Agenda

▪ Role of Optimizer in IBP planning
▪ Overview of Constraints
▪ Approach to Cost Modeling
▪ New optimizer course details (Revised IBP 700)
Role of TS Optimizer
Operational and Tactical Planning

Role of Optimizer

- Optimizer supports both tactical and operational planning processes
- In Tactical Planning, Optimizer is used to determine what the key constraints should be – what should be my capacity? What options exist for constraints – internal and external? What are the scenarios to support Decisions and set policies?
- In Operational Planning role, Optimizer helps generate plans for execution – production, distribution – in most cost effective manner, while using policies and major decisions made in tactical planning process

Key Capabilities

- Right product mix utilizing cost penalties
- Utilize alternatives to meet network demand – alternate lines/sites
- Strike balance between pre-build and late delivery
- Push Production & Asset utilization – Min Resource Utilization & Aggregated Production Constraints
- Fair share – Demand, Late Demand, Target Inv. and Holding Inv (Max Inv).
- Storage Constraints and Max Inventory
- Multiple Mode of Transports to manage cost-effective distribution
- Support industry-specific needs e.g. Production Wheel
- Telescopic Planning for +12 months (D/W/M) for better performance
Create optimized supply plan for Network, with right product mix, taking into consideration constraints and key objectives

**Hard Constraints**
- Must be satisfied, no solution if not possible
- Examples:
  - Capacity – Production, Transportation
  - Stock Balance
  - Max Aggregated Constraints
  - Max Production/Transport
  - Minimum and Maximum lot-sizes (unless overwritten by adjusted values)

**Soft Constraints**
- Should be satisfied, violations are penalized in the objective function
- Examples:
  - Variable/rate costs for transports, production, external receipts
  - Non-delivery costs for customer demands (rate)
  - Fix costs for transports, production and external receipts
  - Inventory holding costs (rate) and safety stock violation costs (rate)
  - Min Resource Utilization

**Pseudo-hard Constraints**
- Soft constraints with a very high penalty cost (usually higher than the sum of all other costs)
- Gets satisfied if possible, but still allows for a solution if not possible
- Examples:
  - Min Aggregated Constraints – Production, Transportation, Inventory
  - Manual adjusted values (internal to the optimizer, very high cost if violated)
  - Storage Capacity
**Approach to Cost Modeling**

**Outline of cost modeling approach**

Understand Production planning – plants, capacity definitions, sourcing and prioritization of lines and alternate sites. Understand the interactions of the planners towards managing capacity. Identify key assets and efficiency needs to determine if Push production is relevant.

Establish definition of customer used for supply planning – align with other definitions and uses in Demand and Response. Define the service levels, prioritization, lateness etc. for demands. Use multiple demand categories, if necessary, to differentiate and prioritize better. Align Forecast Consumption across all planning functions.

Clarify the process for target inventory setting and process handoffs.

Define the network and distribution planning process – identify key constraints for storage, transportation, etc. Clarify and needs for multiple modes of transports. Define sourcing and quotas as applicable for internal and external networks. Identify any key supplier interactions for managing constraints at traded goods, FG Production or procurement of parts.

Align Demand Prioritization with Fairshare – determine the patterns in which the demands are to be met.

Extend the fairshare to meeting target inventory and Max Inventory – align push production concepts such as Minimum Resource Utilization or Aggregated Constraints.

Define the key optimizer performance expectations. Perform Sizing to establish the scope of the run. Define Subnetwork ID as necessary to segment the problem.

Define any special process needs such as Production Wheel, Shelf-Life etc.
Production Planning
Capacity Constraints and alternatives for production

Capacity Constraints

- Line selection is based on the priority – optimizer uses production cost rates
- Capacity constraints will force switching to alternative lines – resource consumptions could vary by line e.g. fast/primary vs. slow/secondary
- Some lines may be dedicated and may not have alternate lines – making it a potential bottleneck resource
- Alternate production sites could be both internal or external e.g. contract Mfr. – vendor must be modeled as location type P (Plant) in IBP to model capacity constraints
- Capacity Leveling can be achieved – Min Resource Utilization or with Aggregated Constraints
Production Planning
Modeling Capacity and Capacity Extension

Available Capacity
- Can be defined in Units or Time – consumption rates dictate it
- Use ERP inputs as time varying capacity – Set Capacity to 0 to model non-working days
- Not possible to model changeover and sequence dependent changeover costs – hence model average capacity

Min Capacity Utilization
- Min Capacity for better asset utilization – could result in push production

Capacity Expansion
- Additional capacity may be modeled for extra shift – incurs additional costs.
- No increments – No Min or incremental steps
- More commonly modeled to ensure Adjusted production qty is met by Optimizer, regardless of the line capacity – set Capacity Supply Expansion Cost Rate as higher than Non-Delivery Cost Rates
Consensus Demand
Demand Prioritization

Modeling Demand Priority with non-delivery costs

- Flexible priority rules to suit different needs – can be varied by and desired levels, as low as product. Best practices dictate simplicity, ease of maintenance and understanding of planning results.
- Penalties and Costs drive both
  - Production and Distribution decisions
  - Better use of common constraints e.g. capacity, material, external capacity
# Target Inventory

## Considerations for costs

Discount = 20  
Target Inv Viol Cost Rate = 18

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## Dependencies
- Target Inventory Violation Cost > Inventory Holding Cost Rate
- Target Inventory Violation Cost < Max Inventory Violation Cost Rate
- Target Inventory Violation Cost < Non-Delivery Cost of Demands
- Target Inventory Violation Cost < Discount rate
## Target Inventory-2

Considerations for costs

Discount = 20  
Target Inv Viol Cost Rate = 22

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When Target Inventory Violation Cost Rate > Discount, Optimizer will hold inventory and not meet demands in the near-term
Fair share for right product and distribution mix

- Primary demands - Sales Orders and Forecasts are fulfilled to ensure all demands are at the same level of fulfillment in the network
- Target Inventory - Fairshare continues next to meeting Target Inventory, with its own fairshare segments
- Holding or Max Inventory - With oversupply due to push production, the supply is distributed once again to not exceed the Max Inventory – with its own additional fairshare segments

Note: It is very important to model full visibility of demands in a network – do not use netted demands to represent partial networks looking for supply from common source
Fairshare Demand
Fairshare segments and additional cost

Key Parameters in Optimizer Profile
- Number of Fairshare segments Non-Delivery = 4
- Fairshare parameter- Additional Costs (Default) = 0.1 (10%)

Calculation performed internally by engine – for each time bucket
- Non-Delivery Cost in a bucket e.g. 11000
- Additional Cost for Non-Delivery by segment 11000 x 0.1 / 4 = 275

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<td>1 x 275 = 275</td>
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Fairshare Target Inventory
Fairshare segments similar to Demand

Key Parameters in Optimizer Profile
- Number of Fairshare segments Inventory Target = 4
- Result
  - First & Second segment fulfilled
  - If any left, it is assigned to next segments e.g. if Total Inv at 2200 were 3000 units, remaining 500 could go to either location 2400 or 2500 but not both.
- Only Target Inventory KF is relevant for fairshare – additional lot size policies do not impact fairshare – either model as Target or Max Inv.

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<td>-</td>
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<td>Nothing left for Segment 3</td>
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<tr>
<td>Segment 4</td>
<td>-</td>
<td>-</td>
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<td>Nothing left for Segment 4</td>
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**Fairshare Target and Max Inventory**

Fairshare segments and calculated costs

### Key Parameters in Optimizer Profile

- **Number of Fairshare segments Inventory Target = 4**
- **Number of Fairshare segments Inventory Target = 10**
- **Calculation**
  - Target Inventory Violation Cost = 18
  - Each Segment is now 19.8, 19.35, 18.9 and 18.45
  - Inventory Holding Cost = 6
  - Fixed cost of 1 is added to the Inventory Cost for First Segment. Each segment is reduced by 10% i.e. by 0.1 (Not added to Max Inventory Violation Cost Rate)

#### Regional DC 2400

Segment 10
- 600
  - 6 + 0.1 = 6.1

Segment 9
- 600
  - 6 + 0.2 = 6.2

Segment 8
- 600
  - 6 + 0.3 = 6.3

Segment 7
- 600
  - 6 + 0.4 = 6.4

Segment 6
- 600
  - 6 + 0.5 = 6.5

Segment 5
- 600
  - 6 + 0.6 = 6.6

Segment 4
- 500
  - 18.45
  - 600
  - 6 + 0.7 = 6.7

Segment 3
- 500
  - 18.9
  - 600
  - 6 + 0.8 = 6.8

Segment 2
- 500
  - 19.35
  - 600
  - 6 + 0.9 = 6.9

Segment 1
- 500
  - 19.8
  - 600
  - 6 + 1 = 7

**Target Inv = 2000**

**Maximum Inv = 6000**
Revised IBP 700 course from SAP Education
SAP IBP Time Series Based Constraint Supply Planning with Optimizer

New Optimizer course replaces Heuristics content (Heuristics moved to IBP 200 with S&OP)

Course Details

- Duration 3 days
- Target Audience
  - IBP Application Consultants
  - Business Process Architects
  - Business Process Owner / Team Lead / Power Users
  - Solution Architects
- Prerequisites
  - Essential:
    - IBP100 - SAP Integrated Business Planning Overview
    - SAP IBP – Platform Features and TS Heuristics Planning
  - Recommended:
    - IBP300 - SAP IBP - Advanced Configuration
- Several advanced topics with hands-on Exercises
- Sample Cost Simulator sheets

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<td>IBP Application Consultants</td>
<td>IBP100 - SAP Integrated Business Planning Overview</td>
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<td>2 Unit 2: Production</td>
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