps?

Single Stage Calculations:
Isolated planning results in over-buffering of inventory across the supply chain
Determining postponement strategy is challenging (To stock at upstream or downstream warehouse)

Multistage Optimization:
Coordinated planning eliminates over-buffering of inventory and ensures services objectives are met
Muesli Supply Chain: Key Inputs

1. Customer service level targets
2. Replenishment lead times
3. Periods Between Review (PBR)
4. Forecasts and forecast error

What is the service level requirement at the raw materials level?
Current base case: Perfect service (99.9%) requirement for the raw materials
Muesli Supply Chain Inventory Representation

Inventory model representation of Blueberries Cereal network
Agenda

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Review
Classical Formula For Computing Safety Stock

- Planning for one product/one location/one period with instantaneous lead time, and the only uncertainty in the Supply Chain is Demand Uncertainty
- Forecast: 100 +/- 25, Forecast Error Distribution: Normal
- Service Level Target: 95% Non-stockout probability
- Classical Formula: Safety stock = z (95%) * σ = 1.64 * 25 = 41
- Target Inventory Position = 141 units, Safety Stock = 41 units

Filled area represents 95% of total

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Computing Safety Stock With Gamma Distribution

Planning for one product/one location/one period with instantaneous lead time, and the only uncertainty in the supply chain is demand uncertainty.
Forecast: 100 +/- 25, Forecast Error Distribution: Gamma
Service Level Target: 95% Non-stockout probability
Calculating the right safety stock requires the numerical integration of the Gamma cumulative distribution function.
Target Inventory Position = 145 units, Safety Stock = 45 units

Filled area represents 95% of total.

Cycle Stock  Safety Stock

145 units
Inventory Cost and Carrying Cost Fundamentals

Inventory Cost:
What does that Inventory cost?
How is that cost carried?
Are Standard Costs used?

Inventory Carrying Cost
• Capital or Financial costs: Working Capital
• Non-Capital, or Operational costs
• Taxes and other interesting ramifications

Cost of Capital
Operational Costs
Considering Tax Effects
Non-Capital Inventory Carrying Costs

In addition to Capital costs, inventory incurs before-tax Operational costs. These may be readily available given the component-level data, but are rarely as well considered as the cost of capital!

- Storage and Warehousing costs (direct fees)
- Risk costs: Obsolescence, Pilferage, Shrinkage, Damage
- Insurance, other Taxes
- Administrative and Other

Non-capital carrying costs can range from 5 to 30+% of the cost of inventory, on top of the capital invested in the inventory itself!!
Inventory Carrying Cost: Good, Better, and Best Practices

**Good practice**: Carry Inventory at WACC

**Better practice**: Carry inventory at WACC + Average Operational Costs

**Detailed practice**: Use WACC + Operational Costs by Item and Location
  + Considers very real differences between items and locations
  + Allocates costs “fairly”, depending on level of data available
  - Requires research, calculation, maintenance

SAP EIO by SmartOps supports WACC, WACC+, and Item-Location Specific Inventory Carrying Costs
At what rate is your inventory carried on your books?

38%  1. I don’t know my inventory carrying costs
44%  2. We carry at standard rates
13%  3. WACC
6%   4. WACC+ by location
0%   5. Use item-location specific costing
At what rate is your inventory carried on your books?

<table>
<thead>
<tr>
<th>Rate</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5% - 7%</td>
<td>33%</td>
</tr>
<tr>
<td>7% - 9%</td>
<td>17%</td>
</tr>
<tr>
<td>10% - 13%</td>
<td>50%</td>
</tr>
<tr>
<td>14% - 17%</td>
<td>0%</td>
</tr>
<tr>
<td>20% - 25%</td>
<td>0%</td>
</tr>
<tr>
<td>25% or higher</td>
<td>0%</td>
</tr>
</tbody>
</table>
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Review
The Necessity of Comparing Forecasts to Actuals

Forecast error is the difference between forecast and actual sales
Random variable since both forecasts and actuals vary with time

Finding best fit for historical sales ignores existing time-varying forecasts
Substitutes forecast error by demand variability
Disconnects planning from execution

Demand Variability CV = 1.05
Forecast Error CV = 0.32
Accurately quantify demand uncertainty, forecast accuracy and bias with Demand Intelligence.

Frequent Demand

Intermittent Demand

Seasonal Demand

Missing Data

Outlier Detection

Forecast Bias

Legend

= Actual sales  = Demand forecast

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Demand Analytics Dashboard

Demand Analytics

Forecast Error
- Average CV: 0.95
- Distribution of Demand Streams:
  - CV < 0.25
  - 0.25-0.50
  - 0.50-0.75
  - 0.75-1.00
  - 1.00-1.25
  - 1.25-1.50
  - 1.50-1.75
  - 1.75-2.00
  - 2.00-2.25
  - 2.25-2.50
  - 2.50-2.75
  - 2.75-3.00
  - > 3

Bias
- Biased Demand Streams:
  - Negative: 47%
  - None: 20%
  - Positive: 3%

Intermittency
- Intermittency:
  - AD1: 13%
  - AD2: 20%
  - AD3: 10%
  - AD4: 15%
  - AD5: 5%
  - 6+:
  - N/A:

Demand Summary Report
- Total # of Demand Streams: 128

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Review
**Should lead time impact target safety stock?**

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>59%</td>
<td>1. Yes</td>
</tr>
<tr>
<td>18%</td>
<td>2. No</td>
</tr>
<tr>
<td>0%</td>
<td>3. Depends on Lead Time</td>
</tr>
<tr>
<td>24%</td>
<td>4. Depends on Supply Chain configuration</td>
</tr>
<tr>
<td>0%</td>
<td>5. Depends on INCO terms (who owns inventory after shipment)</td>
</tr>
</tbody>
</table>
Should Lead Time Impact Target Safety Stock?

- Order placed in current period 1 arrives at start of period 3
- The next shipment doesn’t arrive until the start of period 4
- Period 3 is “Most-at-Risk” of stocking out
- Exposure period = PBR + LT
- Most-at-Risk periods = PBR + LT – 1 (+ corresponding review period)
Lead Time Variability

Safety stock are often required to hedge against uncertainty in delivery and manufacturing lead times

Lead time variability (standard deviation around the mean)

*Should* capture variations in lead times due to natural, external forces

*Should not* include the effects of expediting and advance order placements (we don’t plan to expedite)

*Should not* include effects of upstream material unavailability (that’s a different measurement)

Algorithm handling Lead Time Variability is based on internal research and is proprietary to SmartOps
# Lead Time Variability

**Example**

\[ LT \sim N(\text{Mean}, \text{Std Dev}) \]

\[ D = 100 \pm 50 \]

### NSP = 95%

<table>
<thead>
<tr>
<th></th>
<th>Case 1: No Lead Time Variability</th>
<th>Case 2: Lead Time Uncertainty Modeled as Worst Case</th>
<th>Case 3: Moderate Lead Time Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT Mean</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>LT Std Dev.</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
</tr>
<tr>
<td>LT Dist.</td>
<td><img src="#" alt="Bar Graph" /></td>
<td><img src="#" alt="Bar Graph" /></td>
<td><img src="#" alt="Distribution" /></td>
</tr>
<tr>
<td>Cycle Stock</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Pipeline Stock</td>
<td>100</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>Safety Stock</td>
<td>116</td>
<td>142</td>
<td>137</td>
</tr>
<tr>
<td>TIP</td>
<td>316</td>
<td>442</td>
<td>337</td>
</tr>
</tbody>
</table>
Schedule Attainment

Schedule Attainment / Adherence is modeled as a stochastic input

Has variability around the mean quantity loss percentage

Quantity Loss Percentage Mean

The average percentage loss in quantity produced / ordered compared to scheduled production / order quantity

Quantity Loss Percentage Coefficient of Variation

Measure of variability around the Loss Percentage Mean

Standard deviation = Mean * CV

SA Loss = 10% +/- 3%
PBR = 1
SL = 95%
NSP

Demand = 100 +/- 50
Schedule Attainment Example

\[ SA \sim N(\text{Mean}, \text{Std Dev}) \]

\[ D = 100 \pm 50 \]

<table>
<thead>
<tr>
<th></th>
<th>Case 1: No Schedule Attainment Loss</th>
<th>Case 2: Schedule Attainment Uncertainty Modeled as Worst Case</th>
<th>Case 3: Moderate Schedule Attainment Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SA Mean</strong></td>
<td>0</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td><strong>SA Std Dev.</strong></td>
<td>0</td>
<td>0</td>
<td>3.3%</td>
</tr>
<tr>
<td><strong>SA Dist.</strong></td>
<td><img src="0" alt="Normal Distribution" /></td>
<td><img src="20" alt="Normal Distribution" /></td>
<td><img src="10" alt="Normal Distribution" /></td>
</tr>
<tr>
<td><strong>TIP</strong></td>
<td>316</td>
<td>336</td>
<td>326</td>
</tr>
<tr>
<td><strong>Safety Stock</strong></td>
<td>116</td>
<td>136</td>
<td>126</td>
</tr>
</tbody>
</table>

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Supply Variability

- Lead Time Variability in multiple “buckets”
  - Order-to-ship
  - Ship-to-Arrive
  - Arrive-to-Good
- Reliability
- Yield
- Batch Size
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  - Key Inventory Factors

Review
Batch Size

Batch size is common in manufacturing industries
High cost of changeover, setup and transportation

Production / Order quantities must satisfy minimum and incremental batch size requirements must be a multiple of batch size

Example: Minimum batch size = 0, Incremental batch size = 100
Order quantity can be 0, 100, 200, 300, …

Example: Minimum batch size = 1000, Incremental batch size = 0
Order quantity can be 0, 1000, 1001, 1002, …

Example: Minimum batch size = 1000, Incremental batch size = 100
Order quantity can be 0, 1000, 1100, 1200, …
Batch Size Example: Scenario Analysis

**Batch Size and Safety Stock**

- **LT = 1**
- **PBR = 1**
- **NSP 95%**
- **100 +/- 25**
Time-Varying Safety Stock: No Batch Size

Time-varying output report for WH_FG-StrawberryCereal

no minimum batch size, in units / average
Time-Varying Safety Stock: Batch Size Limitation

Time-varying output report for WH_FG-StrawberryCereal

12,000 unit minimum batch size
Time-Varying Safety Stock: Batch Size, Production Limit

Time-varying output report for WH_FG-StrawberryCereal

12,000 unit minimum batch size, 20,000 unit maximum production
Intuition: Batch Size, Production Capacity, and Shutdowns have measurable inventory effects, and all impact Safety Stock
Enterprise Inventory Optimization Workflows

**Planners’ Workflow**

- Review Inputs and Supply Chain
- Diagnose Targets
- Review Targets
- Review Alerts

**Analysts’ Workflow**

- Analyze alternate scenarios (e.g., Batch Size change, LT reduced by 10%)
- Edit Inputs / Override Targets
- Approve Targets
- Load Targets
- Review Results
- Quantify value and cost
- Identify opportunity for new business approaches

**Supply Chain Planning and Execution**

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Enterprise Inventory Optimization Workflows

The Operational Workflow enables strategic “what-if” analysis by proposing optimal inventory targets automatically.
### Reviewing Inventory Targets

The image shows a software interface for reviewing inventory targets. The interface allows users to specify various parameters such as Key Output, Start Period, End Period, and Percent Change Minimum. It also includes filters for Item, Location, Status, and whether to include increased from zero or new items.

The table displays inventory items such as FG-BlueberriesCereal, FG-MixedfruitsCereal, and RM-Oats, along with their safety stock values for the start and end periods, and the percent change. The safety stock values are in units and are averaged across the start and end periods. Lead times and batch sizes are weighted by supply ratio across all sources.

#### Table Example

<table>
<thead>
<tr>
<th>Item</th>
<th>WH Safety Stock</th>
<th>WH Start Period</th>
<th>WH End Period</th>
<th>WH Percent Change</th>
<th>Other Locations</th>
<th>Other Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG-BlueberriesCereal</td>
<td>12,293.9</td>
<td>12,500.2</td>
<td>206.3</td>
<td>1.68</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>FG-MixedfruitsCereal</td>
<td>12,293.9</td>
<td>12,500.2</td>
<td>206.3</td>
<td>1.68</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>FG-StrawberriesCereal</td>
<td>12,293.9</td>
<td>12,500.2</td>
<td>206.3</td>
<td>1.68</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>RM-Blueberries</td>
<td>518.5</td>
<td>425.9</td>
<td>-92.6</td>
<td>-17.86</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>RM-Nuts</td>
<td>562.4</td>
<td>461.9</td>
<td>-100.5</td>
<td>-17.86</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>RM-Oats</td>
<td>3,839.1</td>
<td>3,153.3</td>
<td>-685.8</td>
<td>-17.86</td>
<td>0.0</td>
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<tr>
<td>RM-Rasins</td>
<td>562.4</td>
<td>461.9</td>
<td>-100.5</td>
<td>-17.86</td>
<td>0.0</td>
<td></td>
</tr>
</tbody>
</table>

For more details, refer to the documentation or software help.
Reviewing Inventory Targets

This dashboard breaks down each component of inventory which includes:

- Safety Stock (your inventory target)
- Cycle Stock
- Pipeline Stock
Service Level to Cost Report

- **Data generation complete.**

- **Data Horizon:** 01/01/2008 to 12/31/2009 (28 periods)

<table>
<thead>
<tr>
<th>Desired Service Level (%)</th>
<th>Safety Stock ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>101,036.73</td>
</tr>
<tr>
<td>55</td>
<td>111,479.29</td>
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<tr>
<td>60</td>
<td>122,090.10</td>
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<td>133,057.20</td>
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<td>144,614.85</td>
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<td>157,087.38</td>
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<td>85</td>
<td>187,165.23</td>
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**Total Safety Stock Required ($ Hundred Thousand)**

This report assumes consistent service levels across all demand streams. The demand streams in your supply chain may have differentiated service levels.
# Service Level to Cost Report: Export to Excel

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This report assumes consistent service levels across all demand streams. The demand streams in your supply chain may have differentiated service levels.
The Sales Department is requesting higher customer service level targets.

This can potentially increase market share.

What is the impact on inventory investment, specifically safety stock?

* The percentage numbers on the curve show the savings in Target Safety Stock ($) compared to the original single-stage calculations scenario.
EIO Intuition Takeaways

- Understanding the purpose of each unit of inventory is key to developing inventory optimization intuition
- Inventory targets are driven by demand, supply and service variability
- Intuitions developed at the total supply chain level / single-stage level may not always apply at the granular level in multi-stage supply chains
- Perfect internal service often leads to redundant inventory
- Batch sizes impacts both cycle and safety stock
- SmartOps EIO provides optimal inventory targets at a granular level by considering a comprehensive set of inputs for supply chain modeling
Session Goals Review

Heads-On experience
Quantify benefit of simultaneous multistage inventory optimization for a supply chain
Perform scenario analysis to answer “real-world” supply chain questions

Learning experience
Continue understanding of SmartOps approach to EIO
Build intuition on impact of key drivers on inventory targets
Discuss SmartOps best practice recommendations on measuring and managing uncertainty
Conclusion

Pipeline Stock Drivers:
- Order Processing lead times
- Transit times
- Demand

Cycle Stock Drivers:
- Review Frequency
- Demand
- Batch Sizes

Safety Stock Drivers:
- Demand
- Demand uncertainty
- Lead times
- Lead time uncertainty
- Review frequency
- Service level targets
- Service times

Pre-Build Stock Drivers:
- Time-varying capacity
- Time-varying demand
- Sourcing ratios
- Changes in safety stock
Convening at the Ritz Carlton South Beach, September 20 - 21st, SmartOps will play host to top executives for this year’s strategic supply chain conference. Hear latest trends in supply chain performance improvement and discover how companies are leveraging SmartOps Enterprise Inventory Optimization. Learn how SmartOps right sizes inventory and captures more sales for global enterprises.

Why Attend?
SmartOps is Supply Chain Planning

•Keynote Speaker: Geoffrey Moore
•Educational sessions, solutions research, and benchmarking
•Hands-on workshop – discover SmartOps Enterprise Inventory Optimization
•Network with supply chain leaders!
•Have fun in Miami! Luxury yacht cruise touring Miami’s South Beach area

Register at: smartops.cvent.com/event/SmartOpsForum2011
Thank you