Fine-Tune Your Safety Stock Levels with SAP SCM Supply Network Planning
Advanced Safety Stock Planning

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Advanced Safety Stock Planning

Inventory Management and Inventory Optimization

Safety Stock Planning in SAP SCM SNP

Inventory Optimization
Inventory management

- Is the process of ensuring the availability of products through inventory
- Handles all functions related to the tracking and management of material, including the monitoring of material moved into and out of stockroom locations, and the reconciling of the inventory balances
- Consists of two broad areas:
  - Inventory accounting, which is the administrative aspect
  - Inventory planning and control, which consists of planning procedures and techniques that lead to inventory order action
- Controls stock levels within the physical distribution function to balance the need for product availability against the need for minimizing stock holding and handling costs

The objective

- Is to get the right inventory, in the right place, at the right time, in the right quantity, in the right form, and at the right cost
What is Inventory Optimization?

Inventory optimization

- Is a set of products and services to help customers identify and evaluate supply chain inventory strategies from either a strategic or a tactical level.

The objective

- Is to determine inventory strategies and inventory influencing parameters throughout the supply chain.
  - While minimizing the inventory buffer needed to achieve a predefined target service level.
  - Or, maximizing the service level with a predefined inventory buffer.
Service level improvement is typically accompanied by dramatically increasing inventory.

Optimized inventory locations and levels – execution efficiency.

Inventory vs. Service Level Trade-Off

Material Inventory vs. Service Level

Better Service

Reduced Inventory
Strategies for Improving Trade-Off Balance

Reduce potential for a stock-out situation
- Reduce lead times
- Improve supply chain execution
- Improve order fill
- Reduce lot sizes

Utilize existing inventory in the best way possible
- Reduce obsolescence and obsolete inventory
- Reduce duplicate materials
- Manage interchangeabilities

Improve responsiveness
- Through better process integration
- Through better system integration (less time lost due to data integration between different systems)
Strategies for Improving Trade-Off Balance (cont.)

Understand the need for inventory buffers
- More accurate knowledge of actual lead times and variability
- Better and more accurate demand visibility
- Better inventory visibility through network driven approach

Work/act optimally within predefined inventory strategies
- Calculate safety stocks based on current demand information

Define inventory strategies
- Determine the optimal inventory strategies
- Determine inventory stocking locations in the network

Only the above highlighted strategies are covered in this presentation
Advanced Safety Stock Planning

Inventory Management and Inventory Optimization

Safety Stock Planning in SAP SCM SNP

Inventory Optimization
Safety stock planning in Supply Network Planning (SNP) deals with the regular planning tasks of managing short-term and mid-term inventory levels

- **Objectives**
  - Define key parameters for operative planning (safety stock)
  - Manage inventory levels on an operational basis to cope with planning uncertainties in demand and supply

- **Design of the supply chain and key parameters are predefined**
  - Supplier relationships
  - Lead times
  - Demand (forecast demand, customer demand, dependent demand, etc.)
  - Stocking strategies for each location
Methods to Protect Against Uncertainty

Uncertainty of supply

- Overestimate customer demand
- Underestimate production output quantity
- Overestimate procurement lead times
- Revised planning within rolling horizon
- Build up safety stock

Uncertainty of demand
What is Safety Stock Planning?

Use safety stock to safeguard the supply chain against negative effects of uncertain influencing factors like:

- Errors in predicting customer demand
- Disruptions in production
- Fluctuations in transportation times

Satisfy unexpected demands caused by these factors using an extra amount of material, intermediate products, or end products

There is a trade-off between service level and storage costs
The Perfect World Scenario

No Uncertainty → Forecast = Observation

Stock

Reorder Point

Replenishment Lead Time

Reorder Quantity

Time
Safety Stock Planning in the Real World

The Real World Scenario

Uncertainty → Forecast ≠ Observation

Stock

Reorder Point

Stock-out

Time

unexpected high demand

unexpected long lead time

Replenishment Lead Time

Replenishment Lead Time
Safety Stock Planning with a Safety Net

The Real World + Safety Net Scenario

Uncertainty → Forecast + Safety Stock ≈ Observation

Stock

Reorder Point

Safety Stock

Stock-out

unexpected high demand

unexpected long lead time

Replenishment Lead Time

Time
Two Main Questions in Safety Stock Planning

For which products and at which locations in the supply chain should safety stock be held?

- In SAP SCM SNP, this question is completely left to the planner’s experience

How much safety stock should be held?

- This question can also be left to the planner’s experience (basic safety stock methods)
- However, this question can be answered by the system if the necessary input information is available (advanced safety stock methods)
Inventory Management Strategies with SAP SCM

Basic safety stock calculation methods
- Basic methods consider one location and one product at a time
- Basic safety stock calculation methods are an integral part of the SAP SCM SNP planning run

Advanced safety stock calculation methods
- Advanced safety stock calculation methods are decoupled from the SNP planning run
- Advanced methods consider the network and its structure

Lot size calculations are an integral part of the SAP SCM SNP planning run
- Lot size strategies are predefined per location product
Safety Stock Methods in SAP SCM SNP

1. **SB**  Safety stock from location product master
2. **SZ**  Safety days’ supply from location product master
3. **SM**  Maximum from SB and SZ
4. **MB**  Safety stock (time-based maintenance)
5. **MZ**  Safety days’ supply (time-based maintenance)
6. **MM**  Maximum from MB and MZ (time-based maintenance)
7. **AT**  $\alpha$ – service level and reorder cycle method
8. **AS**  $\alpha$ – service level and reorder point method
9. **BT**  $\beta$ – service level and reorder cycle method
10. **BS**  $\beta$ – service level and reorder point method
**Basic Safety Stock Methods in SAP SCM SNP**

Six different basic manual methods

- Static or time-based safety stock values
- Maintained in location product master or in the interactive SNP planning table

<table>
<thead>
<tr>
<th></th>
<th>Static</th>
<th>Time-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety stock</td>
<td>SB</td>
<td>MB</td>
</tr>
<tr>
<td>Safety days’ supply</td>
<td>SZ</td>
<td>MZ</td>
</tr>
<tr>
<td>Max {safety stock, safety days’ supply}</td>
<td>SM</td>
<td>MM</td>
</tr>
</tbody>
</table>

Safety stock is built up according to these methods

Safety stock values are based on the experience of the planner

No support of the system to determine the right figures
Advanced safety stock planning is model-based

- Based on uncertainty and service level
- Time-dependent
- For the entire supply chain

Model assumptions

- Regular or sporadic demand
- Backorder case
- No delay approach
- Uncertainties are independent from each other
### Parameters for Advanced Safety Stock Methods

#### Target Days’ Supply

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Quantity and Data Determination</th>
<th>Lot Size Profile and Days’ Supply Profile</th>
<th>Target Stock Level Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Lot Size</td>
<td>Assembly Scrap (%)</td>
<td>Maximum Lot Size</td>
<td>Rounding Value</td>
</tr>
<tr>
<td>Target Lot Size</td>
<td>Rounding Profile</td>
<td>Target Days’ Supply</td>
<td>7.00</td>
</tr>
</tbody>
</table>

#### Service Level

<table>
<thead>
<tr>
<th>Short Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Safety Stock</td>
</tr>
<tr>
<td>Safety Stock from Location Product Master</td>
</tr>
<tr>
<td>Safety Days’ Supply from Location Product Master</td>
</tr>
<tr>
<td>Max of Safety Stock and Safety Days’ Supply from Loc Pro Mst</td>
</tr>
<tr>
<td>Alpha Service Level and Reorder Cycle Method</td>
</tr>
<tr>
<td>Alpha Service Level and Reorder Point Method</td>
</tr>
<tr>
<td>Beta Service Level and Reorder Cycle Method</td>
</tr>
<tr>
<td>Beta Service Level and Reorder Point Method</td>
</tr>
<tr>
<td>Safety Days’ Supply (Time-Based Maintenance)</td>
</tr>
<tr>
<td>Safety Stock (Time-Based Maintenance)</td>
</tr>
<tr>
<td>Maximum from MB and MZ (Time-Based Maintenance)</td>
</tr>
</tbody>
</table>

#### Stock Data

<table>
<thead>
<tr>
<th>Safety Stock</th>
<th>Safety Stock Method</th>
<th>Min. SFE</th>
<th>Max. SFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reorder Point</td>
<td>Service Level (%)</td>
<td>95.0</td>
<td></td>
</tr>
</tbody>
</table>
Definition of Service Levels

Alpha service level

- Service level is shortfall **event-oriented**
  - Number of periods with complete delivery fulfillment/total number of periods
- Useful if the customer accepts only complete deliveries (all or nothing), or if the fixed costs of subsequent deliveries are high

Beta service level

- Service level is shortfall **quantity-oriented**
  - Quantity delivered in time/total demand
- Useful if the customer also accepts partial deliveries or the fixed costs of subsequent deliveries are low
Inventory Strategies According to the Reorder Time

Reorder point strategies
- Purchase order decision is stock-dependent
- Procurement is triggered when stock falls to or is below a predefined stock level (reorder point)

Reorder cycle strategies
- Purchase order decision is time-dependent
- Procurement is triggered regularly at certain points in time (reorder cycles)
Method AT
- Alpha service level, reorder cycle strategy
- Target Days’ Supply is used as reorder cycle length

Method AS
- Alpha service level, reorder point strategy
Method BT
- Beta service level, reorder cycle strategy
- Target Days’ Supply is used as reorder cycle length

Method BS
- Beta service level, reorder point strategy
- Lot size is either equal to Target Days’ Supply x Forecasted Demand or it is taken from the fixed lot size in the location product master
Safety Stock Planning Profile

Maintain Safety Stock Planning Profile

Profile
- Name: SAP_DEFAULT
- Description: SAP_DEFAULTPROFILE

Demand
- Level of Forecast [%]: 100
- Determine Forecast Error: Master Data / Historical Data
- Level of Forecast Error [%]: 100
- Check Historical Data

Replenishment Lead Time
- Determine Forecast: Supply Chain
- Time-Dependent Forecast: Check
- Level of Forecast [%]: 100
- Determine Forecast Error: Master Data / Historical Data
- Level of Forecast Error [%]: 100
- Check Historical Data

Safety Stock Calculation
- Demand Type: Regular Demand
- Observe Fixed Lot Size

Further Settings
- Source Determination: All Levels
- Result Block Size: 1896
- Execute Cycle Test

Determination of Forecast Error (Demand/Replenishment Lead Time)
- Historical data
- Master data
- Master data/historical data

Determination of Replenishment Lead Time
- Supply chain
- Master data
- Master data/supply chain

Demand Type
- Regular demand
- Sporadic demand
- Determine automatically
Safety Stock Planning

Minimum and maximum value for safety stock

<table>
<thead>
<tr>
<th>Stock Data</th>
<th>Safety Stock Method</th>
<th>Min. SFT</th>
<th>Max. SFT</th>
</tr>
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<tbody>
<tr>
<td>Safety Stock</td>
<td>AT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reorder Point</td>
<td>Service Level (%)</td>
<td>95,0</td>
<td></td>
</tr>
<tr>
<td>Max. Stock Level</td>
<td>Demand Fcast Err. (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock</td>
<td>RLT Fcast Error (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replen. Lead Time</td>
<td></td>
<td></td>
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SNP optimization supports the following methods:

- **SB**  Safety stock from location product master
- **SZ**  Safety days’ supply from location product master
- **MB**  Safety stock (time-dependent maintenance)
- **MZ**  Safety days’ supply (time-dependent maintenance)
- **AT**  a – service level and reorder cycle method
- **AS**  a – service level and reorder point method
- **BT**  b – service level and reorder cycle method
- **BS**  b – service level and reorder point method
Safety stock is considered as input for the SNP optimization run.

### Optimization Profile Maintenance

<table>
<thead>
<tr>
<th>Profile</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opt. Prfl.</td>
<td>I GENERIC</td>
</tr>
<tr>
<td>Description</td>
<td>Linear Optimization</td>
</tr>
<tr>
<td></td>
<td>Discrete Optimization</td>
</tr>
</tbody>
</table>

#### General Constraints

- **Capacity Constraints**
  - [x] Production Capacity
  - [ ] Transportation Capacity
  - [ ] Handling Capacity
  - [ ] Storage Capacity
  - [ ] Maximum Product-Specific Quantity Stored

- **Lot Sizes**
  - [ ] Maximum PPM/PDS Lot Size
  - [ ] Maximum Transportation Lot Size

- **Safety Stock**
  - [ ] Ignore Safety Stock
  - [x] Take Absolute Deviation into Account
  - [ ] Take Relative Deviation into Account
  - [x] Take Period Length into Account
Optimization monitors that actual stock lies between maximum stock level and minimum stock level (= safety stock).

Both stock levels can be time-dependent.

If planned stock is above maximum stock or below safety stock, then penalty cost occurs.
Inventory Policy Practices

- Inventory policies set using General Rules (e.g., hold 8 weeks of supply for all products).
- Inventory policies set by ABCD Categories, determined by product throughput speed (e.g., fast movers).
- Inventory policies set in MRP/DRP or APS System to meet service or cost objectives at one level of the supply chain and then propagated to other levels.
- Inventory policies set in Multi-Echelon Inventory Optimization System that understands demand & lead-time variability across the supply chain and assigns policy at each sku-location.

Source: Aberdeen Group, 2004; Survey Results of 178 companies
Inventory Configuration and Policy Vendors

Manufacturing technologies: **Capabilities to model deep bills of materials and optimize complex postponement strategies across a multi-tiered network, accounting for supply variances within the network**

Distribution technologies: **Technologies that focus on service levels by both the type of customer and inventory classification by analyzing the right inventory levels based on demand and supply variability within a multi-tiered network**

![Diagram of inventory configuration and policy vendors](image)

Source: AMR, Redefining the Role of Inventory for Demand-Driven Supply Networks, 2005
Industry Pain Points

- High carrying cost of inventory ties up working capital and reduces cash flow
- Order fill rates and inventory turns are below best-in-class due to uncertain demand and supply events
- Missing on-time delivery targets is a key factor for customer satisfaction
- Product proliferation and globalization causes planners and analysts to have less time to manage more supply chains

Business Benefits

- Reduced working capital and improved cash flow
- 20-40% reduction in Inventory costs
- 5-10% Improvement in Order Fill Rates
- 20-30% improvements in Order Lead Times
- Improved planner and analyst productivity – automated, reliable process allows planners to focus on highest value products and customers

Solution

xAPP MIPO

- Multi-echelon inventory optimization
- Advanced Demand and Supply Profiling leverages SAP BW/BI
- Total supply chain view and operational synchronization
- Implemented in very large scale production environments
- xApp certification and dynamic SAP integration
Thank you!