City Of Houston Six Sigma Supply Chain Project

Final Presentation

July 26, 2004

University of Nebraska Lincoln

Why We are Here

- To Evaluate the City's Supply Chain
- Compare to Best Practices and Key Performance Indicators
- Give Recommendations for Improvement
- A Proactive Effort to Address City Audits

University of Nebraska Lincoln

The Six Sigma Process Methodology

DEFINE		Define Project Area
		Prepare for Project Execution
MEASURE	Step 1	Select Critical Characteristics
	Step 2	Determine Targets and Specifications
	Step 3	Validate Measurement System
ANALYZE	Step 4	Establish Baseline
	Step 5	Determine Improvement Objectives
	Step 6	Study Process Inputs
IMPROVE	Step 7	Determine Potential Causes
	Step 8	Quantify Key Input Settings
	Step 9	Formulate Implementation Plan
CONTROL	Step 10	Validate the Plan
	Step 11	Control Inputs and Monitor Outputs
	Step 12	Sustain the Change

Define

Initial Opportunity Definition

- Inventory Management and Control can be Improved
- Opportunities to Dispose Obsolete and Slow Moving Items
- SOP's Need to be Updated and Distributed
- Some Warehouses have Low Activity Volume
  - Review Committee Report Fall '03
  - Unannounced Northwest Region Audit Spring '01

Current Supply Chain Definition

- Procurement
  - *Strategic Purchasing Department (SPD)*
  - *Materials Management Branch (MMB)*
- Distribution
  - *12 Warehouses*
    - Inventory Value $ 10.1 Million (October ’03 Report)
      - Estimated Current Inventory Value $ 8.2 Million
      - Estimated Reduction of $ 1.9 Million since October
    - Average Turns 0.54 (by dollar CY ’03 Report)
  - *23 Storerooms plus 5 Chemical & Aggregate Sites*
    - Value $ 6.1 Million (March ’04)
- Customer (End User)
  - *Over the Counter, Stock Issue, Field Issue, PCard, PO*

Flowcharting

- Current Flowchart
  - *Begin with Standard Operating Procedures (SOP's)*
    - (Newly Updated from Operations in April '04)
  - *Updated with Observation*
    - Shows many manual Approval Processes
      - Excessive Faxing
      - Excessive System & User Interaction
      - "Z" ing Done by Warehouseman
- Future Recommended Flowchart
    - More Focus on Automation
      - Electronic Approval Processes
      - Electronic receiving (EDI/ASN)

Define Project Metrics

- Primary Project Metric
  - *Decrease in % of Obsolete Inventory*
    - November '03 Values $ 3.7M / $ 10M = 37%
    - Target: 73% Reduction to $ 1.0 M or 10% of Total Inventory
      - Best Practices: between 3% to 6% of Total Inventory
- Secondary Metric:
  - *Supply Chain Inventory Turns*
    - CY 2003 Average of 12 Facilities is 0.540 Turns /Year
      - High 1.46 – Patterson
      - Low 0.26 – Burress
    - Target: Increase Inventory Turn Ratio to 1.2
      - Best Practices: between 1.2 to 2.4

Measure

Focus Groups

- Asked Purchasing Groups for Their Opinion and Perception of the Current Supply Chain
- Strategic Purchasing Department (SPD)
  - *Communication with End Users on Specifications is Difficult*
  - *Believe Best Value Contracts may be More Effective than Low Bid*
  - *Forms Need To be Standardized across all Purchasing Departments*
- Materials Management Branch (MMB) Purchasing(OP)
  - *Spend Limits at $ 20,000 Instead of $ 25,000 May Cause Re-work*
  - *Need Electronic Approvals to Reduce Excessive Lead Times*
  - *Perceive Reverse Auctions are Time Consuming and May Not Always be Cost Effective*
  - *Other Buying Mechanisms Reduce Supply Chain Visibility*

    PCards, Other Division Buying Authorities: ($ 7,500 Waste Water, Utility Customer Service, $ 3,000 Utility Maintenance)

Inventory Category Analysis

- 9,710 Total Commodity Code Line Items
  - *5,427 Show 0 Usage (No Issue Request for Over 1 Year)*
    - 1,091 Non-Active (0 Usage and 0 On-Hand)
    - 3,488 (Operations has Targeted for Reduction)
      - Operations has Actively been Reducing During Study
    - 848 "E" Items ("E" Items are Defined as Critical Items)
      - Based on Recommendation - Targeted for More Reduction
  - *4,283 With Usage*
    - 857 "A" Items
      - Based on Recommendation - Outsource to Vendor or Store in Quadrant Distribution Centers (DC's)
    - 2,142 "B" Items
    - 1,003 "C" Items
    - 282 "E" Items
      - Note: 1,332 Parts were Used 5 or Less Times in the Past Year

Critical Item Definition

- Initial Definition for Critical Items was Created and Inventory was Evaluated
  - Initial Definition came from Inventory Review Committee (Nov 03')
- Critical Items further refined to focus on 3 main criteria shown below
  - Necessary to Respond to Public Calamity
  - Necessary Item that has Significant Lead Time for Delivery and Delays would have Significant, Negative Impact on Service
  - Items that are Custom Built for the City
- All Inventory Currently Classified as "E" should be Re-Evaluated to Further Tighten the Classification

Voice of the Customer Survey

- VOC Survey Distributed to End User's Anonymously to Evaluate the Customers' True Perception of the Supply Chain
  - *End User Respondents Came from Division and Audit Personnel*
- Questionnaire Allowed Respondent to Score Supply Chain Components of Purchasing, Warehousing, Storerooms, Quality, Communication Systems, and Customer Service.
- Questionnaire scales
  - *Customer Satisfaction Scale of "1" to "5", 1 for Highly Unsatisfied, and 5 for Very Satisfied*
  - *Importance to Job Scale of "1" to "5", 1 being Not Important and 5 being Very Important*
  - *Also Included Areas for Comments and Suggestions*
- Suggestions and Comments
  - More Training and Education on Supply Chain
  - More Visibility with Catalogues, Intranet Listings, System Training and Access
  - Viewed Waiting Time as Excessive
  - Using PCards to Avoid Timing Issues
- Top 3 Construct Ratings
  - Scores Indicate that Communication and Systems Processes Need to be Improved

Construct	Satisfaction	Importance
Communications	3.406	3.907
Perceived Quality	3.568	3.892
Storerooms	3.356	3.746

Analyze

Statistical Analysis

- A Linear Regression was Done to Identify Opportunities for Improvement
  - *Regression Indicates that Obsolete Inventory can be Reduced by*
    - High Order Activity
    - Lower Receipt Activity More Often
    - Data Shows that
      - Confirmation Issues have the Biggest Negative Impact
      - Receiving Lines have Large Positive Impact so this indicates
      - Over the Counter Issues have a Significant Effect
- Ordering Less, More Often, to Need (Just In Time) will Reduce Obsolete Inventory and Increase Turns
  - *Just in Time (JIT) May Include the Following:*
    - More Frequent Ordering and Replenishments of Less Quantity
    - Vendor Managed Inventory and or Single Source Vendors on Specific Products
    - Advanced Shipment Notification (ASN/EDI) and Electronic Data Interchange with Vendors
      - See Appendix A 50-53 for regression summary

Quality Function Deployment

- Quality Functional Deployment (QFD) Chart was Used to Identify Events that may be Effecting Processes Qualitatively
  - *X's are Tasks, Events, Programs, and Departments that May be Having an Effect on the Processes*
  - *Y's are Processes that Drive Business Cost and Effectiveness*
- QFD is a Visual Opportunity to See if Specific X's are Having an Effect on Multiple Y's
- This Tool can be Used by all to Focus on the Most Important X's or Events that Will have a Effect on the Most Processes or Y's
  - *Systems Shows the Biggest Opportunity*

Best Practices Warehouse

- Pre-Receiving / Yard Management
- Receiving / Put Away / Replenishment
- Order / Wave Management
- Picking / Packing / Shipping
- Measurements
- Inventory Management
- Technology
- General

Benchmarking

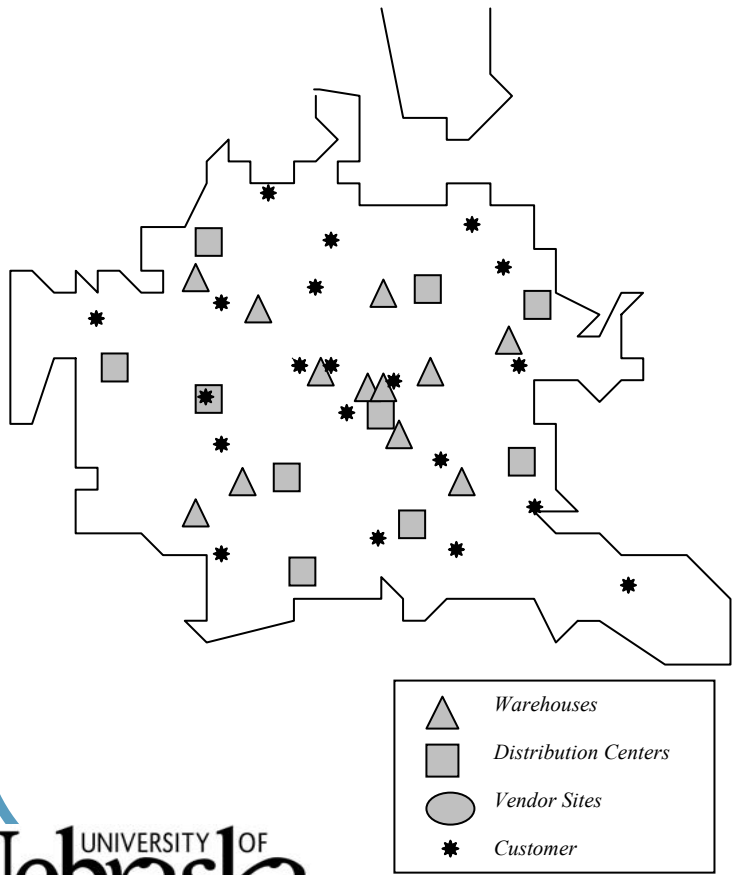
- San Francisco, Dallas, San Antonio, Denver, Omaha
- % Obsolete
  - *Denver – Reduced from 45% to 2-3%*
- Inventory Turns
  - *Dallas – 2*
  - *Denver – 4 to 6*
- PCards
  - *Not Utilized in San Francisco*
  - *Utilized in Denver but Very Strict*
  - *Utilized in Dallas for 0.5% of Purchases*

- Many More Details in White Paper

Improve

Current Supply Chain

Current Model



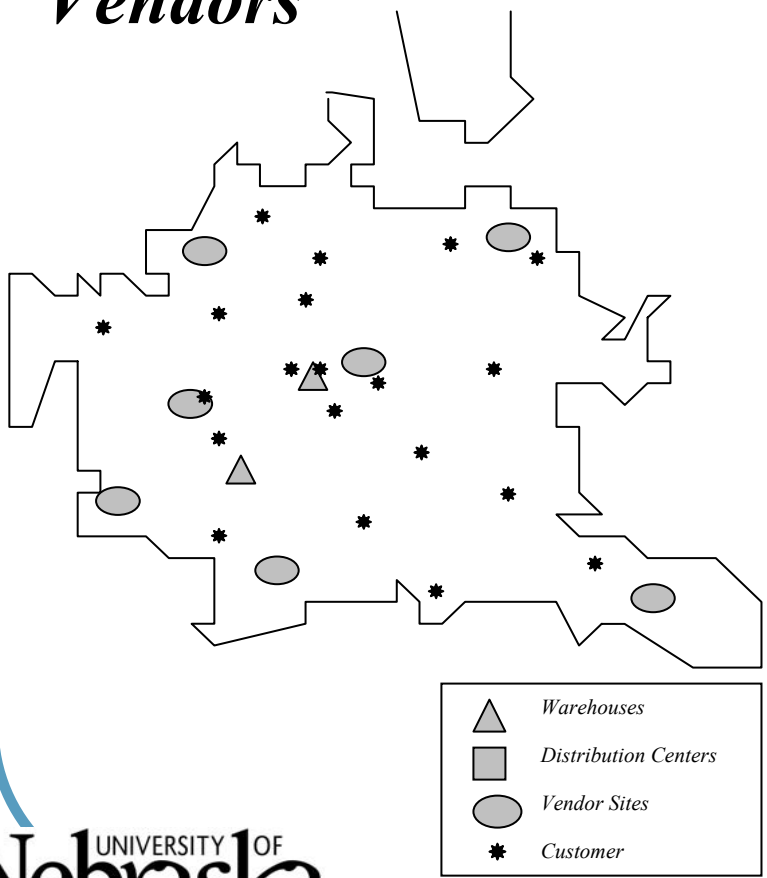
Operations	12 Warehouses / 28 Storerooms (DCs)
Policy	PCard for "Immediate Need" Buys, Contract Buys, Non Contract Buys
Investment	N/A
Service	Over the Counter, Some Delivery
Cost	$14.9M (with transportation) W/Facility Acquisition $39M
Advantages	Meet Some Customer Demand
Disadvantages	High $0 Issue Inventory, Turns Lower than 1.0

Supply Chain Quick Hits

- Procurement
  - *Evaluate and Audit Non-Contract PCard Buys*
  - *Perform a Spend Analysis*
    - Future Standardization
    - Best Value Definition with Vendor Compliance,
    - Cost Savings Opportunities
      - Teams Include Purchasing, Engineering, and End User Team Members
  - *Use Electronic Approvals and Forms with Current System Wherever Possible*
- Distribution
  - *Re-Evaluate Criticality of "E" Items*
  - *Sell or Dispose of Non Critical Obsolete Inventory*
    - Currently in process
    - Realize funds from sale for process improvement
  - *Evaluate SOPs with Future Flow Charts*
    - Some Items need Future System Enhancements
  - *Implement Current Key Performance Indicators*
- End User (Customer)
  - *Expand VOC survey*
  - *Purchasing and Distribution 101 Training*
  - *Have supplier and end user open house for large and or problem buys*

Supply Chain Model 1 *(0 – 6 months)*

2 Warehouse & Vendors



Operations	2 Warehouse, No DCs
Policy	V-Card, P-Card (Emergency Only), Contract, Non-Contract, Internet
Investment	Warehouse Management System (WMS), Consolidation, Delivery Operation Cost
Service	OTC, Delivery Service to Site
Cost	Additional Fleet Maintenance, New Racking, Project Manager
Advantages	Vendor Managed Inventory on Noncritical Fast Moving Items, Critical Items Better Managed, Reduced Labor, Reduced Facility Cost

Supply Chain Model 1 (0 – 6 months)

- Procurement
  - *Utilize Preferred Suppliers w/ Vendor Compliance*
    - Direct Vendor Buys May be More Costly (10-40%)
      - Aggressive Negotiations with Short Term Contracts 1-2 Years
    - Institute a VCard for Vendor Sourcing (May Combine with PCard)
    - Define Best Value with Vendor Compliance and Enforce
  - *Work with "ALL" City Purchasing Entities and to Standardize Procurement Forms*
  - *Standardize Buys as a Strategy for Best Value with Spend Analysis*
- Distribution
  - *Buy and Implement a Warehouse Management System (WMS)*
    - Must have Future Functionality to Integrate into ERP Systems
    - Create an Inventory Catalogue to Increase End User Visibility
    - Best Practices must be Performed in Conjunction with Implementation
  - *Reduce from 12 Warehouses to 2 in Conjunction with Implementing the WMS*
    - Reduction of Obsolete Inventory is Critical
    - Integrate Installation of Racking for Additional Facility Space
    - Use Key Performance Indicators to Evaluate Distribution Performance
- End User
  - *Communicate to End User of Improvements from Procurement and Distribution in Effort to Improve Customer Service*

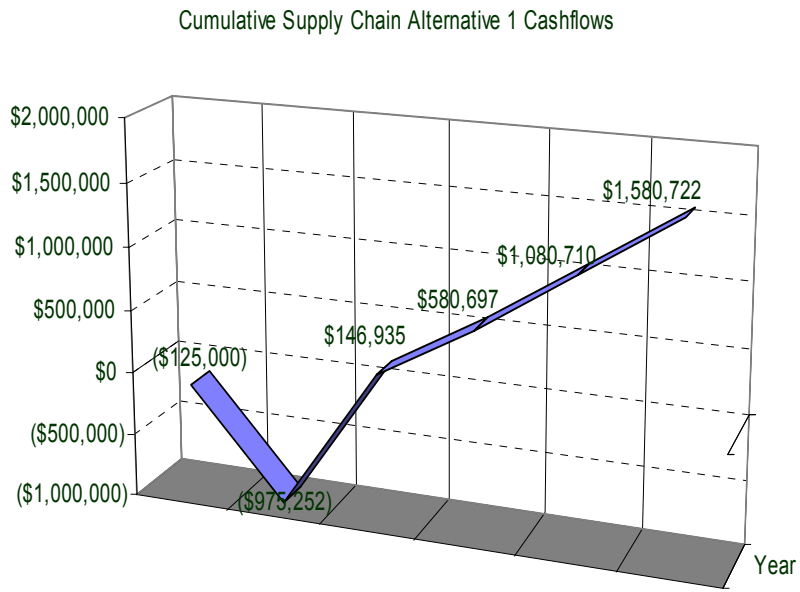
Cash Flow – Supply Chain Model 1

ROI

- Investment $250K Infrastructure, $750K Software & Service, $ 340K Ongoing
- Cost Savings - $3.5M over 5 years (1.580M) net
- 2.5 year Payback
- Facility Space Reduction 90K sq ft Reduced
- 20% Labor Reduction

Assumptions

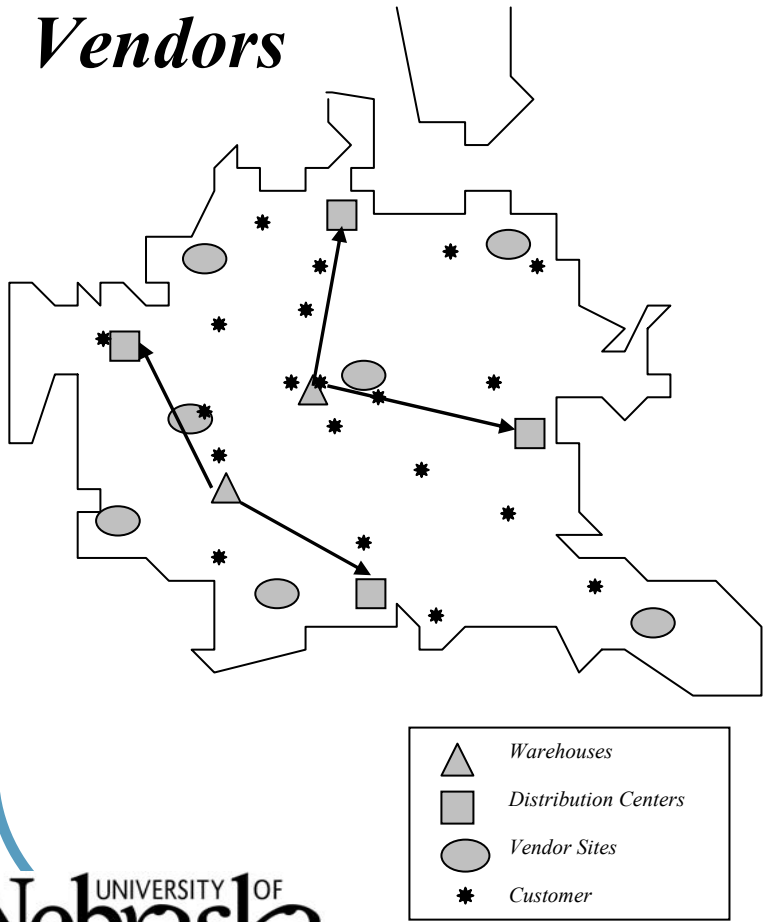
- Does not Include Facility Sales Acquisition Cost at $ 39 M
- SCM1 - Does not Include Possible Increase in Vendor Unit Cost



	0	1	2	3	4	5
Year	($125,000)	($975,252)	$146,935	$580,697	$1,080,710	$1,580,722

Supply Chain Model 2 *(6 – 24 months)*

2 Warehouse, DCs & Vendors



Operations	2 Warehouses / 4 DCs
Policy	P-Card (Emergency Only), Contract Buys, Replenish to DCs
Investment	WMS
Service	Over the Counter, Delivery Service, Cross Docking
Cost	System Maintenance, Labor Reduction, Project Manager, Rack Alternatives
Advantages	Meets Customer Demand, Can Roll in Storerooms, Can Take in the Whole City
Disadvantages	System Maintenance, System Complexity

Supply Chain Model 2 (6 – 24 months)

- Procurement
  - *Evaluate Preferred Suppliers w/ Vendor Compliance*
    - Use Performance Information to Evaluate which Volume Needs to Left with the Vendor and which Volume Should be Stored at the Distribution Centers
  - *Define Best Value with Vendor Compliance*
    - Vendor Compliance Enforcement
- Distribution
  - *Roll out WMS implementation to 4 Quadrant DCs (WMS)*
  - *Expand to 2 Warehouses and 4 Quadrant Distribution Centers*
    - Incorporate Storeroom Volume into Distribution Centers
      - Possibly Convert Storerooms into Distribution Centers
    - Reduction of Obsolete Inventory is Critical
    - Integrate Installation of Racking for Additional Facility Space
  - *DCs will Hold Fast Moving Volume*
    - Less Expensive than Vendor Direct
    - Use Key Performance Indicators to Evaluate Performance against Vendor Managed Inventory
- End User
  - *After Implementation Perform VOC Surveys*
  - *Promote Feedback on Higher Customer Service*

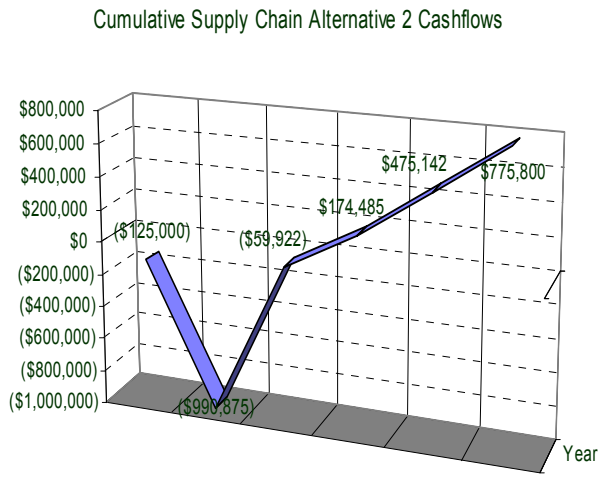
Cash Flow – Supply Chain Model 2

ROI

- Investment $250K Infrastructure, $750K Software & Service, $ 340K Ongoing
- Cost Savings - $2.99M over 5 years (775K) net
- 3.5 year Payback
- Facility Space Reduction 56K sq ft Reduced
- 10% Labor Reduction

Assumptions

- Does not Include Facility Sales Acquisition Cost of $ 39 M
- SCM2 - Does not Include Possible Savings in Vendor Unit Cost for Strategic Buys



	0	1	2	3	4	5
Year	-125000	-990874.6936	-59922.42056	174484.9689	475142.3583	775799.7478

Transition Plan – Short-Term

- Procurement
  - *Negotiate Vendor Contracts for Best Value*
  - *Identify the Inventory to be Serviced by Vendor*
- Distribution
  - *Designate and Hire a Project Manager and Team*
  - *Continue Reducing Non-Critical Items*
  - *Evaluate which Commodity Codes will be Serviced by Vendor*
  - *Buy and Implement WMS in 6 Months*
  - *Begin Delivery service to sites*
  - *Begin Closing Facilities*
    - Close by Increasing Order Volume
    - Close at a Rate of One per Month
    - Buy and Re-use Racking Options for Space Utilization
  - *Move to Recommended Flowcharts and Best Practices*
- Customer Service
  - *Have Key End Users Visit Facilities after Implementation*
  - *Evaluate Customer Service with VOC Survey after Implementation*

Transition Plan – Long-Term

- Procurement
  - *Evaluate Vendor Performance and Customer Request to Identify which Volume Should be Rolled Back into the Distribution Centers*
    - Work with Operations to Increase Ability to Service Customer
  - *Begin Enforcement of Vendor Compliance*
- Distribution
  - *Identify Quadrant Facilities*
    - Include reducing transportation costs in analysis
  - *Begin Consolidating Storeroom Volume into Quadrant Distribution Centers*
  - *Continue Implementing WMS into DC's*
  - *Continue Reducing Non-Critical Items from Storerooms*
  - *Buy and Re-use Racking Options for Space Utilization*
  - *Advertise Ability and Service to Distribute Other City Operations-Move to City's Strategic Warehouse Operations*
- Customer Service
  - *Have Key End User Visit Facilities after Implementation*
  - *Evaluate Customer Service with VOC Survey after Implementation*
  - *Expand Customer Base*

Control

Key Performance Indicators

Recommended KPIs

Category	Metric	Definition
Service	Turns	Annual $ Issued Divided by Average
Service	% Obsolete Inventory	# of Commodity Codes (CC) that have not been Issued for over 1 Year Divided by the Total # of CCs
Cost	Cost / Pick	Total Labor Cost Divided by Total # of Picks
Cost	Cost / Order	Total Labor Cost Divided by Total # of Orders
Asset Management	Facility Utilization	# of Pallet Positions Utilized vs. Available
Future		*Other KPI*
Transportation	Shipments / Division	Track the Number of Deliveries to Site for Each Division
Inventory	Velocity	Annual Revenue / Daily Overhead
Labor	% Productivity by Area / Task	Divide Actual Labor Hours by the Efficiency Standard for the Task and Track by Employee
Labor	Picks / Hour	Number of Pick Issues and Divide by Pick Labor Hours
Purchasing	PCard Spend by Category	PCard Spend by Contract, Non-Contract, and Emergency Usage vs. Total PCard Spend

Replenishment Policies

- Warehouses Contain
  - *Standard Items - 30 Days of Supply*
  - *Emergency Items*
    - Greater of 6 Months or Lead Time
- DCs Contain 10 Days of Supply in Supply Chain Model 2
  - *Vendor Must Meet 2 Day Delivery Cycle*

Vendor Compliance Manual

- Best Value vs. Low Bid
- Cost for Non-Compliance
- On Time Delivery
- Update the Plan for New Products and Commodity Codes
- Return to Vendor (RTV) Policies
- System Visibility of their Catalogues
- Standardization Focus for Purchasing

- Sample Manuals Available

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