Webinar: Optimizing Packaging’s Impact in the Supply Chain

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Supply Chain Management Series (SCMS) Series
Optimizing Packaging's Impact in the Supply Chain
Sept 1-2, 2015 | Georgia Tech Global Learning Center
www.scl.gatech.edu/opisc
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Introduction
Packaging for the Supply Chain Professional

Supply Chain Professionals need to understand packaging’s important impacts on the supply chain

- Transportation Packaging for Supply Chain
- Identify Opportunities for Improvement
- Apply to Your Own Situations
Introduction
Packaging for the Supply Chain Professional

- Sustainability meets cost reduction
  - Cost savings is the business driver
- Go where the money is
  - The largest breakthroughs are in logistics
  - Leverage packaging design for system cost reduction
- Damage, Logistics Costs, Customer Experience
  - Three major motivators
Introduction
Packaging for the Supply Chain Professional

- Workshop format
  - Examples, pictures, case studies, references
- Flexibility to discuss questions and applications
- Small group discussions
- Pre-seminar prep work, real-life situations
- Expectations - what to get out of this seminar?
# Packaging’s Impact on the Supply Chain

## DAY 1 AGENDA
- Introduction
- Transport Packaging Basics
  - The Package Unit
  - Design, Material, Performance
  - Transportation & Distribution
  - Total Costs
- Where Things Go Wrong
- Case Studies / Applications
  - Examples and Exercise

## DAY 2 AGENDA
- Damage
  - Hazards in Transportation
  - Defining the Environment
- Cost Reduction
  - Strategies for Optimization
- Sustainability
- Case Studies / Applications
Transport Packaging Basics

The Package Unit
Transport Packaging Basics
Packaging Testing

- **Real life shipments**
  - Problem with “let’s try it”?
  - Singular event, was it a smooth or rough journey?

- **Advantages of Laboratory Testing**
  - Save time – a lot of information in short time
  - Save money – less than fuel, driver and equipment costs
  - Know what the packaging/product has been subjected to
  - Testing replicates a harsh environment: controlled, predictable
  - Identify and isolate what causes problems
Impact of Packaging on the Supply Chain
Holist View of Packaging

- Supplier
  - Resources
  - Packaging
  - Disposal
  - Transportation
  - Conserved Resources

- Manufacturing
  - Resources
  - Packaging
  - Disposal
  - Transportation
  - Reduced Packaging Material

- Storage Warehouse
  - Resources
  - Packaging
  - Disposal
  - Transportation
  - Less Storage and Handling

- Distribution Center
  - Resources
  - Packaging
  - Disposal
  - Transportation
  - Less Fuel and Reduced Emissions

- Retail Store
  - Resources
  - Packaging
  - Disposal
  - Transportation
  - Minimized Waste

- Customer
  - Resources
  - Packaging
  - Disposal
  - Transportation
  - Damage
Transport Packaging Basics
The Seven Major Hazards

- Manual Handling
- Mechanical Handling
- Warehouse Stacking (Static)
- Vehicle Compression (Dynamic)
- Vehicle Vibration
- Horizontal Impact
- Environmental conditions
## Seven Major Distribution Hazards

<table>
<thead>
<tr>
<th>Environment</th>
<th>Event and Hazard</th>
<th>Damage Observation</th>
<th>Simulation Tests</th>
<th>What to Do/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough Handling</td>
<td>Shock, drop, tip-over, side and top impact</td>
<td>Crushed corners, punctures, concealed</td>
<td>Shock and drop testing</td>
<td>Cushioning, handling features, right amount of materials</td>
</tr>
<tr>
<td>Warehouse Stacking</td>
<td>Vertical compression from stacking,</td>
<td>Crushed cases, toppled stacks, creased</td>
<td>Top to bottom compression, side clamp handling</td>
<td>Racking height limits, increased materials strength and</td>
</tr>
<tr>
<td></td>
<td>horizontal for clamp handling, static loads</td>
<td>sides, bulging rows on pallets</td>
<td></td>
<td>safety factors</td>
</tr>
<tr>
<td>In-Transit Stacking</td>
<td>Dynamic vertical compression for TL &amp; LTL</td>
<td>Crushed cases, toppled stacks, creased</td>
<td>Compression testing (safety factors),</td>
<td>Anticipate mixed loads &amp; stacking, increased safety factors</td>
</tr>
<tr>
<td></td>
<td>due to shock input</td>
<td>sides, bulging cases</td>
<td>Cubic ft. average load (density)</td>
<td></td>
</tr>
<tr>
<td>Vehicle Vibration</td>
<td>Vibration resonance, amplification through</td>
<td>Abrasion, fatigue, (wine glass shattering</td>
<td>Vibration resonance, random vibration/shake, real-life</td>
<td>Air ride vans, load restraints (damage free bars, airbags),</td>
</tr>
<tr>
<td></td>
<td>stacks due to vibration input</td>
<td>due to sound resonance)</td>
<td>ship tests</td>
<td>unitize load, harden products</td>
</tr>
<tr>
<td>Loose Load Vibration</td>
<td>Transient shock, stack amplification,</td>
<td>Drop, abrasion, excessive compression</td>
<td>Repetitive shock, (burst tests),</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tumbling or falling load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal Impact</td>
<td>Lateral compression, rail car switching</td>
<td>Shifted loads, crushed cases, blocked</td>
<td>Horizontal impact, (sled test)</td>
<td>Load blocking &amp; bracing, cushion cars/hydro-cushion, avoid</td>
</tr>
<tr>
<td></td>
<td>and humping</td>
<td>doors, tip overs</td>
<td></td>
<td>humping</td>
</tr>
<tr>
<td>Environmental Conditions</td>
<td>Condensation in container, trapped heat in</td>
<td>Warped board, exploded edges, discoloration, frozen &amp; brittle products, corrosion and rusting</td>
<td>Temperature, humidity cycling, atmospheric pressure, high &amp; Low</td>
<td>Specialized transport (Reefer), insulated materials, corrosion prevention materials</td>
</tr>
</tbody>
</table>
**PRODUCT + PACKAGE = ENVIRONMENT**

The environment encompasses . . .

- Mode of distribution: truck, rail, air, ocean, etc.
- Handling methods: push/pull, fork, clamp, pallet jack
- Storage/warehousing: stack height, racking
- Conditions: temperature, humidity
- Palletization: over/underhang, double stack, floorloading
- Many other variables

Product + package < environment….Damage

Product + package > environment….Over Packaged
Packaging Performance

Increasing Packaging Costs
Decreasing Damage Costs
Real Cost of Damage

- **Price of product**
  - Cost of raw materials, manufacturing, logistics

- **What else?**
  - Markdowns, discounted products, slow product turnover
  - Rework: in field service, travel costs, expedited shipping costs
  - Return shipment costs, disposal cost of damaged unit
  - Interruptions: delayed installations, missed deadlines, project planning
  - Sustainability, waste
  - Customer satisfaction: value of dissatisfied/lost customer
Transport Packaging Basics

Material Costs
- Handling Costs
- Warehousing Costs
- Labor Costs
- Freight Costs
The Truth About Sustainability

MYTH
- It’s a bad thing
- It’s for tree huggers
- Costs more money
- Must be “green”
  - Compostable
  - Biodegradable
  - Recycled

REALITY
- Makes business sense
- Provides long-term benefits
  - Financial benefits
  - Environmental benefits

Sustainability with $avings
Sustainability
Environmental Impact of Packaging

Natural Resource Consumption

Greenhouse Gas Emission
Sustainability
Minimize Environmental Impact of Packaging

- **Material Consumption (Fiber):**
  - Reduce or Eliminate Materials
  - Substitute Packaging Materials

- **Greenhouse Gases (Diesel, Energy):**
  - Reduce Weight
  - Increase Shipping Densities
Two areas of focus for packaging improvement opportunities

Packaging Materials
Packaging Volume
Practical Steps to Minimize Environmental Impact

Reduce Material
- Reduced expenses
- Less material in waste stream
- Fewer disposal challenges
- Reduced weight
- Cube utilization

Examples
- Right-weighting packaging materials
- Shared load packaging strategies
- Minimize internal packaging
- Proper amounts of cushioning
Practical Steps to Minimize Environmental Impact

Reduce Volume

- Decreased freight costs
- Decreased small parcel shipment costs
- Increased throughput
- Storage, warehouse savings
- Handling, labor savings

Examples

- Eliminate headspace and voids
- Minimize case dimensions
- Pallet unit load optimization
- Primary packaging size
Sources for Sustainability Calculations:
- www.climatecrisis.net/takeaction/carboncalculator/howitwascalculated.html
- www.replanttrees.org/biz%20calc/BusForm.htm
- www.papercalculator.org
- http://www.design-compass.org/
- http://www.epa.gov/sustainability/
- national renewable energy lab - http://www.nrel.gov/
Assumptions (from website sources):

- CO₂ per combusted gallon of diesel = 22.2 lbs/gal
- 3052 Tons of Diesel consumed for 14 Day Trip Ocean Vessel
- Max Load of 3,875 Containers (40’) per Ship
- Diesel weighs approx. 7 lbs/gal
- Average mpg Diesel for Truck and Trailers = 7.5 mpg
- 101lbs of corrugated material equivalent to 1 tree
Case Study: Meat Products

Objective

- Reduce Packaging Damage During Transit
- Decrease Supply Chain Costs
Case Study: Meat Products

Solution

- Solve for Damage
- Optimize for Cubic Densities and Transit Efficiencies
- Utilize Shared-Load Concepts
- Improve Stacking Performance
Case Study: Meat Products

Solution

**ORIGINAL CASE**

16 x 11 x 5.25
90 cases per pallet

**REDESIGNED CASE**

15.125 x 9.5 x 4.875
144 cases per pallet

Quantity Difference: 54 cases
Increase: 60%
Case Study: Meat Products

Solution

<table>
<thead>
<tr>
<th>ORIGINAL CASE</th>
<th>REDESIGNED CASE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60% More Cases per Pallet</td>
</tr>
</tbody>
</table>

60% More Cases per Pallet
Case Study: Meat Products

Results: For Each Million Units

<table>
<thead>
<tr>
<th>BUSINESS RESULTS</th>
<th>SUSTAINABILITY RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Savings $125,000</td>
<td>C-Flute Reduction 3,165,305 ft²</td>
</tr>
<tr>
<td>Labor Savings $5,000</td>
<td></td>
</tr>
<tr>
<td>Warehouse Savings $86,000</td>
<td>Pallet Reduction 4,400</td>
</tr>
<tr>
<td>Pallet Savings $19,000</td>
<td></td>
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</tbody>
</table>

Bottom Line:

$235,000 Costs Saved

164 Tons Fiber Reduced
Webinar Agenda

- Introduction
- Course Content
- Questions/Discussion
- Case Studies / Applications
Webinar Agenda

- Introduction
- Course Content
- Questions/Discussion
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Questions and Discussion for the Course

- Potential Questions
  - Retail vs. CPG vs. Industrial?
  - What preparation is required? Expectations from participants?
  - What about e-Commerce?

- Inputs from Participants
  - Tailored content and applications
Webinar Agenda

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Webinar Agenda

Introduction

Course Content

Questions/Discussion

Case Studies / Applications
Case Study: Clear Plastic Wrap

Objective

Optimize Product Dimensions to Reduce Material Consumption
Case Study: Clear Plastic Wrap

Solution

- Space Saving Carton Reduction ~ 16%
- Core Size Reduction ~ 23%
- Corrugated Case Reduction ~ 18%
- New Unit Load Configurations ~ 30%

ORIGINAL: 1.625”  REDESIGNED: 1.25”
Case Study: Clear Plastic Wrap

Solution

<table>
<thead>
<tr>
<th>ORIGINAL CASE</th>
<th>REDESIGNED CASE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30% More Cartons per Pallet</td>
</tr>
<tr>
<td></td>
<td>18% Corrugated Reduction</td>
</tr>
</tbody>
</table>
## Case Study: Clear Plastic Wrap

### Results: For Each Million Units

<table>
<thead>
<tr>
<th>BUSINESS RESULTS</th>
<th>SUSTAINABILITY RESULTS</th>
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<tbody>
<tr>
<td>Material Savings</td>
<td>Paper Reduction: 2,559,524 ft²</td>
</tr>
<tr>
<td>Freight Savings</td>
<td>Pallet Reduction: 2,200</td>
</tr>
<tr>
<td>Labor, Warehouse, &amp; Handling Savings</td>
<td></td>
</tr>
<tr>
<td>$300,000</td>
<td></td>
</tr>
<tr>
<td>$75,000</td>
<td></td>
</tr>
<tr>
<td>$40,000</td>
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### BOTTOM LINE:

- **$415,000** Costs Saved
- **33 Tons** Fiber Reduced
- **1,400 Tons** CO₂ Eliminated
Case Study: Medical Device

Objective

- Decrease Transit Damage
- Identify Improvement Opportunities
Case Study: Medical Device

Solution

Tray Re-Design with Paired Products

<table>
<thead>
<tr>
<th>ORIGINAL VS. RE-DESIGNED TRAY</th>
<th>Original</th>
<th>Re-designed</th>
</tr>
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<tbody>
<tr>
<td>Length</td>
<td>11.15</td>
<td>9.41</td>
</tr>
<tr>
<td>Width</td>
<td>7.625</td>
<td>7.44</td>
</tr>
<tr>
<td>Height</td>
<td>2.625</td>
<td>2.625</td>
</tr>
<tr>
<td>Cube</td>
<td>223</td>
<td>184</td>
</tr>
<tr>
<td>Reduction</td>
<td></td>
<td>18%</td>
</tr>
</tbody>
</table>

RE-DESIGNED TRAY

Cube 184
Solution

<table>
<thead>
<tr>
<th>OLD CONFIGURATION (700)</th>
<th>NEW CONFIGURATION (800)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14% More Units per Pallet</td>
<td></td>
</tr>
<tr>
<td>9% Corrugated Reduction</td>
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Case Study: Medical Device
Case Study: Medical Device

**Results: For Each Million Units**

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<tr>
<td>Material Savings</td>
<td>Paper Reduction 66,000 ft²</td>
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<tr>
<td>$86,000</td>
<td></td>
</tr>
<tr>
<td>Freight Savings</td>
<td>Pallets Eliminated 420</td>
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<tr>
<td>$14,000</td>
<td></td>
</tr>
<tr>
<td>Labor, Warehouse, &amp; Handling Savings</td>
<td>Tray Material Savings 18%</td>
</tr>
<tr>
<td>$8,000</td>
<td></td>
</tr>
<tr>
<td>Sterilization Savings</td>
<td>Lid Material Savings 15%</td>
</tr>
<tr>
<td>14%</td>
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**Bottom Line:**

- **$108,000** Costs Saved
- **6 Tons** Fiber Reduced
- **270 Tons** CO₂ Eliminated
An ROI challenge for participants:
- Bring a packaging challenge to be solved
- Take home new idea that can be applied to your situation
Conclusion

- What questions do you have about your system: what do you need to learn or know?
- Where is the money in your packaging or supply chain system?
- How are you going to approach packaging cost reductions and sustainability improvements?
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For more information, please contact
Tom Blanck: tblanck@chainalytics.com

Questions?

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Georgia Tech Supply Chain & Logistics Institute

http://www.youtube.com/gtscl