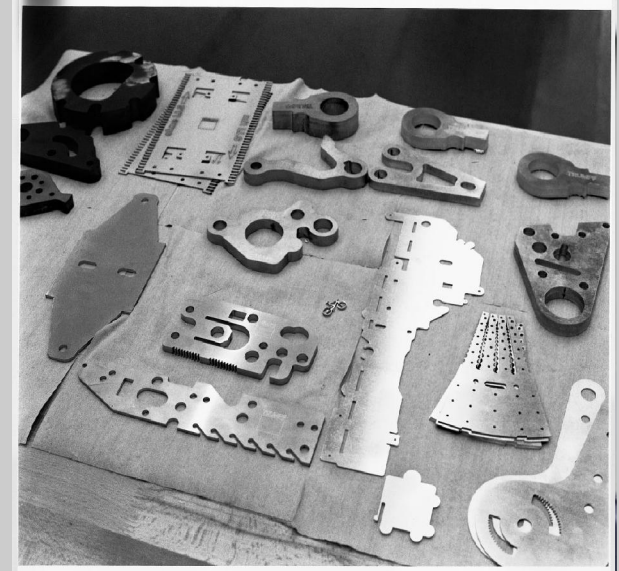


Fine-Tune Your Safety  
Stock Levels with SAP SCM Supply  
Network Planning  
Advanced Safety Stock Planning

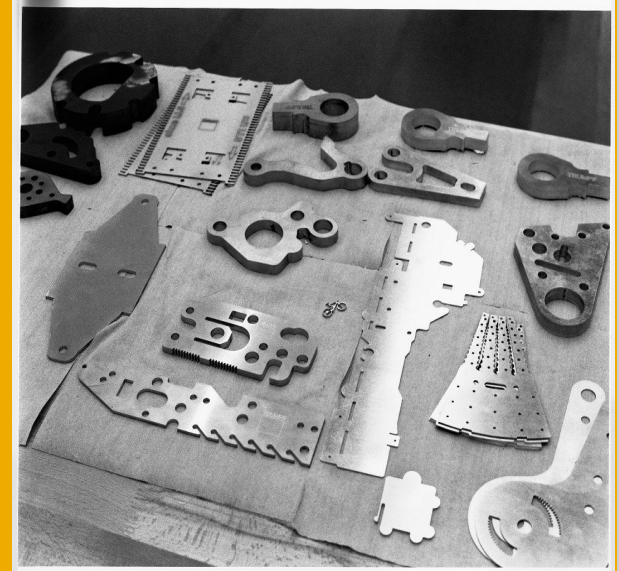


Claus Bosch  
Solution Management SCM  
SAP AG

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# Advanced Safety Stock Planning



## Inventory Management and Inventory Optimization

Safety Stock Planning in SAP SCM SNP

Inventory Optimization

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# What is Inventory Management?



## 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

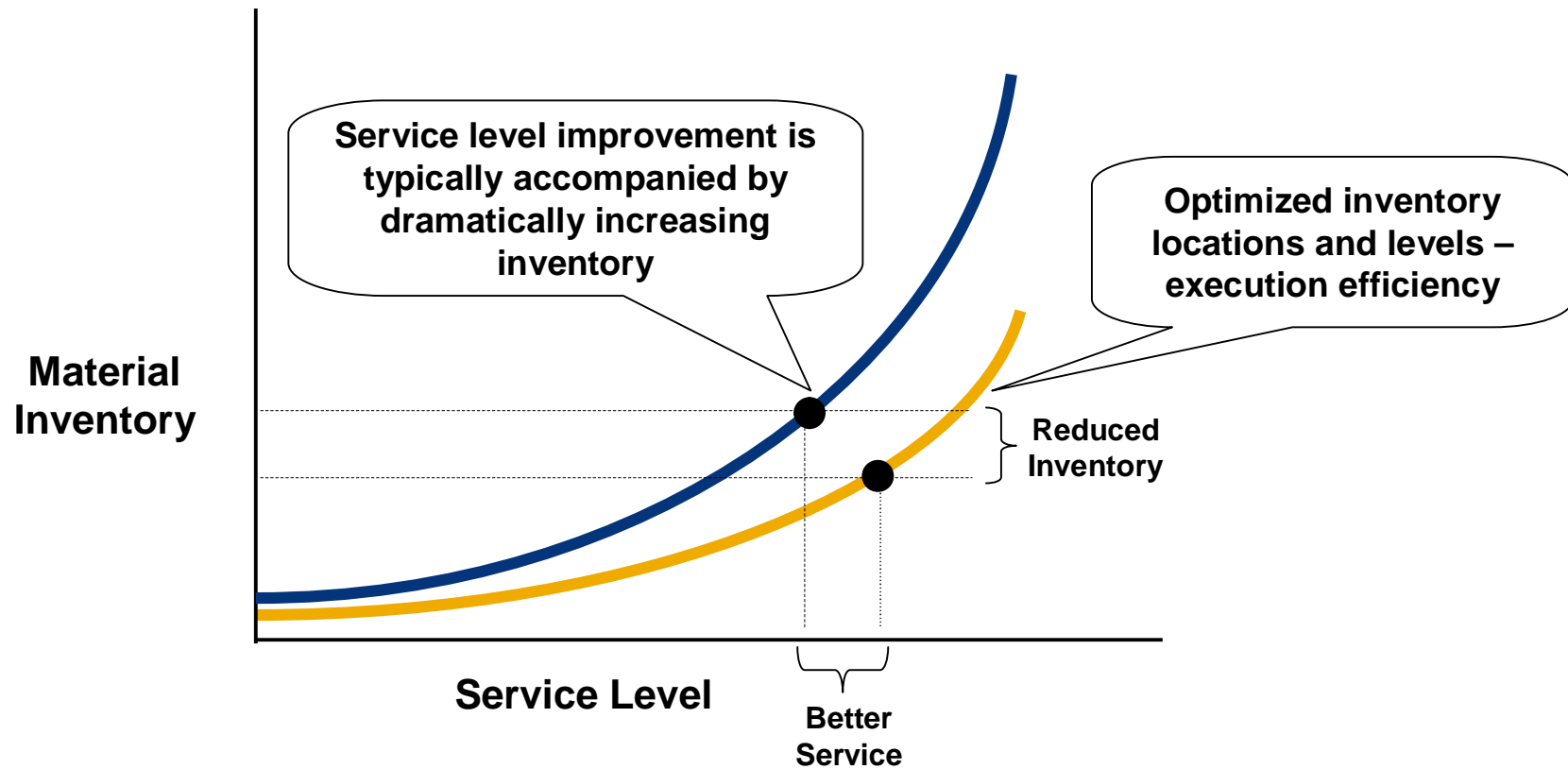
- Is a set of products and services to help customers identify and evaluate supply chain inventory strategies from either a strategic or a tactical level

## 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



## Inventory vs. Service Level Trade-Off



## 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

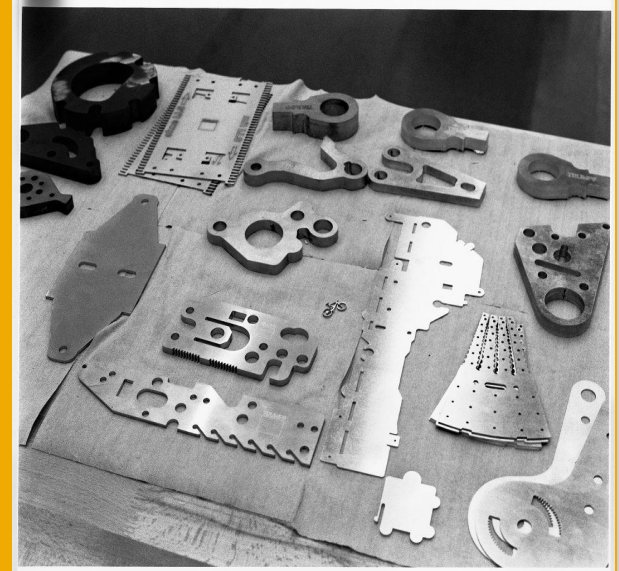
## Define inventory strategies

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

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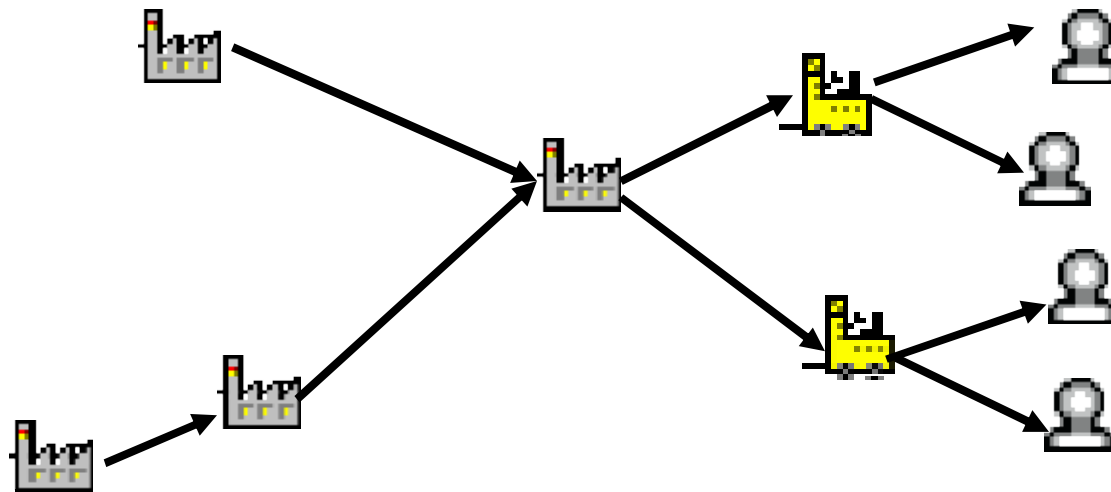
Safety stock planning in Supply Network Planning (SNP) deals with the regular planning tasks of managing short-term and mid-term inventory levels

- 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

Uncertainty of demand



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

# 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

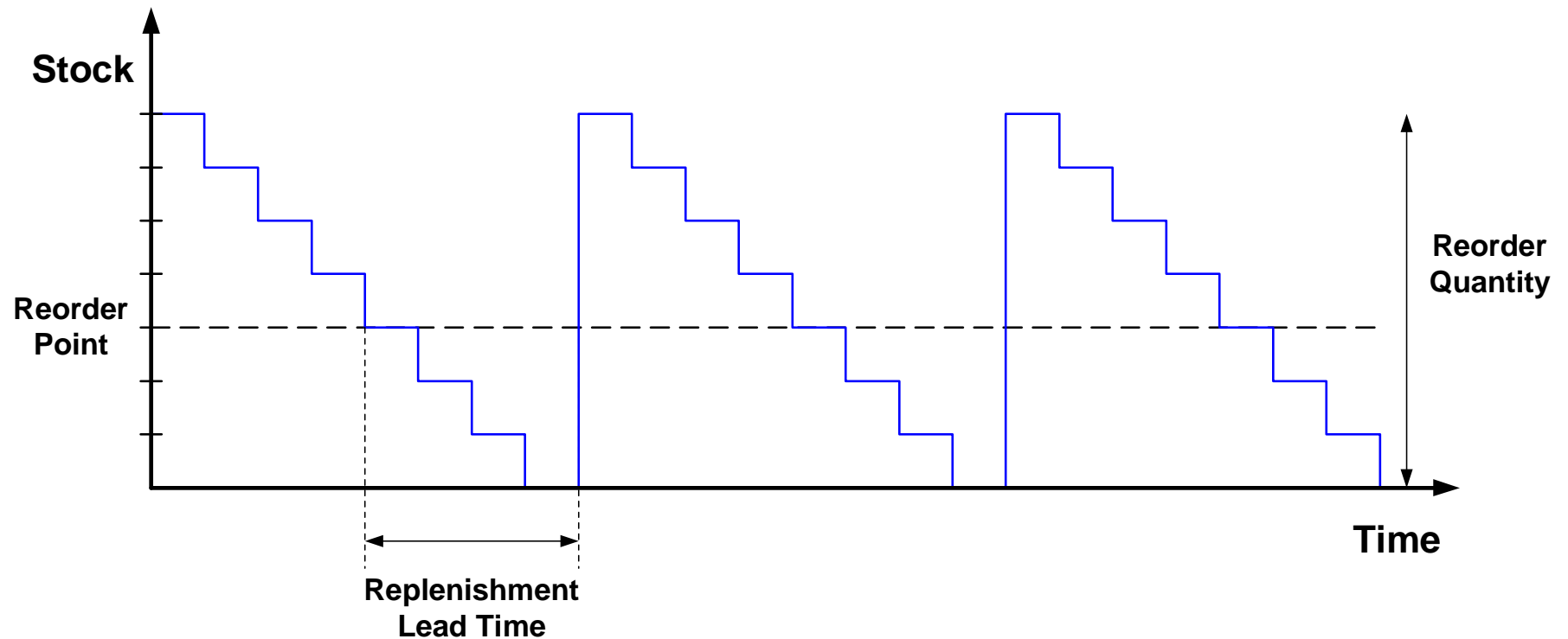
There is a trade-off between **service level** and **storage costs**

# Safety Stock Planning in a Perfect World



## The Perfect World Scenario

No Uncertainty → Forecast = Observation

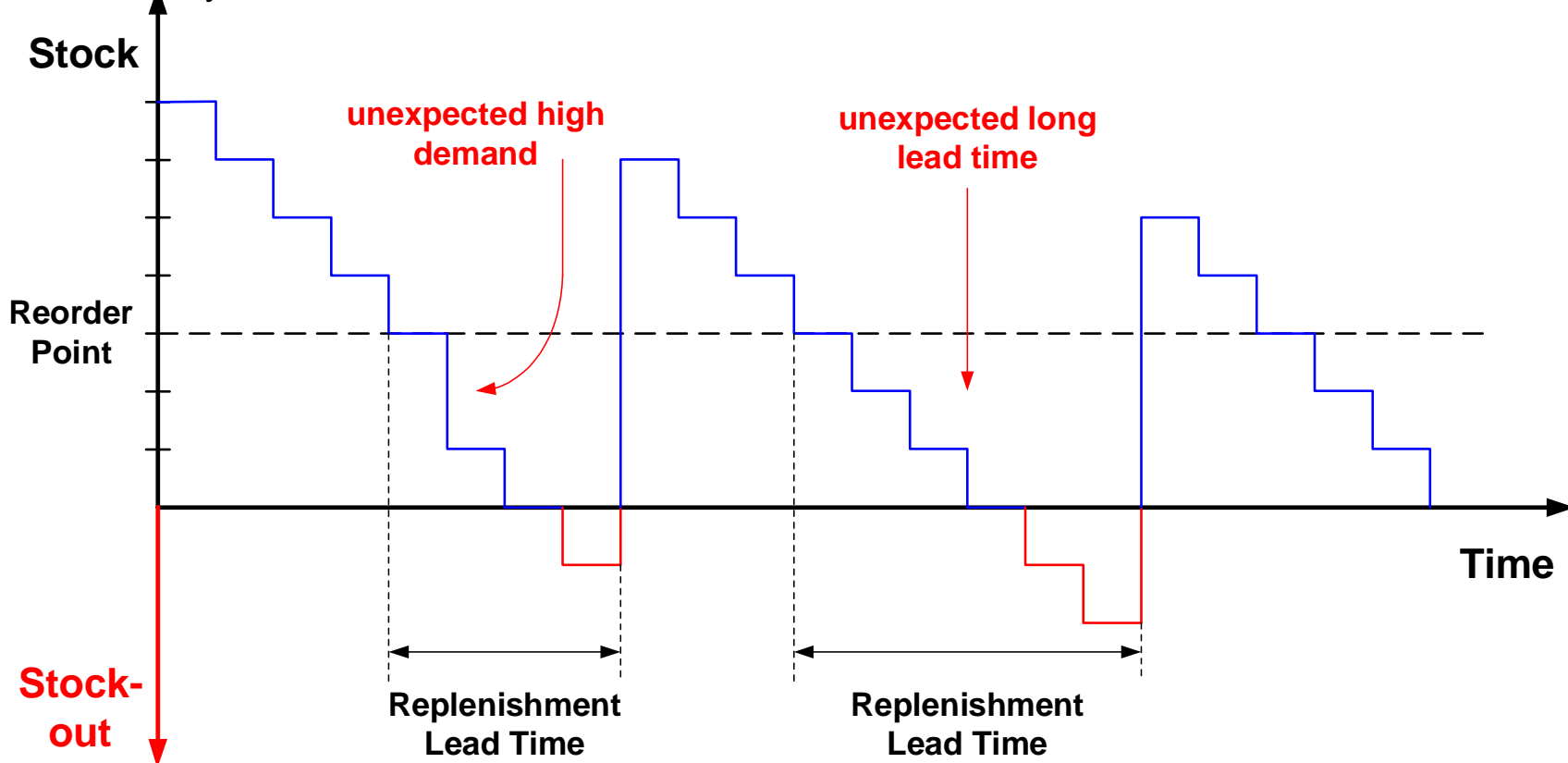


# Safety Stock Planning in the Real World



## The Real World Scenario

Uncertainty → Forecast ≠ Observation

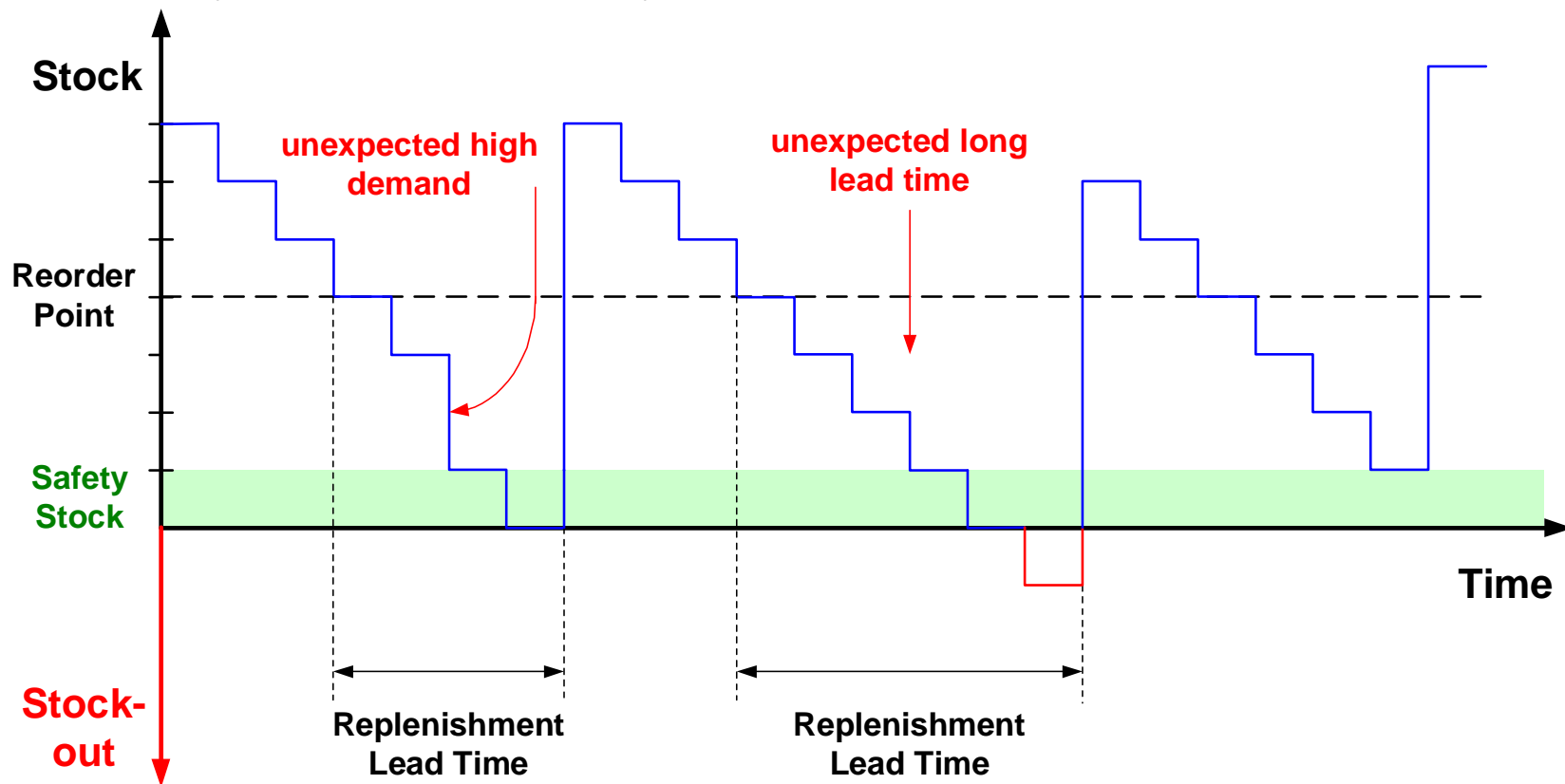


# Safety Stock Planning with a Safety Net



## The Real World + Safety Net Scenario

Uncertainty  $\rightarrow$  Forecast + Safety Stock  $\approx$  Observation



# 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)



## 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



## Basic Methods

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)

## Advanced Methods

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



## Six different basic manual methods

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

	Static	Time-Based
Safety stock	SB	MB
Safety days' supply	SZ	MZ
Max {safety stock, safety days' supply}	SM	MM

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



Product: PROD01      Base Unit: PC

Prod. Descript.: Product 01

Location: PL01      Plant 01

Storage    ATP    SNP 1    **SNP 2**    Demand    **Lot Size**    PP/DS

Lot Size Profile and Days' Supply Profile

Lot Size/DS Profile:      Lot Size Unit:     

Procedure: **Quantity and Date Determination**

Quantity Determination

Minimum Lot Size:      Assembly Scrap (%):     

Maximum Lot Size:      Rounding Value:     

Targ.Stk Lvl Methd:      Rounding Profile:     

Target Days' Supply: 7,00

Scheduling

Safety Days' Supply:     

Use Period Factor      Period Factor:     

Stock Data

Safety Stock:      Safety Stock Method: AS      Min. SFT:     

Reorder Point:      Service Level (%): 95,0      Max. SFT:     

Max.Stock Level:      Demand Fcast Err.(%):     

Stock: 10      RLT Fcast Error (%):      Replen. Lead Time:     

**Target Days' Supply**

SStk meth ...	Short text
	No Safety Stock
SB	Safety Stock from Location Product Master
SZ	Safety Days' Supply from Location Product Master
SM	Max.of Safety Stock and Safety Days'Sup.from Loc.Prod.Master
AT	Alpha Service Level and Reorder Cycle Method
AS	Alpha Service Level and Reorder Point Method
BT	Beta Service Level and Reorder Cycle Method
BS	Beta Service Level and Reorder Point Method
MZ	Safety Days' Supply (Time-Based Maintenance)
MB	Safety Stock (Time-Based Maintenance)
MM	Maximum from MB and MZ (Time-Based Maintenance)

**Service Level**



## 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)

# Advanced Safety Stock Planning Methods



## Method AT

- Alpha service level, reorder cycle strategy
- Target Days' Supply is used as reorder cycle length

The screenshot shows the SAP configuration interface for Lot Size Profile and Days' Supply Profile. The top section includes fields for Product (PROD01), Prod. Descript. (Product 01), Location (PL01), and Base Unit (PC). Below this is a navigation bar with tabs for Storage, ATP, SNP 1, SNP 2, Demand, Lot Size (selected), and PP/DS. The main area is divided into three sections: Lot Size Profile and Days' Supply Profile, Quantity and Date Determination, and Stock Data. In the Quantity and Date Determination section, the Target Days' Supply field is circled and contains the value 7,00. In the Stock Data section, the Safety Stock Method field is circled and contains the value AT, and the Service Level (%) field is circled and contains the value 95,0.

Field	Value
Product	PROD01
Prod. Descript.	Product 01
Location	PL01
Base Unit	PC
Lot Size Profile	
Lot Size Unit	
Quantity Determination	
Minimum Lot Size	
Maximum Lot Size	
Targ. Stk Lvl Methd	
Assembly Scrap (%)	
Rounding Value	
Rounding Profile	
Target Days' Supply	7,00
Scheduling	
Safety Days' Supply	
Use Period Factor	<input type="checkbox"/>
Period Factor	
Stock Data	
Safety Stock	
Reorder Point	
Max. Stock Level	
Stock	10
Safety Stock Method	AT
Service Level (%)	95,0
Demand Fcast Err. (%)	
RLT Fcast Error (%)	
Min. SFT	
Max. SFT	
Replen. Lead Time	

## Method AS

- Alpha service level, reorder point strategy

# Advanced Safety Stock Planning Methods (cont.)



## Method BT

- Beta service level, reorder cycle strategy
- Target Days' Supply is used as reorder cycle length

Product: PR0001, Base Unit: PC  
Prod. Descript.: Product 01  
Location: PL01, Plant 01

Storage, ATP, SNP 1, SNP 2, Demand, Lot Size, PP/DS

Lot Size Profile and Days' Supply Profile  
Lot Size/DS Profile: , Lot Size Unit:

Procedure: Quantity and Date Determination

Quantity Determination  
Minimum Lot Size: , Assembly Scrap (%):  
Maximum Lot Size: , Rounding Value:  
Targ. Stk Lvl Methd: , Rounding Profile:  
Target Days' Supply: 7,00

Scheduling  
Safety Days' Supply: ,  
 Use Period Factor, Period Factor:

Stock Data  
Safety Stock: , Safety Stock Method: BT, Min. SFT: ,  
Reorder Point: , Service Level (%): 98,0, Max. SFT: ,  
Max. Stock Level: , Demand Fcast Err.(%):  
Stock: 0, RLT Fcast Error (%): , Replen. Lead Time:

## 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	SAPDEFAULT
Description	SAP DEFAULT PROFILE
Demand	
Level of Forecast [%]	100
Determine Forecast Error	Master Data / Historical Data
Level of Forecast Error [%]	100
<input checked="" type="checkbox"/> Check Historical Data	
Replenishment Lead Time	
Determine Forecast	Supply Chain
<input checked="" type="checkbox"/> Time-Dependent Forecast	
Level of Forecast [%]	100
Determine Forecast Error	Master Data / Historical Data
Level of Forecast Error [%]	100
<input checked="" type="checkbox"/> Check Historical Data	
Safety Stock Calculation	
Demand Type	Regular Demand
<input type="checkbox"/> Observe Fixed Lot Size	
Further Settings	
Source Determination	All Levels
Result Block Size	1000
<input type="checkbox"/> 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



## Planning Book: [Live] SNP SAFETY STOCK PLANNING / SNP PLAN (SSP)

TLB View

Selected Objects

Product	Ty...	Locati...	Prod.Des...	Loc. description
PROD01		DC02	Product 01	Distr. Center 02
PROD01		DC03	Product 01	Distr. Center 03
PROD01		DC04	Product 01	Distr. Center 04
PROD01		DC05	Product 01	Distr. Center 05
PROD01		DC06	Product 01	Distr. Center 06
PROD01		PL01	Product 01	Plant 01
PROD01		PL02	Product 01	Plant 02

Selection profile

- HEISIGG
  - PROD01\_SST

Planning Book/Data View

- IGEN\_DEMAND\_HIST
  - DEMAND HISTORY DEMAND HISTORY
- IGEN\_DEPL
- IGEN\_DP
- IGEN\_SAFETY
  - SAFETY SNP PLAN (SSP)
- IGEN\_SNP
- IGEN\_SNPAGGR
- IGEN\_SNPPOPT

	Unit	Initial	29.09.2006	30.09.2006	01.10.2006	02.10.2006	03.10.2006	04.10.2006	05.10.2006	06.10.2006	07.10.2006	08.10.2006
SNP PLAN												
Total Demand	PC											
Distribution Receipt (Planned)	PC											
Distribution Receipt (Confirme ...)	PC											
Distribution Receipt (TLB-Con ...)	PC											
In Transit	PC											
Production (Planned)	PC	896										
Production (Confirmed)	PC											
Manufacture of Co-Products	PC											
Total Receipts	PC											
Stock on Hand	PC											
Supply Shortage	PC											
Safety Stock (Planned)	PC		45	45	45	41	41	41	41	41	41	
Safety Days' Supply	PC											
Safety Stock	PC											
Reorder Point	PC											
Target Days' Supply	D											
Target Stock Level	PC											
Days' Supply	D											
ATD Receipts	PC	896										
ATD Issues	PC											

## Minimum and maximum value for safety stock

Stock Data	
Safety Stock	<input type="text"/>
Reorder Point	<input type="text"/>
Max. Stock Level	<input type="text"/>
Stock	10
Safety Stock Method	AT
Service Level (%)	95,0
Demand Fcast Err.(%)	<input type="text"/>
RLT Fcast Error (%)	<input type="text"/>
Min. SFT	40,000
Max. SFT	45,000
Replen. Lead Time	<input type="text"/>

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

# Consideration of Safety Stock in SNP Optimization



Safety stock is considered as input for the SNP optimization run

Optimization Profile Maintenance

Profile	Method
Opt. Prfl. I_GENERIC	<input checked="" type="radio"/> Linear Optimization
Description	<input type="radio"/> Discrete Optimizatn

General Constraints | Discrete Constraints | Model Params | Soluti

Capacity Constraints

- Production Capacity
- Transportation Capacity
- Handling Capacity
- Storage Capacity
- Maximum Product-Specific Quantity Stored

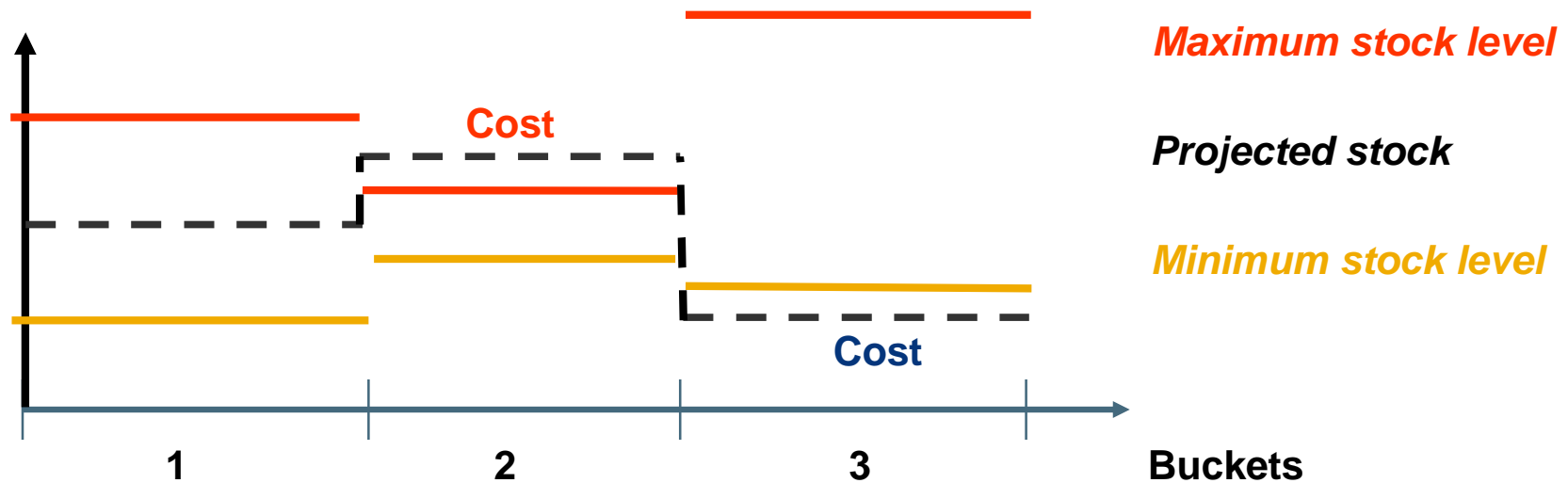
Lot Sizes

- Maximum PPM/PDS Lot Size
- Maximum Transportation Lot Size

Safety Stock

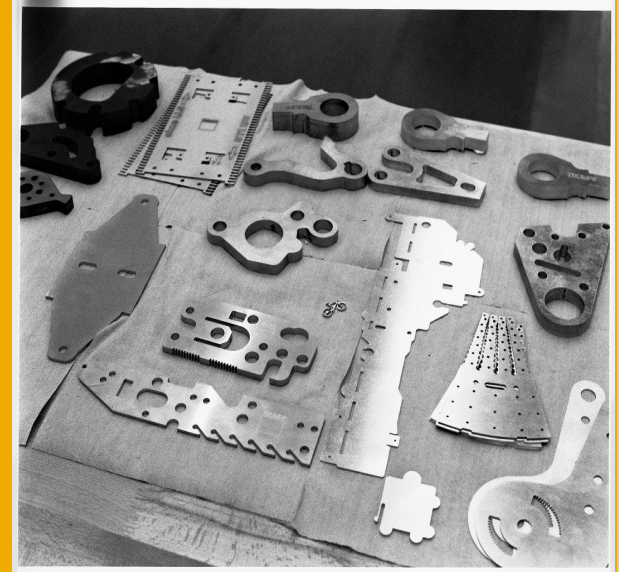
- Ignore Safety Stock
- Take Absolute Deviation into Account
- Take Relative Deviation into Account
- Take Period Length into Acc.

# Optimizing Stock Levels with SNP Optimization



- 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

# Advanced Safety Stock Planning



Inventory Management and Inventory Optimization

Safety Stock Planning in SAP SCM SNP

**Inventory Optimization**

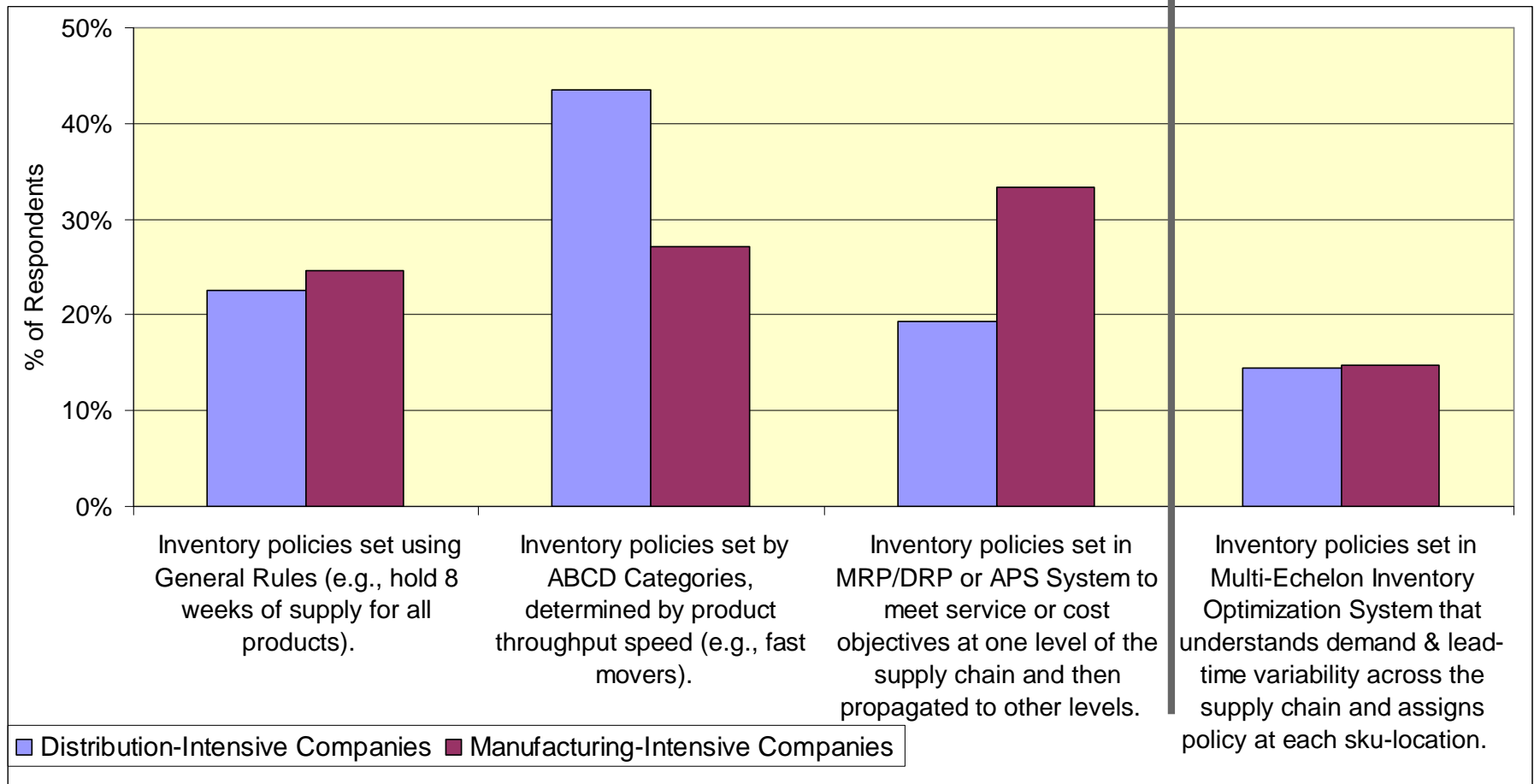
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# Inventory Policy Practices



Traditional Approach ← → Next Generation Approach



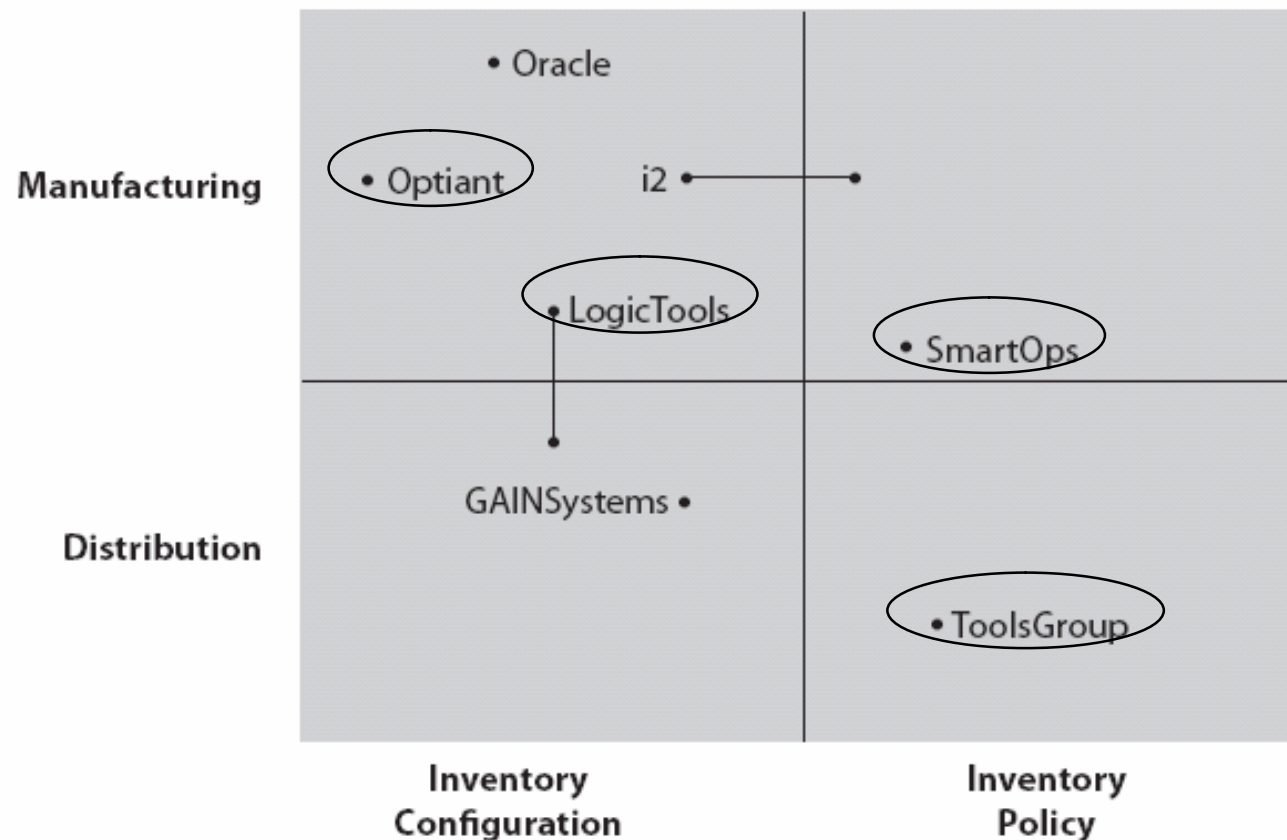
Source: Aberdeen Group, 2004; Survey Results of 178 companies

# 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**



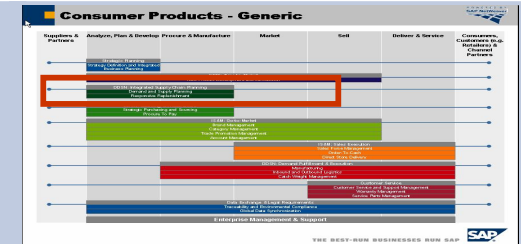


# SAP Enterprise Inventory Optimization with SmartOps



The SAP-SmartOps Enterprise Inventory Optimization solution is used to determine optimal and visible supply chain inventory policies

Enterprise Inventory Optimization is a key component of successful DDSN Integrated Planning and Optimization and Dynamic S&OP processes



## 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



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