

LeadTime Technology™

Process control for the supply chain

**Opportunity Assessment
Report
SAMPLE**

Agenda

- Opportunity Assessment (OA) Scope
- Forecast Analysis
- Simulation Runs
- Business Process Observations
- Proposal

What is LeadTime Technology™ (LTT)?

LTT is a set of proprietary tools for short-term-supply chain planning, including:

- Demand forecasting (how much product will we ship in each time bucket?)
- Inventory planning (how much inventory should we hold? What are the minimum and maximum inventory levels?)
- Master production scheduling (how much product should we make in each time bucket?)
- Distribution requirements planning (how much product should we move in each time bucket and where should we move it to/from?)

LTT takes the manual guesswork out of many supply chain decisions and brings scientifically based decisions to the planner in an easy to understand and implement action plan.

Opportunity Assessment(OA) Process

Purpose:

- Identify opportunities for business process improvements in the AAA group for BBB
- Document cost savings opportunities
- Propose a path forward using LTT methodology

OA Process (continued)

Methodology:

- Data Extraction and validation
- Interviews with key supply chain knowledge workers
- Supply chain analysis
 - Demand forecast/modeling (seasonality, forecast error, etc.)
 - Inventory plan modeling (run lengths, safety stocks)
 - Opportunity identification

Scope of the OA

Three principle AAA Plants

- 111
- 222
- 333

Also obtained data for the entire network

Dimensions

Total Database:

- 7139 items
- 150 combinations
- 582,000 shipments
- 286,000 forecast elements

AAA Group:

- 18.6 million gross shipped
- \$245 million annual sales
- \$20 million inventory

Definitions

- **Item** – SKU as a finished product in bulk or in a carton
- **Service Level** - The percentage of time you plan to supply what the customer wants when they want it, without unusual effort
- **Safety Stock** - the minimum inventory that triggers another production run. It is sized based on service level. How much of the variability of both demand and supply are you willing to cover?
- **Cycle Stock** – when you do produce, how much do you make?
- **Cycle Time** – Cycle stock measured in days supply

Data Utilized in Analysis

- 2 years transaction level Shipment data
- 2 years month ending inventory by item by location
- Master data (item)
- 2 years of transaction level Job History
- 2 years of Monthly Forecast at the item x customer ship-to x pkg level

Analysis Process

- Reformulated and distilled the data
- Forecast sales
- Compared LTT Forecast to Sales Forecast
- Created Product Wheel based inventory simulations through 2005
- Compared with history
- Ran sensitivity analysis

Interviews conducted with Supply Chain Personnel

Key Personnel in the functional areas of:

- Supply Chain
 - Planning
 - Customer Service
- Operations
- IT
- Marketing
- Sales
- Customers
- Management
- Finance

Forecast

There is a universal belief that the forecast is poor

- Customers rely on their own internal systems to forecast
- The forecast can change hands inside the customer's location several times with the last person having no idea what it represents
- There are no metrics to monitor the accuracy

Forecast analysis

- Took 1 year of Forecasts at the item x Customer Ship-to location x pkg
- One month advanced forecast
- Determined actual demand using transaction level shipments
- Compared the two (the forecasts and the shipment history are in two different files and customer name, ship-to locations are not mapped)
- The accuracy metric we use is MAPE (mean absolute percent error = $\text{Abs}(\text{Actual}-\text{FC})/\text{Actual}$)

Forecast Accuracy

- Using your current process, the demand weighted average forecast **error** is 34.9% at the item x Ship-to location x Package level
- There is a large disparity among customers:

	23.7%
	41.6%
	12.6%
	46.4%
	21.1%
	39.9%
	46.9%
	110.9%
	33.9%
	53.7%
	91.3%
	38.6%
	44.0%
	18.6%
	49.9%
	28.1%
	46.6%
	54.5%
	6.1%
	29.9%
	69.3%

LTT Forecasting

- LTT uses 12 unique algorithms and dozens of variations of each to identify the one with the lowest MAPE
- The LTT process typically re-forecasts daily using the best algorithm and booked orders
- The Forecast is optimized at the “Period of Risk” to assure it’s optimal for production planning
- In simulation mode we forecast each Item x Ship-to Location x pkg each week for the past 52 weeks

LTT Forecast Results

- The demand weighted average **error** for all SKUs was **22.0%**
- In simulation mode we did NOT use our patented “blending algorithm” which usually reduces error by an additional 5%
- The difference in “noise” between 22.0 and 34.9% error is worth \$5.4 million of safety stock inventory for the aaa segment

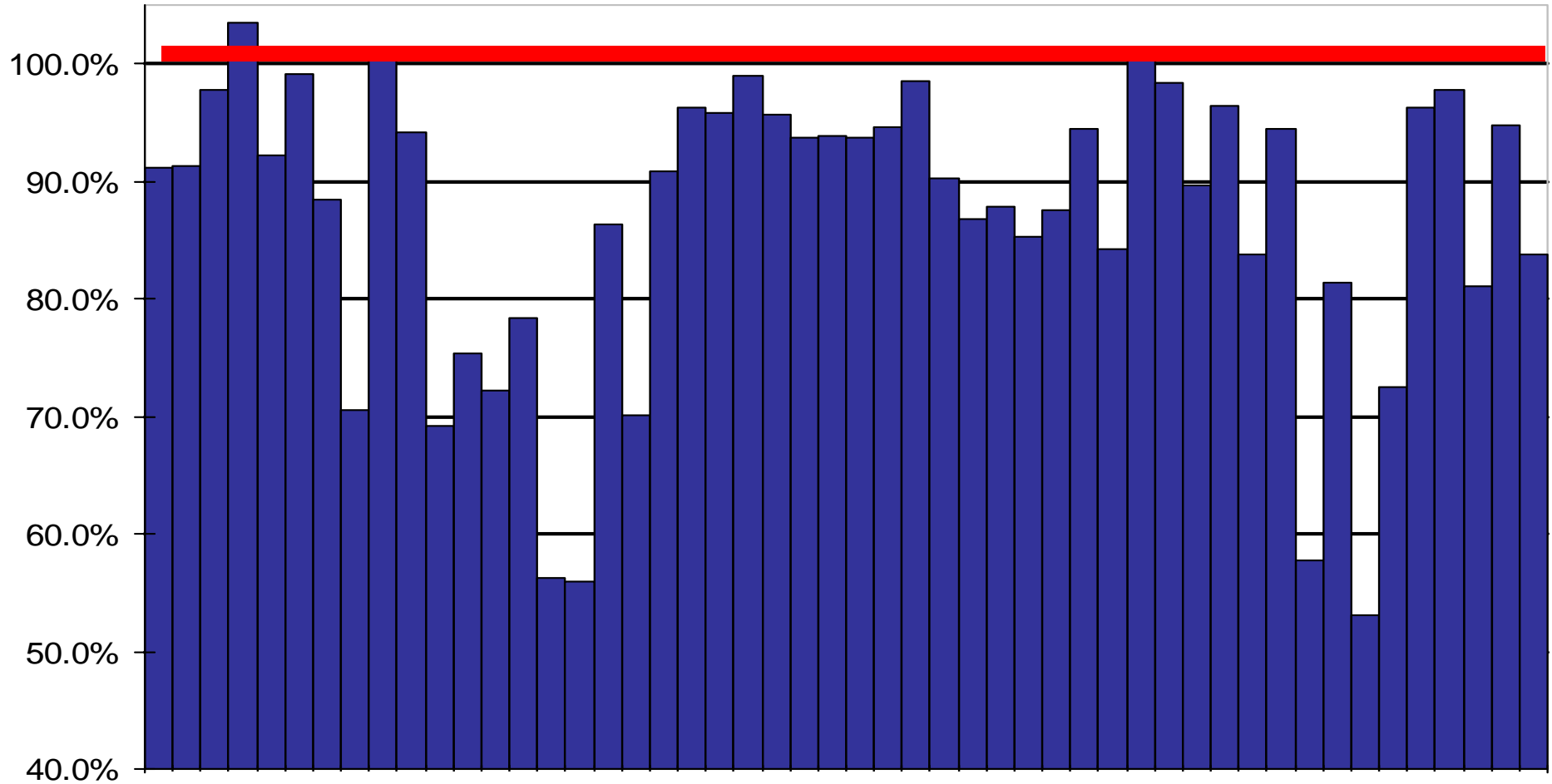
Customer Linking

- The customer forecasting process appears to be broken
- Better demand signals can improve business not only for you, but for the customer as well
- A linked value chain provides a new entry barrier for competition
- The process is a unique “value add” for most favored partners
- Customers can leverage the learnings to other parts of their business

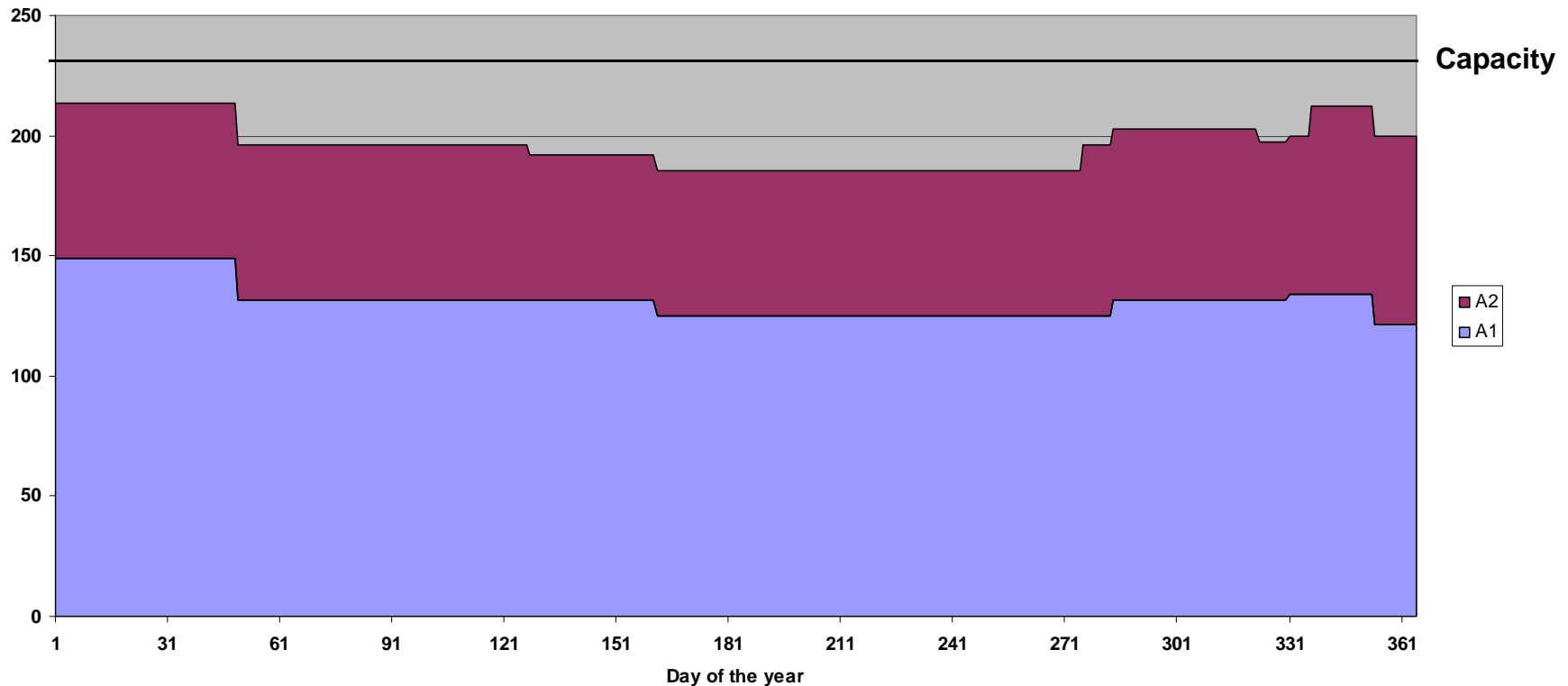
Capacity Utilization

- By far the most significant contribution you can make to cash is to improve utilization of capacity
- You have acknowledged this and are making strides towards instilling this as a major performance measure

Capacity



Better capacity utilization requires more machine flexibility



In order to better utilize the capacity, you must have machine capability well in excess

Capacity Utilization

The program you currently use to optimize machine loading accounts for :

- Sales forecast
- Machine Capacity (gross/day)
- Capacity (over capacity only)
- Standard cost (as bulk)
- Freight rates
- Storage costs (for pre-build)
- Available Operating days (typically 360)

And optimizes on *least cost*

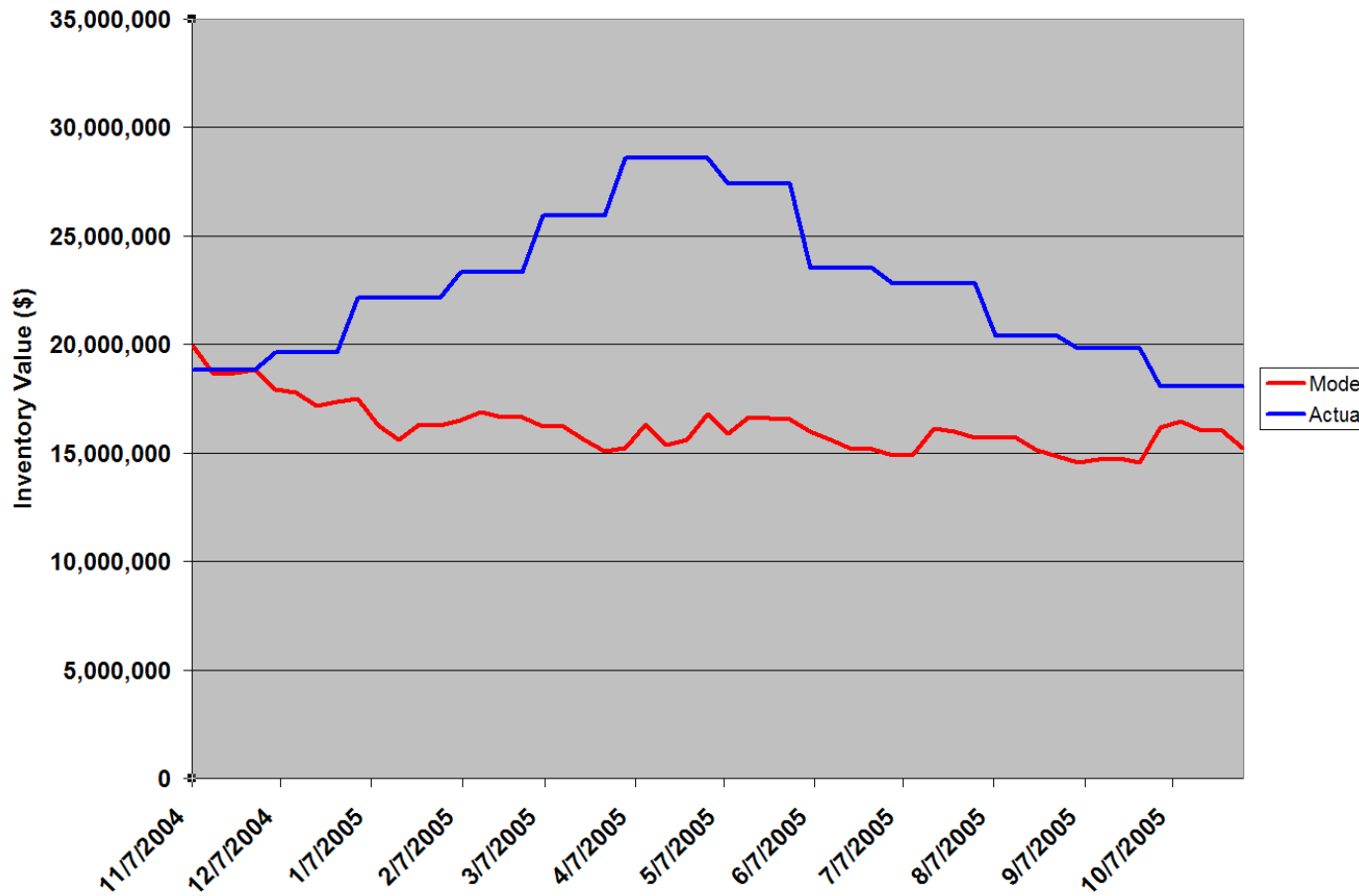
Simulation

- One of the most powerful tools we can offer you is process simulation using your data to re-cast history
- While we do this primarily as an analytical assessment tool, it can also be used in “what-if” mode

Simulation Process

- Started 10/31/2004
- Reformulated and distilled the data
- Forecast sales at the Item level
- Rolled up the forecast to the item level
- Assigned Items to one or more machines at one of the three aaa plants using the Job History data for historical rates
- Balanced the production load using Product Wheel models
- Calculated optimum cycle stock and safety stock for each item at each location by week
- Loaded the inventory on 10/31/04
- Debited the inventory by week based on the actual Item shipments for that week
- “Produced” additional Items based on the Cycle Stock and Safety Stock targets
- Ran through 52 weeks and calculated the resultant inventory
- Compared with history
- Ran sensitivity analysis

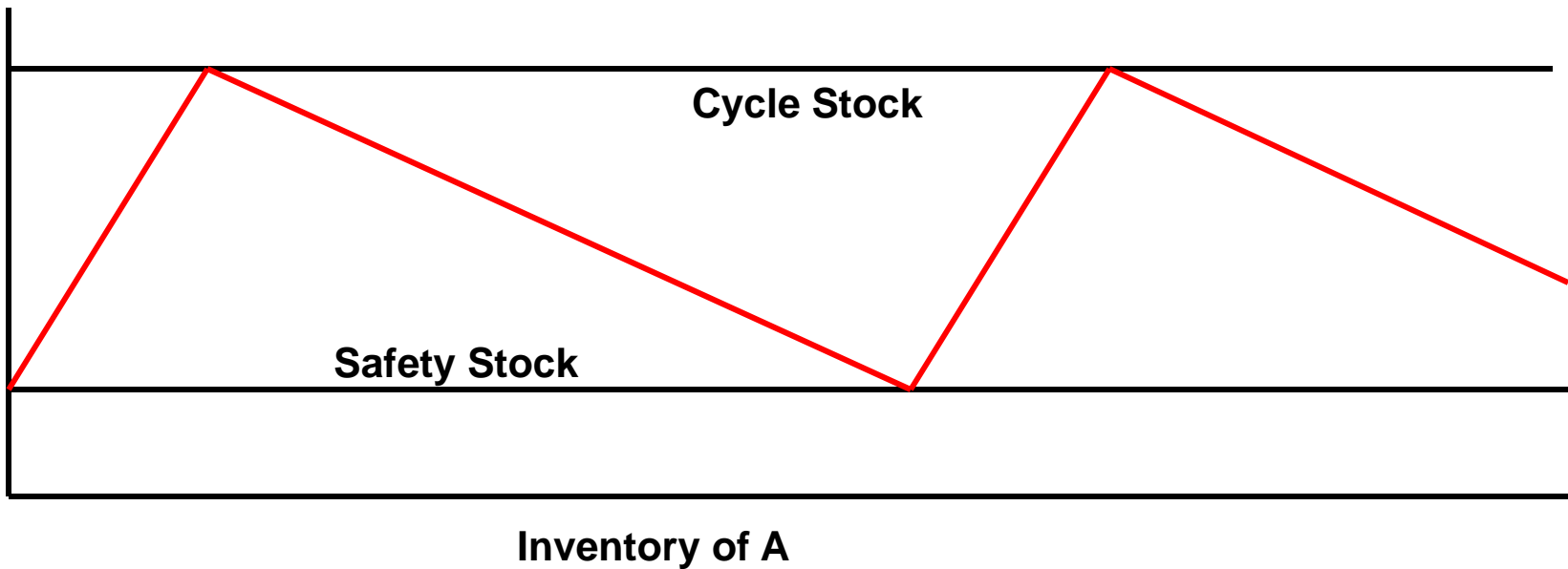
Simulation Results



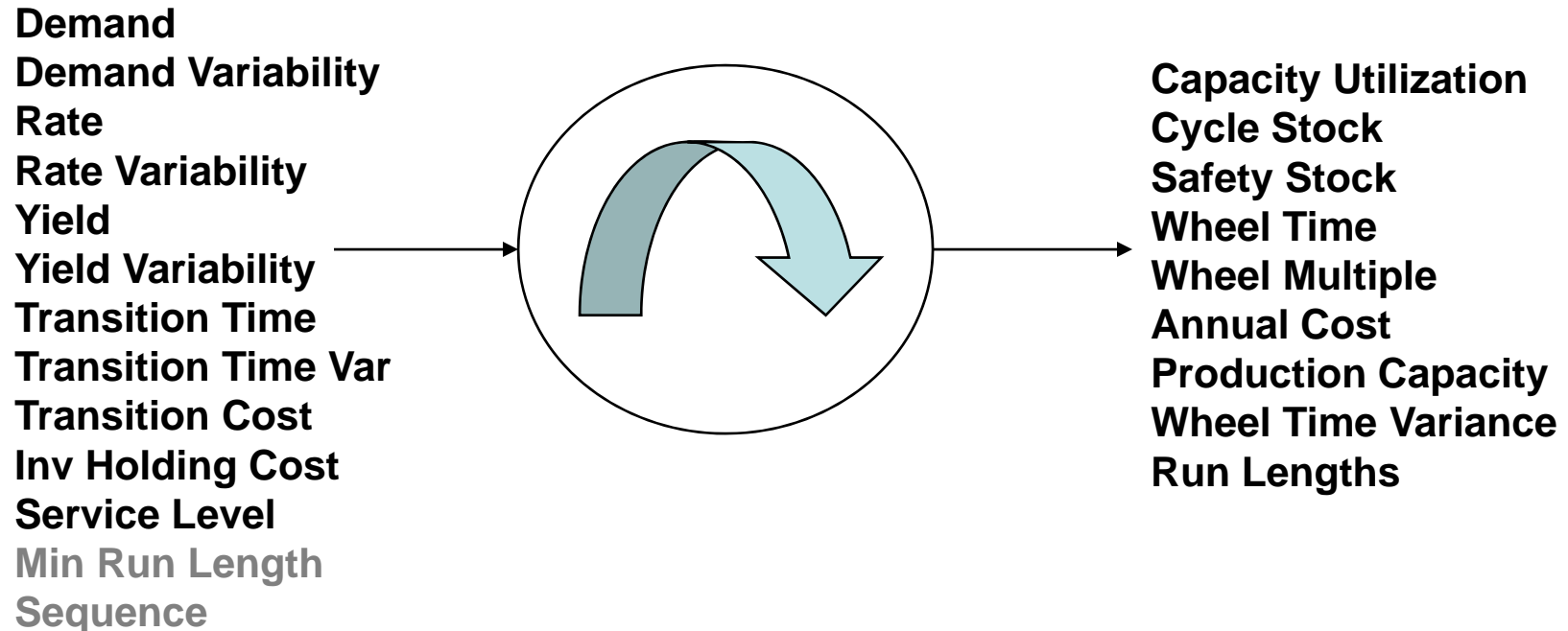
**30%
reduction in
inventory**

Product Wheel

Linear Representation



Product Wheel



Optimization is based on highest total value

Dynamic Product Wheels

- Changes daily based on demand, rates, inventory, etc.
- “Wheel Time” is only virtual – contracts and expands based on need
- Not every sku must be made each turn of the wheel – some will be skipped until the next “opportunity”
- Wheels can be “nested” or run in parallel for production lines which share SKUs

Freight and Warehousing

- Freight and warehousing adds about \$/ton or \$3.00/gross to the price of a typical aaa product
- Freight costs rose 3.9% in 2005 (excluding fuel surcharges) and are likely to climb higher as the trucking industry gets tighter
- The inventory reduction opportunities afforded by LTT will no doubt have an impact on warehousing costs – variable warehousing costs will go down immediately and at some point fixed warehousing costs may be in play
- The use of LTT combined with zzz will no doubt provide a more stable, longer range plan that will result in reduced freight costs. While we expect this reduction to be of the order of 5% for the entire network, a 1% reduction for the aaa group appears more realistic.

Change Cost Calculations

- Typically use lost variable cost (yield, overtime, solvents for cleanup, etc.) as a change cost
- At high capacity utilization, we also include lost opportunity cost for product that could be made during the transition time
- We've valued this cost at the variable margin and rate of the individual item

A 1 hour change to 1234 on 111 abcd would cost 2600 gross at a variable margin of \$8.80/gross = \$23,000

Inventory Holding Cost

- Cost of capital
- Variable warehouse cost
- Damage
- Obsolescence

Typical range is 25-30% of Variable Cost – we used 25%

As we learn more about obsolescence, we can vary the holding cost by product group

Process Observations

- Few people trust the forecast
- The planning cycle is manually intensive
- There is a very strong network optimization tool in place
- The key production metrics are a to b ratio and M&E Costs, but the value of utilization is beginning to be appreciated
- Employees we spoke with are technically very strong and are capable and energized about making changes
- Everyone is dedicated to satisfying the customer and assuring they are always in glass, but there are no customer service metrics

Benchmark Observations

- As traditionally defined, this business is Make to Stock
- DSO metrics are outstanding for your industry
- Cash to Cash cycle time is good
- Production makes what is planned
- Compensation is tied to key metrics
- There is no formal S&OP process
- Freight costs are high and getting higher – better planning tools should enable savings
- Key metrics are lacking (customer service, forecast accuracy...)
- You've done a great job linking disparate systems, but there's much work ahead integrating data

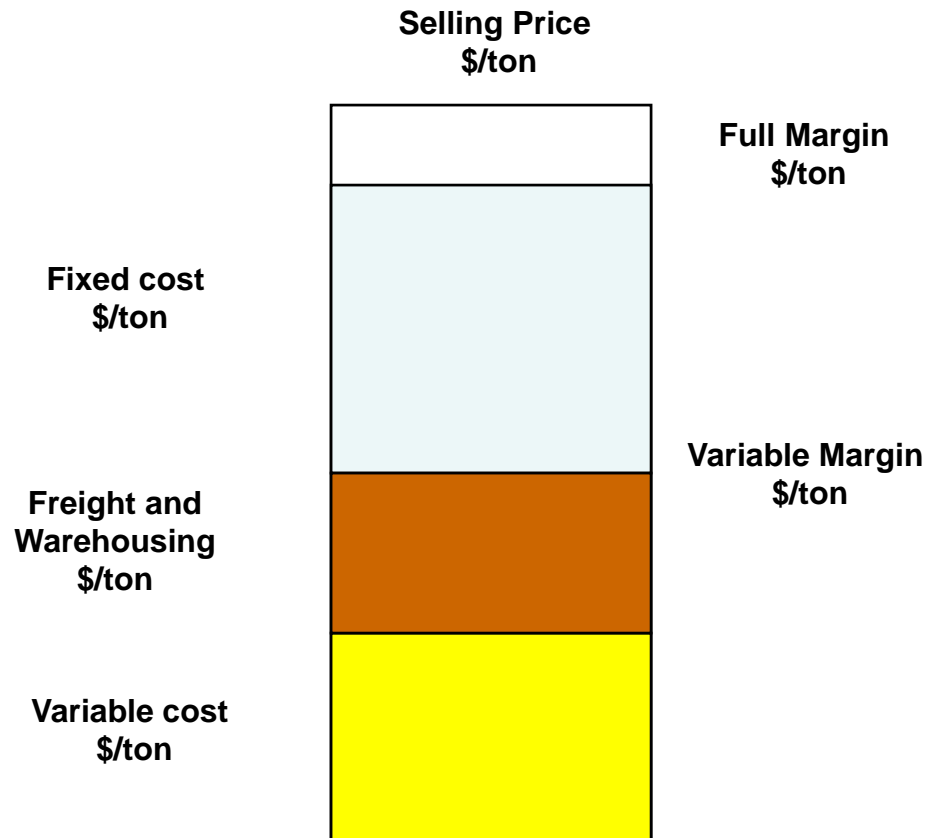
Business Process Changes are Required

- Technology tools will not overcome poor business processes
- In order to achieve the benefits we propose, you will need to do more than simply install software....business process paradigms must change.

Necessary Paradigm Shifts

- Utilization as a key driver
- Inventory as an Asset
- Changeovers as flexibility
- Demand as a forecast for a Make to Stock business

What is a ton worth?



- What would the price be?
- What is truly variable?
- At what point does the price erode?

Averages for Food group

Inventory as an asset

- **Smooth production, increase yield, rates**
- **Opportunistic sales**
- **Protection against outages**
- **Capacity utilization/pre-build**

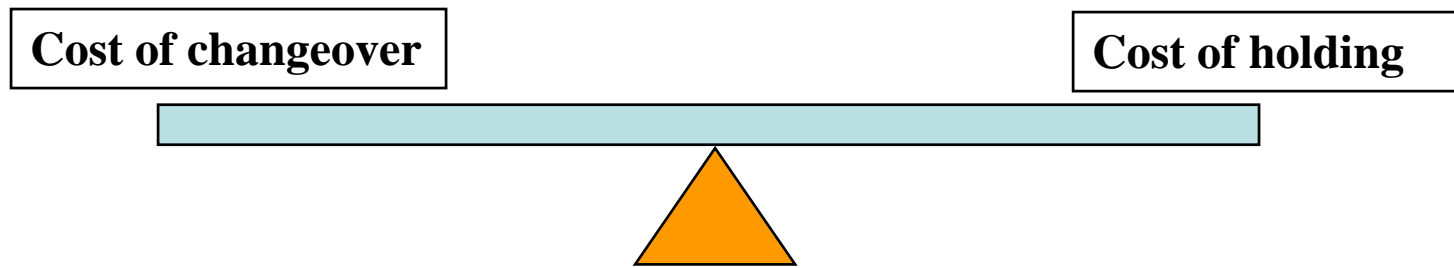
Change overs Drive Lower Inventory

Changeover expertise:

- Enhances flexibility
- Enables lower inventory levels
- Provides rapid response to customer needs

Where is the balance?

Inventory balance

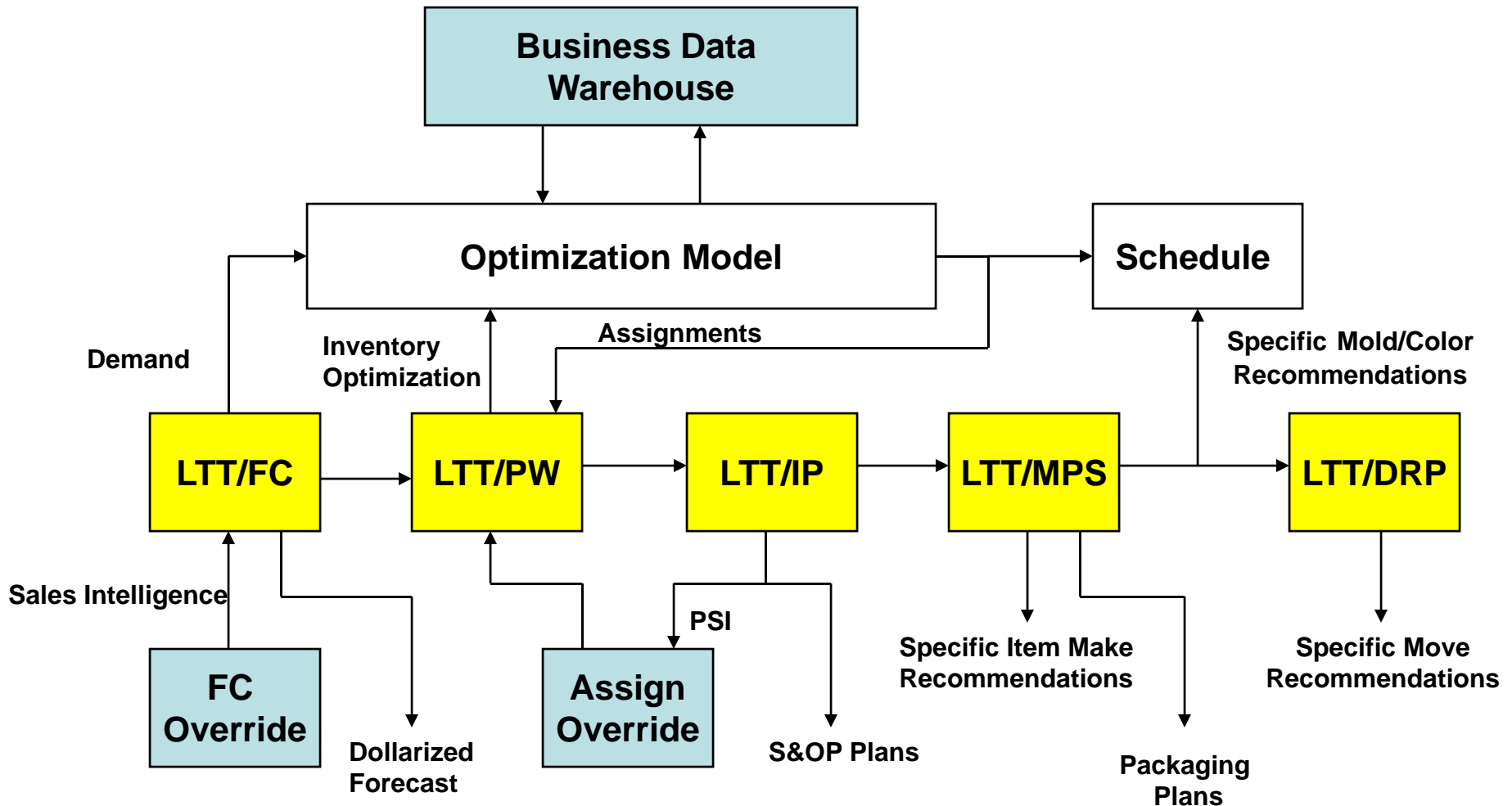


Shareholder value add...

Order Driven Process

- Service Reps/ Mgrs get forecasts from most customers
- Business Mgrs also digest, upgrade the forecast
- The final forecast is manually entered into the PSIs
- For higher volume skus the Reps rely on the PSIs to help identify the need for orders
- For lower volume skus there are no tools
- Orders are entered in 90 day blocks
- These Orders drive the business cycle

Business Cycle with LTT



LTT Project proposal

Phase I:

Provide forecasting, product wheel based inventory planning, and master production scheduling with feeds to the a and b X systems for the aaa Plants (111, 222, 333)

- Daily re-forecasting
- Forecast graphics
- Simple forecast override capability
- Daily value optimized cycle stock, customer service level driven safety stock targets at each location
- On demand PSIs for all skus
- Recommendations for Item/carton prioritization

LTT Project Proposal

Phase I (Cont.)

- **Graphical interface with summary data for inventory planning**
- **Simple reports for Orders, Inventory, Sales, etc.**
- **Provide seed money for several Customer Linking projects with high value partners**
 - Reduce the noise in the demand
 - Reduce inventory on both sides of the fence
 - Improve service
 - Provide a unique entry barrier

LTT Project Proposal (cont'd)

Phase II:

Leverage the learnings from the aaa group to expand the LTT tools across all bbb

- The combined engine will generate the highest value when the entire network is enabled
- Freight reduction opportunities will also be realized
- Use web based systems for optimal connectivity and reduced support load

Project Cost and Timing

Phase I

Cost:

- one time consulting and implementation fee of \$XXX,XXX (not to exceed (+10%) + expenses
- ongoing support and license fee of \$XXXX per month

Timing:

3 months elapsed time after data feeds are qualified

Phase II

Cost:

- one time consulting and implementation fee of \$XXX,XXX (not to exceed (+10%) + expenses
- ongoing support and license fee of \$XXXX per month

Timing:

9 months elapsed time after data feeds are qualified

LTT Project Proposal - PAYBACK/SAVINGS

Phase I:

A. Provide LTT Tools for aaa Plants

- \$ 3.00 million one time cash inflow from inventory reduction
- \$ 0.45 million/year working capital savings
- \$ 0.15 million/year freight and warehousing savings

B. Provide Seed money for Customer Linking Projects

- TBD – improved forecast accuracy

Phase II:

Leverage LTT tools for all bbb

- \$ 2.00 million one time inventory reduction - (10% reduction)
- \$ 3.00 million one time inventory reduction – rest (2% reduction)
- \$ 0.75 million ongoing working capital savings
- \$ 1.40 million freight savings (1% reduction)
- \$ 1.00 million warehouse savings (1 leased site)

Project NPV and IRR

	<u>NPV¹</u>	<u>IRR</u>	<u>Payback</u>
Phase I and II	\$ 26.3 million	593%	5.4 months

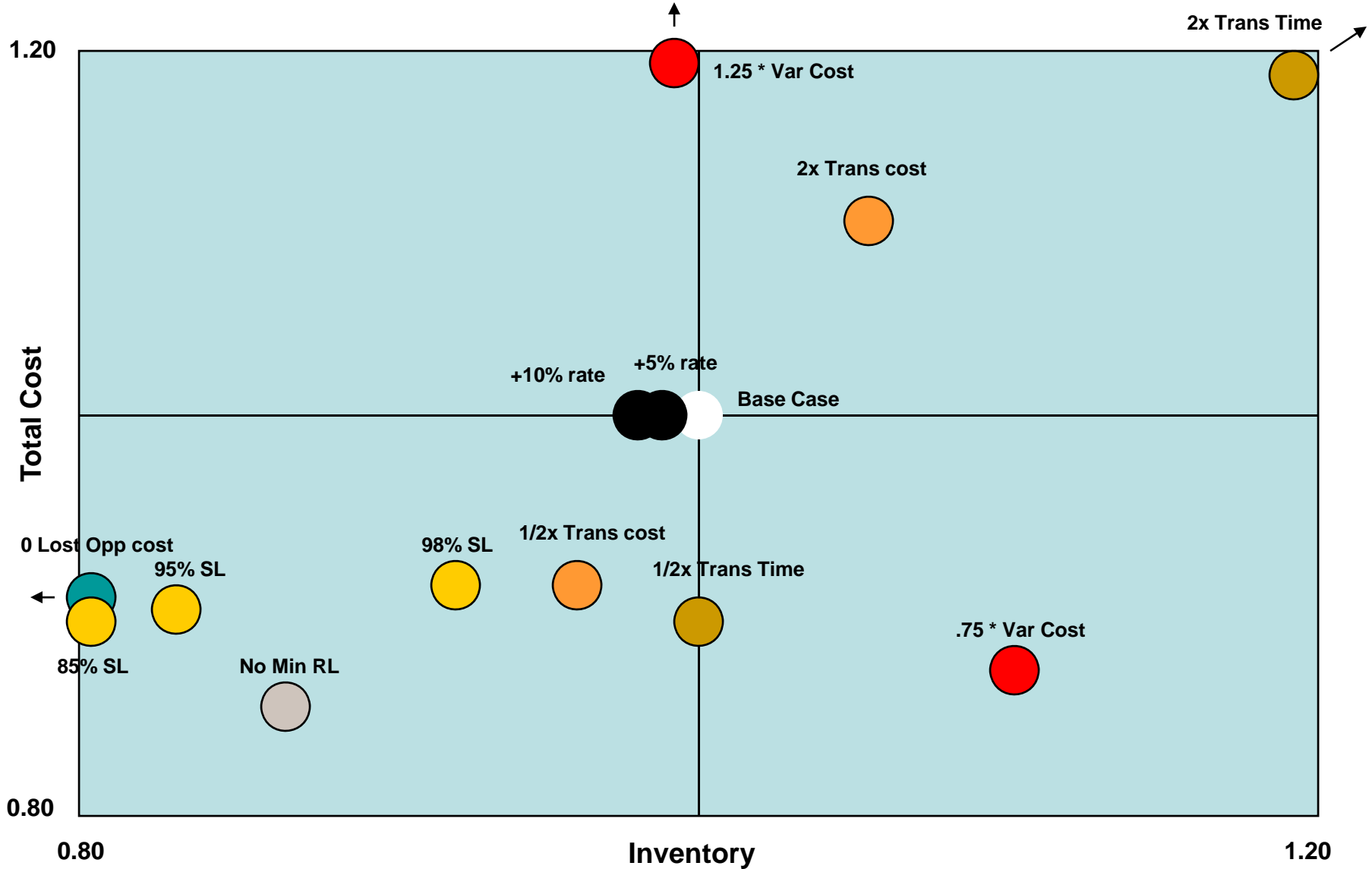
Notes: 1. 10 years at 10%/year

Conclusion

- **Lead Time Technology can help XXX achieve significant cost and inventory reductions**
- **Other identified improvement opportunities can be implemented internally immediately**
- **Proposed next step:**
 - XXXXXXXXXXXXXXXXXXXXX
- **Thank you to the organization/people for their support during the OA process!**

Appendix

Sensitivity Analysis



Inventory targets

Plant	FM	Cs	Ss	Ct	Fraction of Demand
Confidential content		15,463	3,763	67	0.15
		13,829	3,381	67	0.55
		25,572	3,850	151	0.00
		26,595	17,771	34	0.23
		16,816	11,021	34	0.22
		15,294	1,077	134	1.00
		25,019	3,798	151	0.00
		13,117	373	103	0.02
		43,174	335	154	0.10
		59,735	6,524	51	1.00
		43,573	1,293	103	1.00
		44,607	4,704	51	0.97
		57,104	13,463	46	0.52
		27,381	6,033	46	0.18
		13,354	0	366	0.03
		20,729	1,485	136	0.79
		19,665	2,538	102	1.00
		4,695	587	102	0.45
		24,716	6,239	68	0.74
		14,513	10,122	34	0.12
	18,679	12,449	34	0.16	
	19,869	2,593	102	0.15	
	14,571	9,149	22	0.23	
	17,060	203	154	0.03	
	14,792	9,193	22	0.40	
	6,319	699	66	1.00	
	2,061	50	194	1.00	
	2,440	59	194	1.00	

Network Recommendations

Plant	FM	Fraction of Demand
		1.00
		1.00
		1.00
		1.00
		1.00
		0.21
		0.79
		1.00
		0.35
		0.00
		1.00
		0.79
		0.21
		1.00
		0.15
		0.85
		0.67
		0.33
		0.30
		0.20
		0.80
		0.46
		0.52
		0.00
		1.00
		1.00
		1.00
		1.00
		1.00

Confidential content

Slow Moving Inventory

	<u>Peak</u>	<u>Days Over Peak</u>
Confidential content	0	139312
	0	8277
	0	1136
	2111	1116
	2536	1094
	0	622
	6234	619
	0	562
	0	476
	0	413
	0	388
	2211	314
	0	309
	39189	303
	0	265
	1800	262
	1847	229
	0	223
	10569	211
	1842	193
	4882	181
	2900	177
	1855	163
	2988	155
	0	146
	1840	143
	1095	140
	6948	128

Typical Reports

Inventory

Item	Plant	Location	Prod Date	Qty
Confidential content			5/15/05	30,000
Confidential content			12/1/05	20,000
Confidential content			7/1/05	900,000

Forecast

Confidential content

	Last Month	Jan 06	Feb 06	Mar 06
Confidential content	20,000	30,000	25,000	35,000
Confidential content	25,000	20,000	25,000	25,000
Confidential content	300,000	900,000	500,000	75,000
Confidential content	50,000	50,000	50,000	25,000

Recommendations

Item	Load	Location	Need by	Qty
Confidential content			2/15/06	1,667
Confidential content			2/1/06	3,334
Confidential content			2/1/06	1,667
Confidential content			2/1/06	1,667
Confidential content			2/1/06	1,667

Open Orders

Confidential content

Item	Want Date	Order Qty	Customer
Confidential content	5/15/06	30,000	Confidential content
	12/1/06	20,000	
	7/1/06	900,000	
	5/15/06	30,000	
	12/1/06	20,000	
	7/1/06	900,000	
	5/15/06	30,000	
	12/1/06	20,000	