Applying Theory of Constraints to Spare Parts Supply Chain Management

NDTA – USTRANSCOM FALL MEETING 2019
Typical Spare Parts Problem

Need to protect Operations
Shortages are painful!
More Inventory!!

Need to control budget/costs
Surpluses are painful
Less Inventory!!

Both shortages and surpluses are a challenge
Overall Objective

How to Improve parts availability within Budget
Operational Challenges (typical)

- There is high variation in demand (demand spikes, sporadic demand) causing shortages
- Forecasting has errors (over or under forecast)
- Vendor lead times are long + there are supply Constraints
- Exponential impact of shortages
- Manual cumbersome acquisition processes
- Constant priority changes leading to expediting & fire-fighting
- High Workload and not enough capacity
Cause & Effect

Not enough budget for other Parts → Order Less Than Demand

Too Much Inventory

+ Forecast errors (over or under forecast)

- Too Little Inventory

Parts shortage

Order More Than Demand (Over Buy)

Fluctuations in Demand

Long lead times
# TOC vs. Traditional Approaches

<table>
<thead>
<tr>
<th>Traditional Approaches</th>
<th>TOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Improve Forecast Accuracy</td>
<td>1. Improve FLOW</td>
</tr>
<tr>
<td>2. Buy based on Forecast (PUSH)</td>
<td>2. Buy based on Actual Consumption (PULL)</td>
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</tbody>
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Core Concept

1. Inventory level is equal to Maximum usage over RLT ➔ Longer the RLT, higher the inventory
2. Longer the RLT, worse the forecast accuracy ➔ More shortages & surpluses

Reducing RLT reduces inventory AND reduces shortages
Exercise
Solution Elements

1. Reduce RLT by ordering frequently (i.e. cut time between usage & PO)

2. Set initial inventory (buffer) level = Max Usage Over RLT

3. Order what is consumed (not EOQ or human intuition)
Solution Elements

4. Adjust inventory (buffer) levels based on usage increases or decreases

- **Usage increases** → on-hand qty goes “too much red” → increase buffer level & make a one-time additional buy

- **Usage decreases** → on-hand qty stays “too much green” → decrease buffer level & stop buy until item returns to green

5. Prioritize vendors and expedite parts based on buffer status
6. Further reduce inventory (for selected high $ parts) by aggregating inventory in central warehouse (CW) and replenishes bases from CW
7. Re-invest some of savings to increase Inventory breadth for very low usage parts
Summary

1. Set inventory (buffer) levels equal to max consumption over Replenishment Lead Time (RLT)
2. Reduce RLT by ordering frequently (monthly)
3. Order what is consumed (not forecast)
4. Expedite orders based on buffer situation
5. Adjust buffers up and down based on consumption
6. Aggregate and replenish from Central Warehouse
7. Increase Inventory breadth