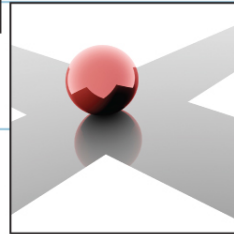


BEST PRACTICES



FOCUS



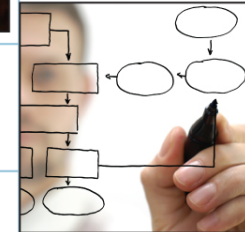
INNOVATION



TECHNOLOGY



RESPONSIBILITY

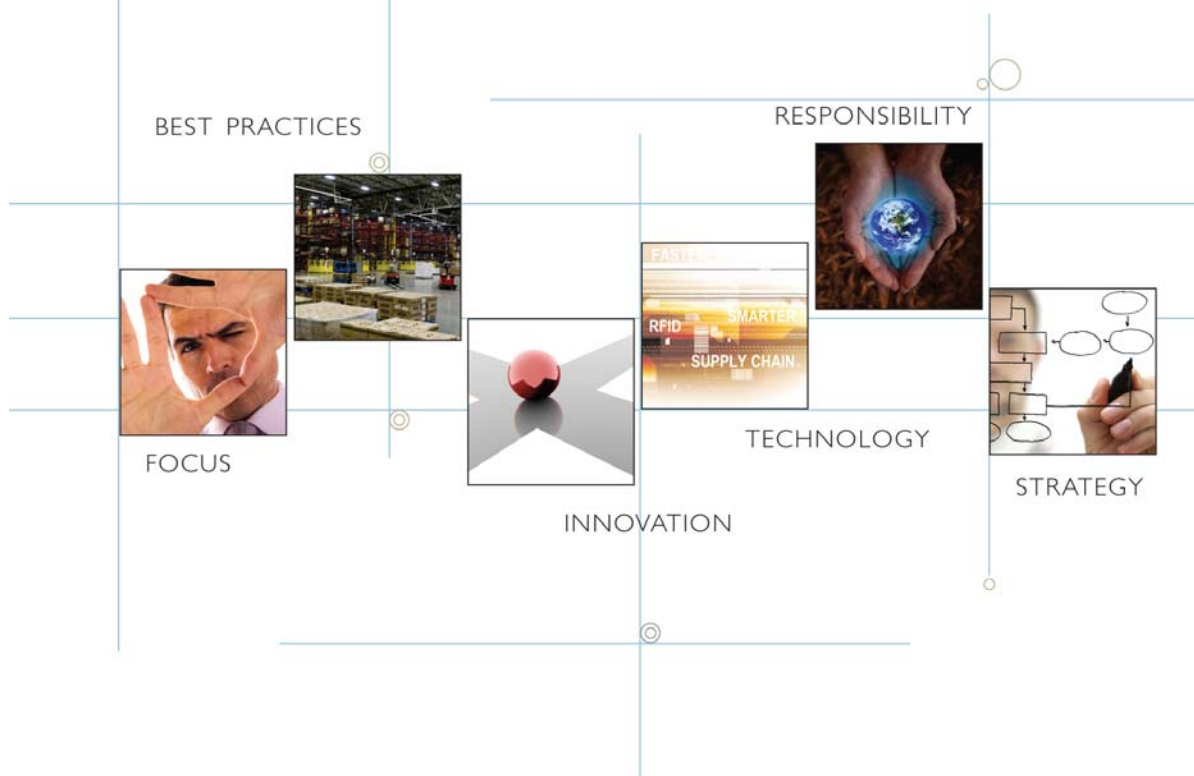


STRATEGY

**Material Handling  
& Logistics  
CONFERENCE**  
SPONSORED BY HK SYSTEMS  
september 14-17, 2008 ■ park city, utah

# Filling That 5 Pound Can: Pallet and Cargo Load Optimization Software

Track 5 Session 5



## William J. Rehring

**President Director of Operations  
TOPS Engineering Corporation**

**[Bill@TopsEng.com](mailto:Bill@TopsEng.com)**

**(972) 739-8677**

# Abstract



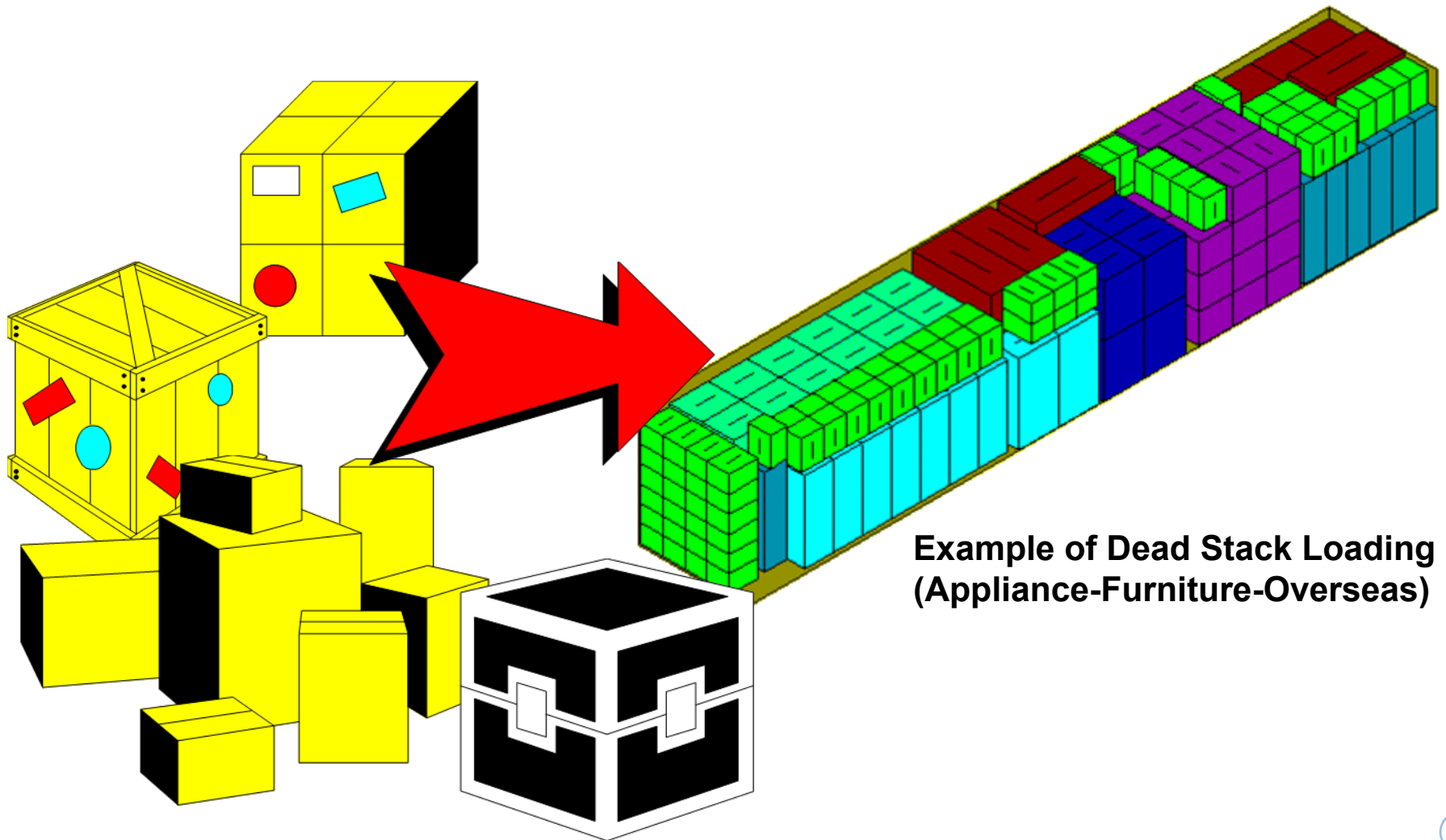
- **Anyone who has ever poorly loaded a moving van will appreciate the art and science of this intelligent software. As global material handling continues its drift toward multi-SKU order fulfillment, the quest for density and logic in load building becomes critical. This tutorial and demo will illustrate the next generation solution of pallet building and container loading optimization.**

# Agenda



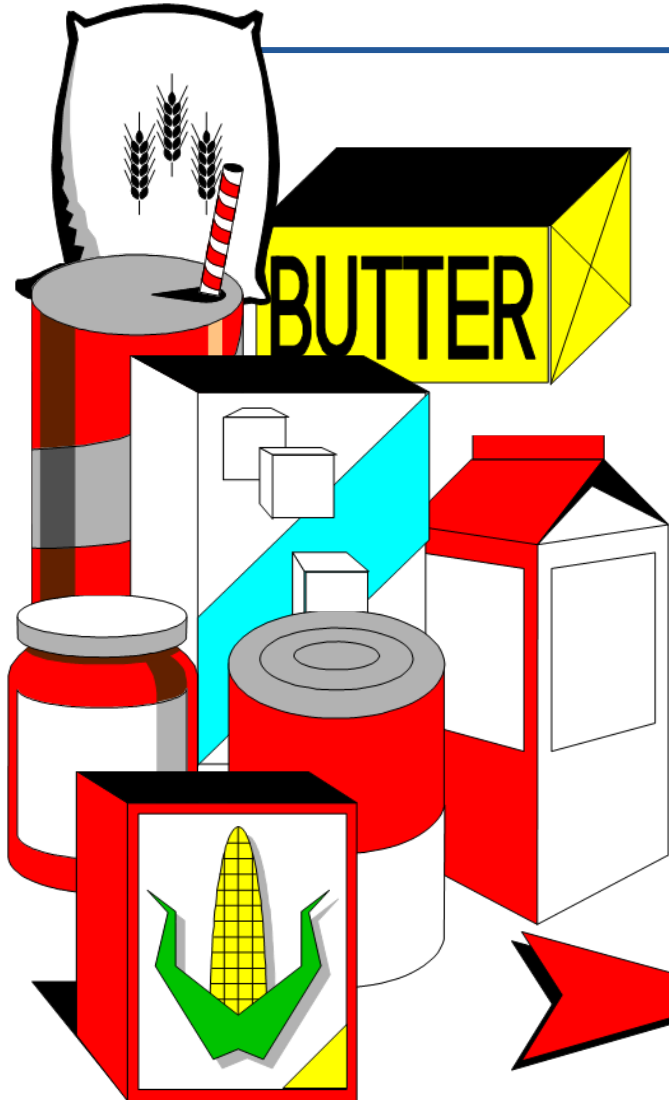
- **What is mixed cargo loading and optimization**
- **Consideration in optimizing mixed loads**
- **Benefits of mixed load optimization**
- **Successful implementations in the industry**
- **Mixed pallet optimization and automation**
- **Some considerations ....**
- **Conclusions**
- **Key Takeaways**

# What is Mixed Cargo Loading?

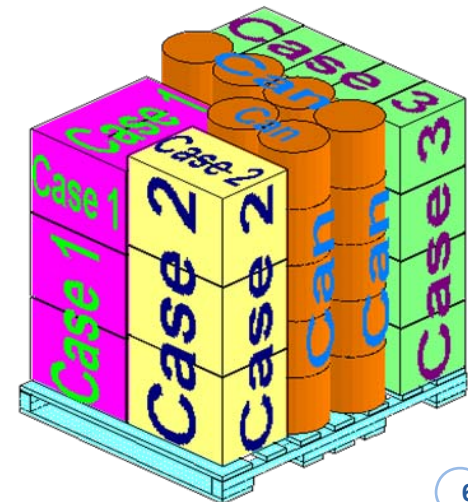
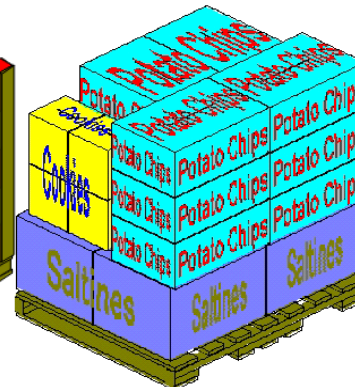
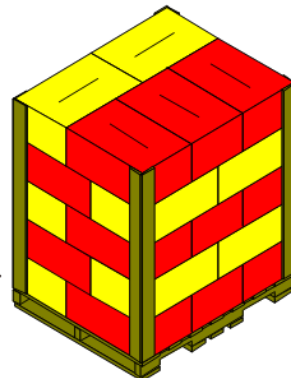


**Example of Dead Stack Loading  
(Appliance-Furniture-Overseas)**

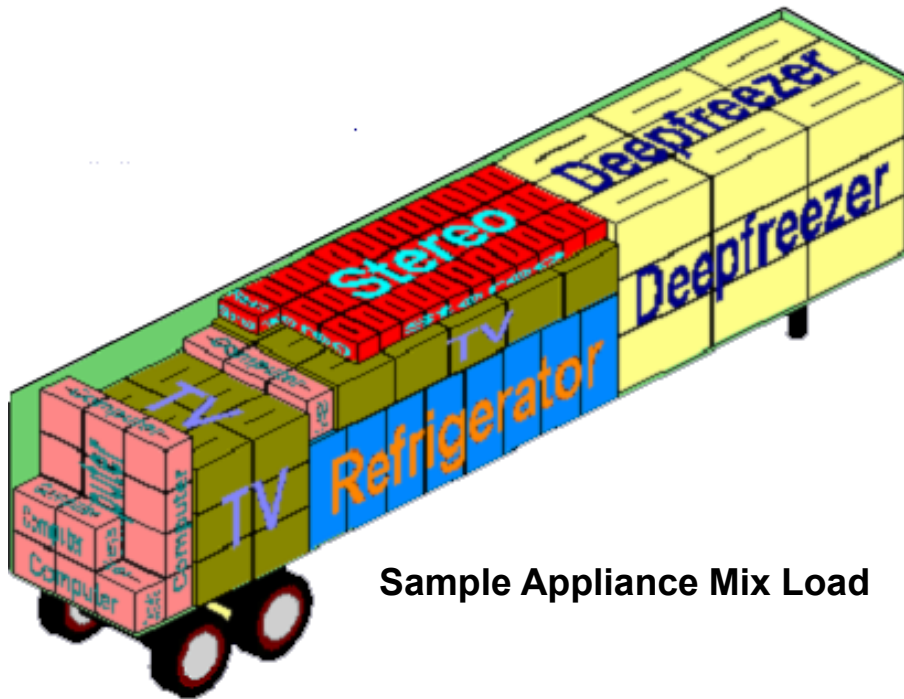
# What is Mixed Cargo Loading?



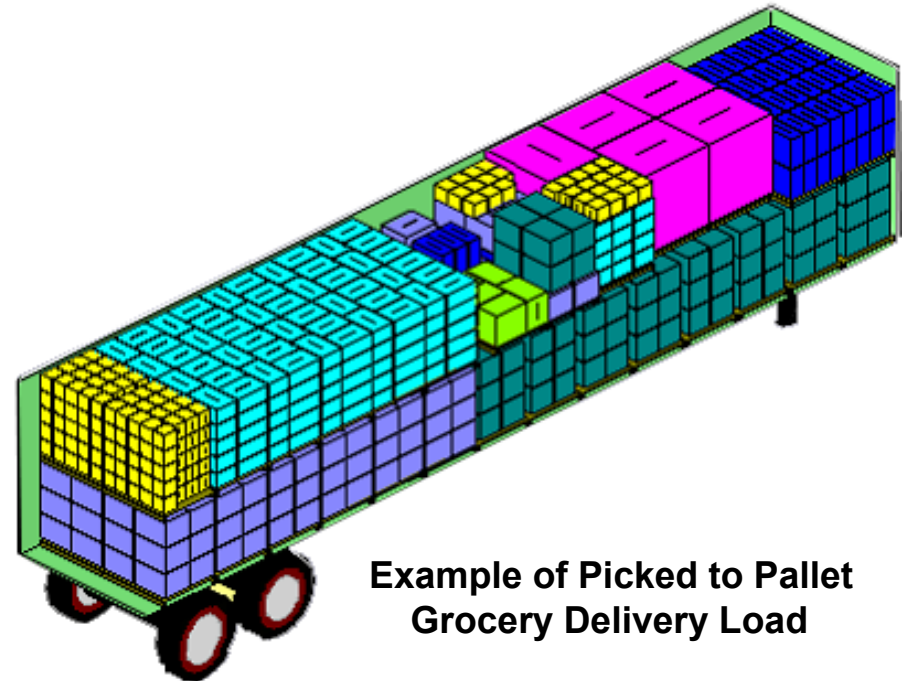
**Grocery Order Pick Load  
(Case-to-Pallet-to-Truck)**



# Software Examples of Mixed Cargo Loading



Sample Appliance Mix Load



Example of Picked to Pallet Grocery Delivery Load

# Logic and Loading Rules (Truck)

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- **Keep Like Items Together**
- **Big on Bottom...Lighter/Smaller on Top**
- **Maximum Weight Above Each SKU**
- **Orientation within Vehicle (4-way vs. 2-way)**
- **Stack Matrix (What Can Stack on Top ?)**
- **Labeling Orientations**
- **Allowed vs. Preferred Dimensions Vertical**
- **Palletized First or Dead Stack or Mixed**

# Logic and Loading Rules (Truck)

---

- **Bundled or Pull Stock by Groups**
- **Axle Weights and Load Balancing**
- **Center of Gravity Calculations**
- **Trailer Set-Up (Straight/Reefer/Decking)**
- **Delivery Discharge (Rear or Side Doors)**
- **Drop Shipments, Load Priority or Stop-Offs**

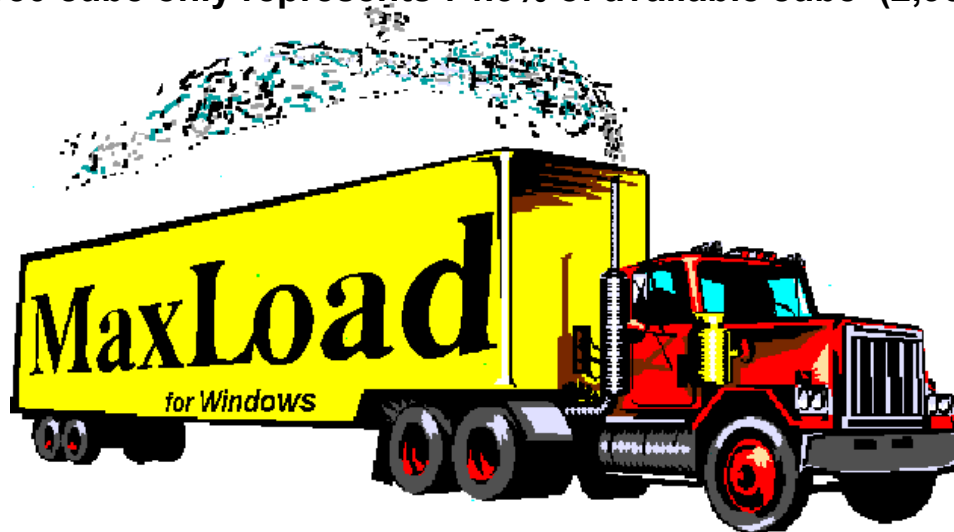
# The “Challenge”



A large paper products company targets for 2,950 cube in the truck trailer.

**This is accepted as a “Full Load”**

However, this 2,950 cube only represents 74.3% of available cube (2,950 of 3970 water cube)



It is estimated that with load placement software, the cube yield could increase 82% to 85% cube efficiency

## *The Benefits*

Every 1% increase in cube efficiency translates to \$780,000 savings

# Results of Cube Audit / Proof of Concept



**When compared to in place SCM/routing software recommendations,  
load planning / optimization software yields**

**9.33 % more case loaded  
with  
8.71% increase in cube utilization**

**When compared to actual loads organized and sent,  
load planning / optimization software yields**

**4.75% more cases loaded  
with  
4.39% increase in cube utilization**

# Benefits of Computerized Load Plans



- **Cost Savings**

- **Increase cube yield = 5% to 17%**
- **Step-by-Step graphical loading instructions**
- **Enforcement of load rules and damage abatement**
- **Design load plans earlier in the process (CSR)**
- **Reduce re-works or “It does not fit” problem**
- **Allows for “fill items” to max out loads**
- **Reduce time to load a truck**

# Benefits of Computerized Load Plans



- **Know Before You Ship**
  - **Answers “Does it fit” at order receipt**
  - **Provides time to react to flesh out load**
  - **“Is load balanced?”**
  - **Any problems with weight outs**
  - **Determine axle weight and rearrange load**
  - **Eliminate staging areas in warehouse**

# Savings Analysis for Sea Vans



## Yearly Transportation Costs

Yearly Truckloads	% MaxLoad Pro Savings			
	8%	10%	15%	20%
500	40,800	51,000	76,500	102,000
1000	81,600	102,000	153,000	204,000
2000	163,200	204,000	306,000	408,000
5000	408,000	510,000	765,000	1,020,000
10000	816,000	1,020,000	1,530,000	2,040,000
20000	1,632,000	2,040,000	3,060,000	4,080,000
50000	4,080,000	5,100,000	7,650,000	10,200,000

## Assumptions:

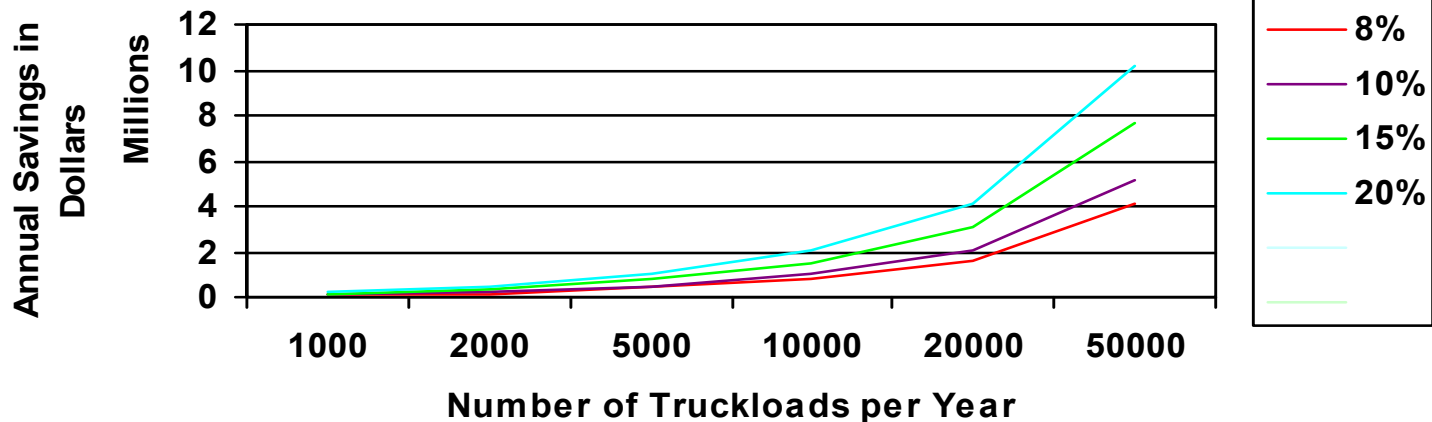
Average Miles / Load 750  
 Average Cost / Mile \$1.36

## Containers

Average cost \$4,200

It is not long before load planning software pays for itself in real savings

## Saving Scenario for Truckloads



# Success Stories



- **Major Appliance Manufacturer**
  - Reduced transportation cost 4.5% across the board
  - Enforced loading rules reduce damage claims
  - Reduced truck loading times by 18% with step-by-step load diagrams
  - Improved customer relations with speedier order processing and on-line communications
- **Largest Hot Water Heater Manufacturer**
  - Integrated with in-house SCM software & Oracle database
  - Reduced total transportation costs by over 10%
  - Eliminated need for LTL loads by ensuring ahead of time “It will Fit !!”
  - Training of loading personnel significantly reduced
  - Batch processing of EDI orders via “Black Box” server
  - Secured very “cost conscience” customer with reduced product costs

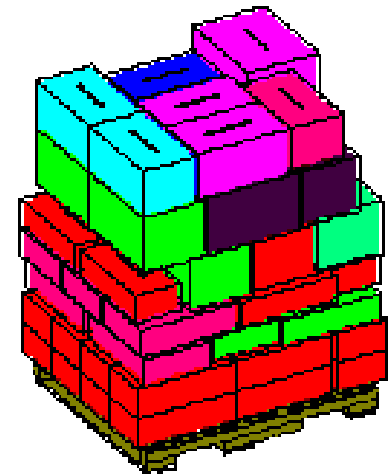
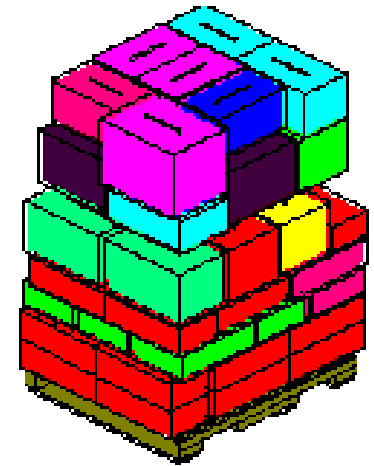
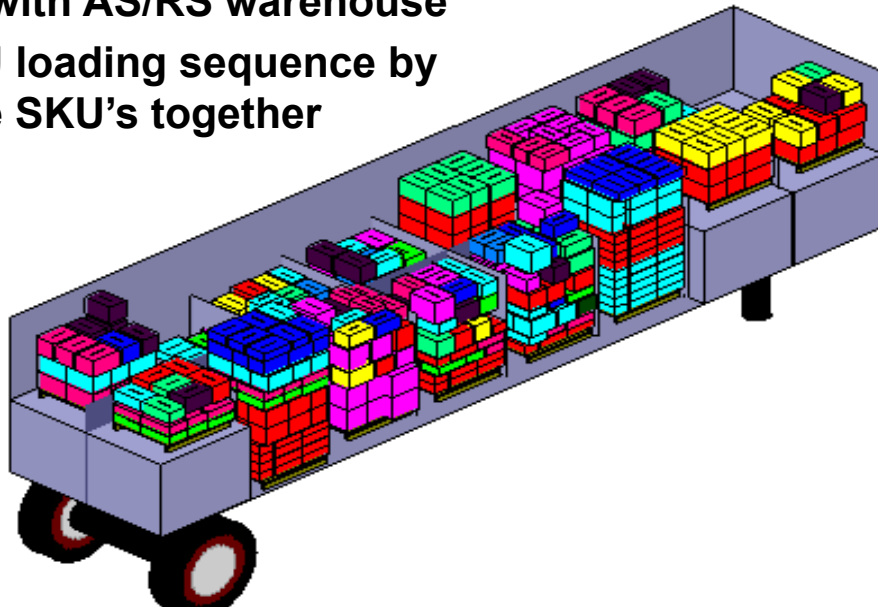
# Success Stories

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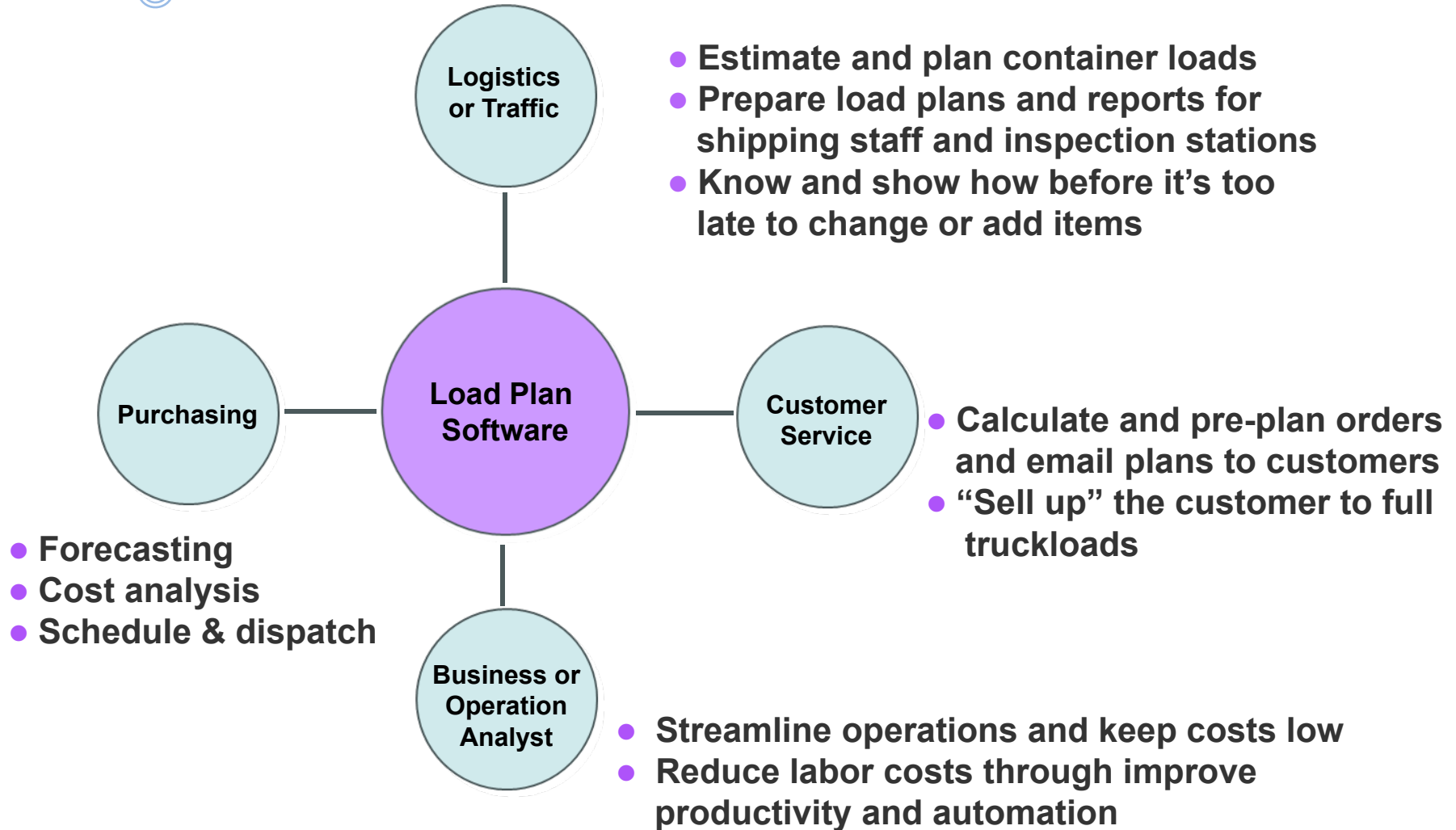
- **Major Building Products Producer**
  - Fully integrated with Oracle and Web methods (TCP/IP sockets)
  - Unix based main processor with client server for on site use
  - Produced load plans that reduced loader OSHA injury claims
  - Dramatically reduced pallet & truck build times
  - All orders cube/weight optimized at time of order processing
- **Largest Welding Machine / Supplies Manufacturer**
  - Load plans led the way for China expansion
  - Integrated with customer SAP software
  - Provided exact bill of lading and placement for overseas vans
  - Reduction of errors, paperwork and steps needed to process order
  - Load plans rules implemented to match exacting clients needs

# Beverage Distribution

- Automatically convert from sales orders to pallet orders
- Generate pallet orders by stop.
- Mix orders/stop only if needed to fit on truck
- Assign and optimize pallet orders for side bay trucks and end loader trucks
- Load pallets by stop on trucks
- Generate pallet orders to maximize use of Layer-Picker in combination with AS/RS warehouse
- Optimize SKU loading sequence by keeping same SKU's together



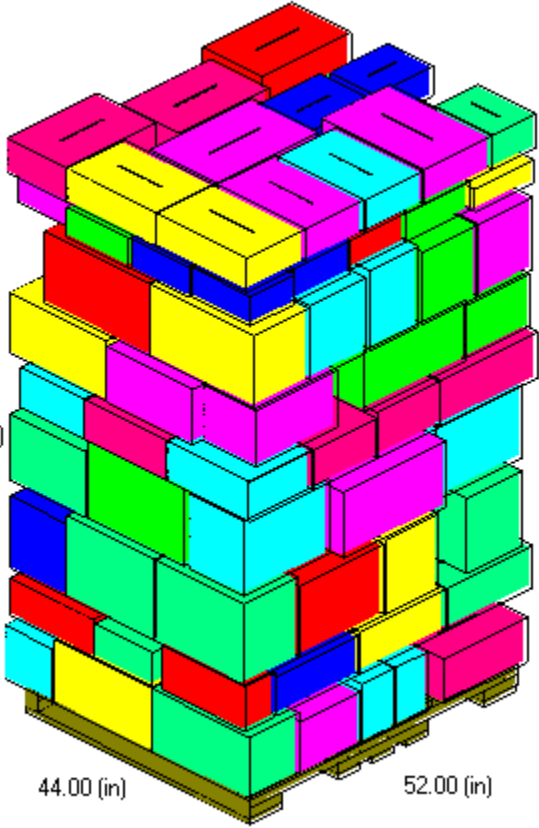
# Who Can Use Load Plan Software



# What is Pick to Pallet Mixed Loading?

SKU	Dim
863079	14.20x11.30x6.90
803710	10.60x8.20x4.60
806395	16.00x11.00x7.80
806454	11.50x8.40x4.60
812433	15.50x12.10x8.30
814873	15.60x10.50x6.40
816064	16.20x10.80x5.10
816088	12.20x9.80x3.90
816747	16.30x10.70x5.20
819444	15.60x10.00x10.90
819454	15.60x10.00x10.90
823768	16.00x10.80x3.60
823770	15.80x10.50x5.00
826683	15.10x10.00x5.70
830053	10.80x5.00x8.00
834064	18.50x12.30x5.20
834885	15.60x10.50x6.40
837223	16.10x10.50x5.10
837238	16.10x10.50x5.10
837296	16.10x10.50x5.10
837312	17.50x8.90x11.90
837334	13.30x10.30x11.30
839986	14.80x9.70x8.50
841210	16.00x10.60x5.00
841463	20.40x10.20x5.90
844361	18.90x10.00x10.80
844368	18.90x10.00x10.80
847829	18.50x9.40x9.10
848566	17.50x12.80x7.00
850632	13.30x10.30x11.30
850637	13.70x10.30x9.90
850639	13.70x10.30x9.90
850643	17.50x8.90x11.90
850655	17.50x8.90x11.90
853542	14.80x11.50x6.10
853719	16.30x10.70x5.20
856481	16.10x10.50x5.10
859018	15.00x5.60x6.60
859040	17.50x11.80x9.00
859055	19.40x10.30x11.10
859062	17.50x11.80x9.00
859065	19.40x10.30x11.10
860530	9.50x5.50x9.50
861465	17.50x8.90x11.90
861483	10.80x5.00x8.00
862888	13.40x11.40x4.40
862890	13.40x11.40x4.40
862906	18.90x10.00x10.80
862931	15.60x12.00x8.20
862939	18.90x10.00x10.80
863060	14.20x11.30x6.90
800733	10.60x8.00x5.20
863082	14.20x11.30x6.90
863090	15.50x11.90x8.30
863116	17.60x12.00x7.90
863118	17.60x12.00x7.90
863236	15.40x10.10x11.20

Over 100 different SKUs on one pallet



GMA Notched

# Why Load Plan Automation?



- **Absolute precursor to Robotic Pallet Building**
- **Integrate with AS/RS Warehouse pick routine**
- **Increase cases handled per hour (productivity)**
- **Chicken and Egg situation**
- **Convert sales order to precise pallet orders**
- **Accurately calculate how many pallets and or trucks are needed**
- **Follow strict loading and stacking rules**
- **Provide exact SKU loading sequence and location**

# Logic and Loading Rules (Mixed Pallet Build)

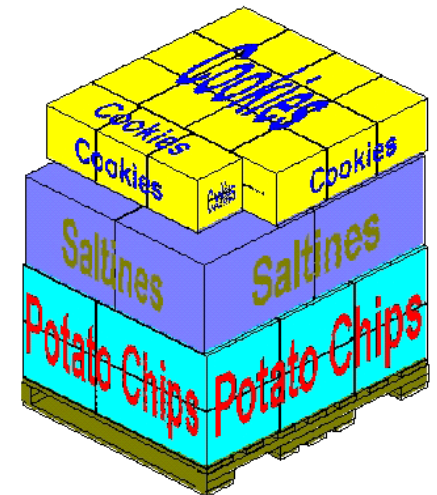
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- **Stronger / Heavier SKU on Bottom of UL**
- **Pallet Stability**
- **Box Labeling and Pallet Tags**
- **Verboten Loads (e.g.. Caustics with Acids)**
- **Different Pallet Size for Classes of SKU's**
- **Pick Sequence from Warehouse**
  - Dictated by warehouse layout or
  - Dictated by more efficient/stable loads

# Manual vs. Automatic Pallet Picks

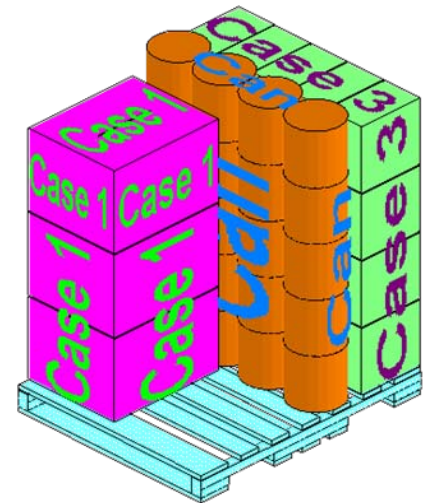
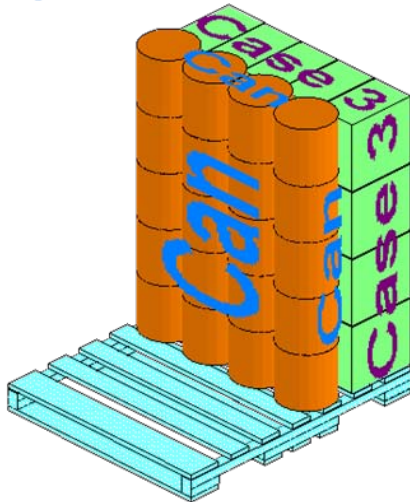
Software can be used to enforce pick rules, look globally for each order and follow sequence of full loads then mixed layer loads then remaining mixed pallet

Manual Pick	GMA Notched	Auto Pick
1.18	Unused Floor (in)	1
46 (83%)	Cargo Cube (Ft3)	49 (88%)
76.50	Cargo Weight (lbs)	88.50
<b>Load Summary</b>		
4	Cookie	15
8	Potato Chips	10
6	Saltines	4
18	<b>Total</b>	<b>29</b>



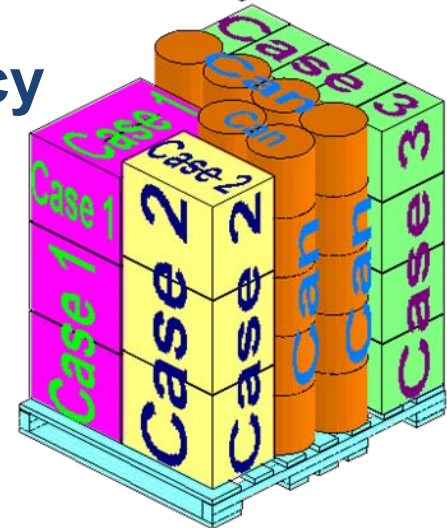
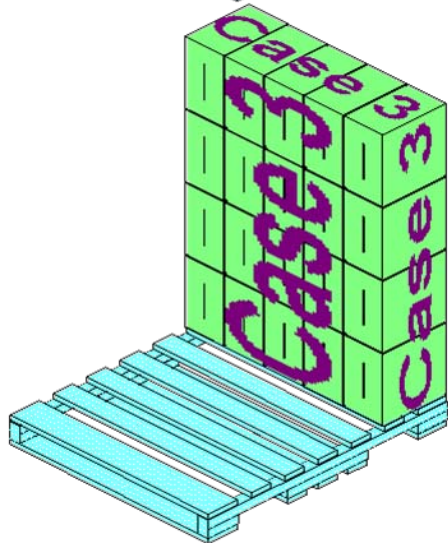
**Results in Less Pallet Loads to Build per Order**

# Exact Sequence of Pick Provided



**Details of the exact pick sequence that provides best load cube efficiency and most load stability**

**Provided as printed document or real time screen display at pick station or as data to EMS system**



# Implementation Concerns for Computerized Load Plans

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- **A “Rule is a Rule” forced compliance**
- **“Know Thyself” Do you really know your product dimensions and weights?**
- **How to interface (to what degree) to your existing SCM system**
- **Cube Audit Trail—Compare before to after**
- **LTL shipments and how to consolidate to build full truckloads**
- **Understanding and incorporating all business rules**

# Implementation Options

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- **“Basic”**
  - Usually a stand alone or LAN system to provide proof of concept and verify data, estimate overall savings to be realized
- **“Enhanced”**
  - Use within organization via WAN system to all warehouses, interface to WMS/ERP, usually many licenses
- **“Automated”**
  - Direct interface (black box) to customer order dept., production scheduling, transit planning and on line load building with little if any human coordination required

# Key Takeaways

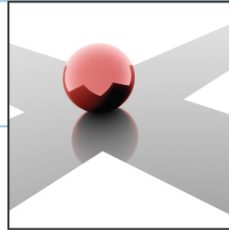
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- **COST SAVINGS AVAILABLE with LOAD PLANS**
  - Cube Savings = Less Trucks / Pallets
  - Less Manpower = Greater Productivity
  - Reduced Mistakes and Product Damage
- **Process Improvements**
  - Better CSR Productivity
  - Know Load Plan at Order Taking
  - Include Load Plan w/ Manifest Documents
- **Know Your Operations**
  - Existing Cube Utilization of Trucks & Pallets
  - Accurate Product Dimensions & Weights
  - Load Rules Unique to Your Business

BEST PRACTICES



FOCUS

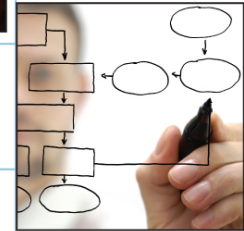


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# *Carpe Diem* Questions?