## "Light-Weighting"

(or is it Optimization?...or is it Responsible Packaging Design?)





## Agenda:

- The global perspective-Sustainability
- Light weighting or source reduction myth
- •What is 'Responsible Package Design"?
- Standards for responsible packaging design
- Understanding today's distribution networks to optimize your package
- Steps to Analyze your product/package for optimization.
- Optimization Success Stories

## **Global Perspective-Sustainability**

- Purpose of packaging profession.
- Economics of packaging

## Global Perspective-Sustainability

#### **ASTM** Definition of Package Sustainability

- "Sustainability: in packaging, is a feature of a package resulting from an assessment of the short-term and long-term environmental, social and economic impacts of design considerations and of the entire life of the package, from manufacturing and production, storage, distribution, use, and through end-of-life action; it does not include the product itself."
  - ASTM D10.19 Subcommittee

#### SPC Definition of Package Sustainability

#### **Sustainable Packaging:**

- Is beneficial, safe & healthy for individuals and communities throughout its life cycle;
- Meets market criteria for both performance and cost;
- Is sourced, manufactured, transported, and recycled using renewable energy;
- Optimizes the use of renewable or recycled source materials;
- Is manufactured using clean production technologies and best practices
- Is made from materials healthy in all probable end of life scenarios;
- Is physically designed to optimize materials and energy;
- Is effectively recovered and utilized in biological and/or industrial closed loop cycles



#### **GREEN GUYS GLOBAL**

One green blog, all global editors

#### 'Less packaging', good as it sounds?

Since then I've noticed several companies, just like M&S, claiming to be greener by reducing their packaging.

Great! I hear you shout. On the surface of it yes it is a good thing, but I'm worried that more and more companies are using this message to convince their customer base that they care about the environment. Oh yes, the figures stack up, and their auditors approve them, but I'm not convinced less packaging always correlates with less environmental harm. The situation is much more complicated than it seems on the surface.

#### **How is Sustainability Described?**

- Regardless of your definition, working towards sustainability can be put in the context of two basic concepts:
  - Cradle-to-Cradle (coined by Walter R. Stahel)
    - Cradle to Cradle Design defines a framework for designing eco-effective products and industrial processes that turn materials into nutrients by enabling the formation of cyclical material flow metabolisms.

Instead of designing cradle-to-grave products, dumped in landfills at the end of their 'life,' the design paradigm transforms industry by creating products for cradle-to-cradle cycles, whose materials are perpetually circulated in closed loops from:

#### Material ConneXion®

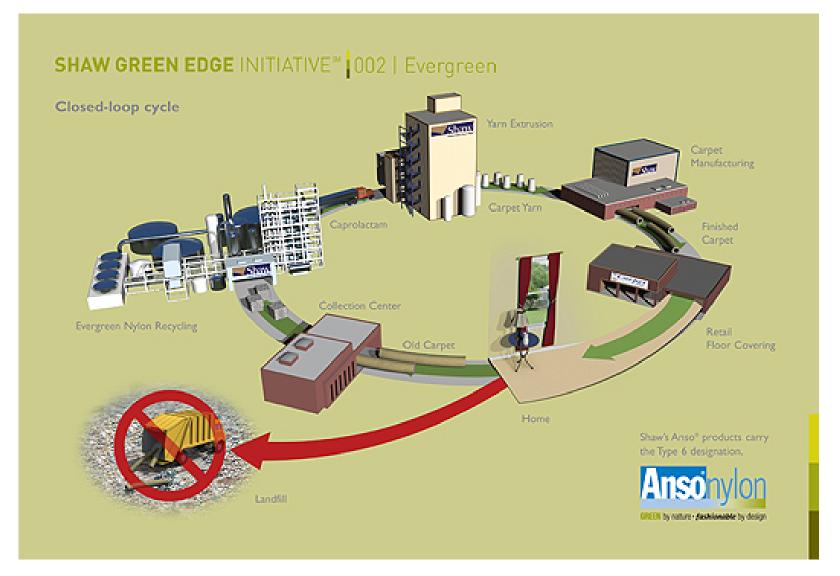
- Literally: from "beginning to new beginning"
- Not just efficient but essentially waste free
- Products return to the earth's life cycles

#### \*IDEALISTIC?

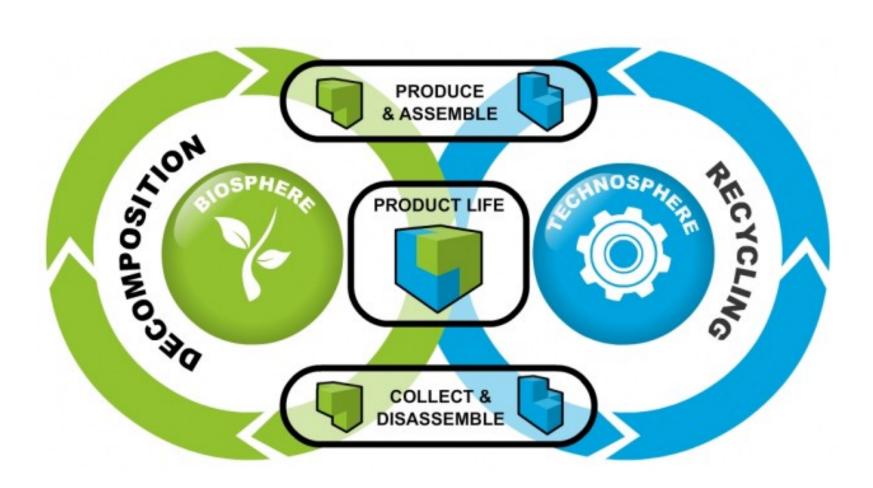
#### Cradle-to-Grave

- Cradle-to-grave is the full Life Cycle Assessment from resource extraction ('cradle') to 'use' phase and disposal phase ('grave')
- Literally from "beginning to death" or disposal—land filling
- A Sustainable strategy for disposal is essential

#### Cradle-to-Cradle/Cradle-to-Grave?



## **CRADLE-TO-GRAVE**



## What does Source Reduction Mean?

- Two Perspectives
  - Reduce amount of packaging at the design phase-responsible packaging design.
    - Balanced perspective. Results in responsible design outputs for optimization, recycling, reuse, energy recovery.
  - Reduce the amount of extraction of raw materials by forcing use of less materials.
    - More radical perspective. Results in unbalanced sustainability continuum; inflexible design options.

## Hierarchy of Responsible Package Development



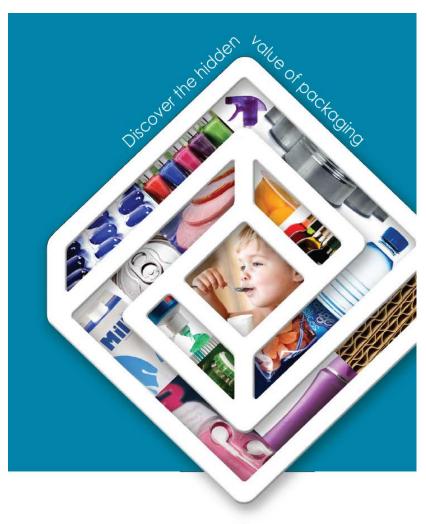
## Designing Packaging for "Source Reduction?"

- It really should be called "Optimization".
- Summed up as "Responsible Packaging Design"

## **Optimization = Responsible Packaging Design**

"Packaging plays a critical role in almost every industry, every sector and every supply chain. Appropriate packaging is essential to prevent loss of goods and as a result decrease (the) impact on the environment."

SOURCE: ISO CD 18601 Packaging and the environment — General requirements for the use of ISO standards in the field of packaging and the environment, ISO TC122 SC 4, 2010-11-30





# much more than meets the eye

There is great interest in finding ways to reduce or even eliminate packaging. This concern is due largely to the public's perception that much of the packaging they experience is unnecessary and even wasteful.

The reality, however, is quite different. An objective, science-based approach reveals that packaging protects the economic, environmental, and social value of the products it contains. In fact, effective packaging actually helps prevent waste.



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# Standardization and Guides

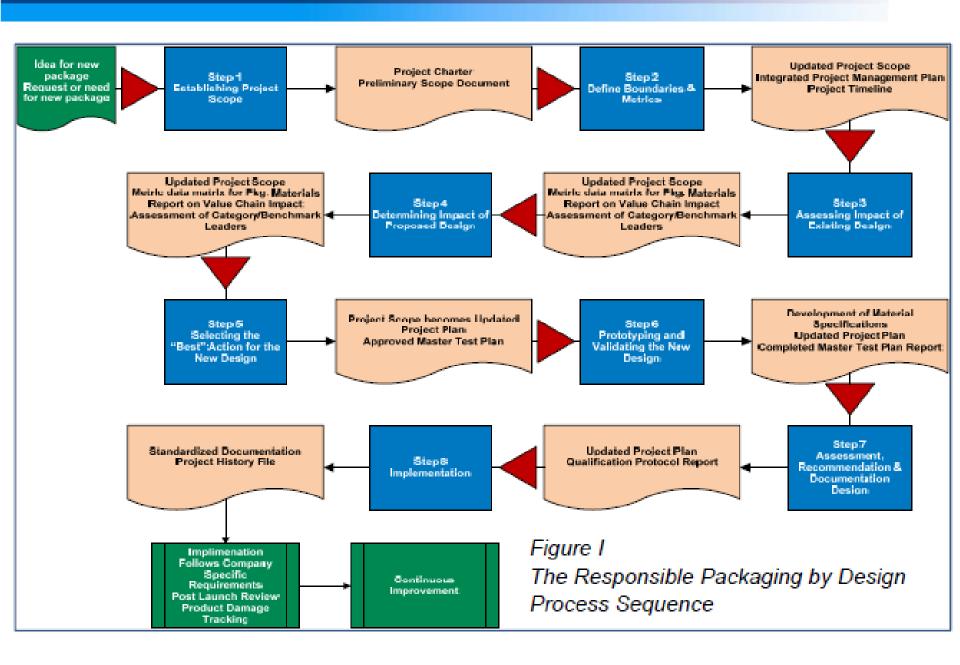
WHAT'S BEING DONE?



A voluntary process management standard developed by the ISTA Sustainable Solutions Division to advance the performance of packaging

**Responsible Packaging** – Packaging which has been designed using a specific process that optimizes the performance of packaging with regards to:

- Functional requirements
- Environmental performance
- Financial performance
- Sourcing, production, distribution, use and recovery of materials
- Using life cycle thinking (which may include full or partial life cycle assessments)
- Knowing the source of the materials, energy and water used in its manufacture
- Understanding its role in relation to preventing damage or spoilage of the product it contains
- Ensuring that, after use, 'value' as recycled materials or energy can be recovered in areas where collection and reprocessing facilities exist or it can disposed of safely in areas that do not have such facilities



## Step by Step Process

- Establish the scope of the project
- Define boundaries for the project
- Assess the impact of existing design
- Determine impact of proposed design
- Select the right action
- Prototype and validate proposed design
- Assess, recommend and document
- 8. Implement design

#### At this time, ISTA recommends the following metrics:

- Packaging weight and minimization
- Packaging to product weight ratio
- Material waste
- Recycled content
- Renewable content
- Chain of custody
- Packaging reuse rate
- Packaging recovery
- Cube utilization
- Packaged product losses
- Cumulative energy demand
- Global warming potential
- Toxicity (i.e. cancer, Ecotoxicity, etc.)
- Aquatic eutrophication

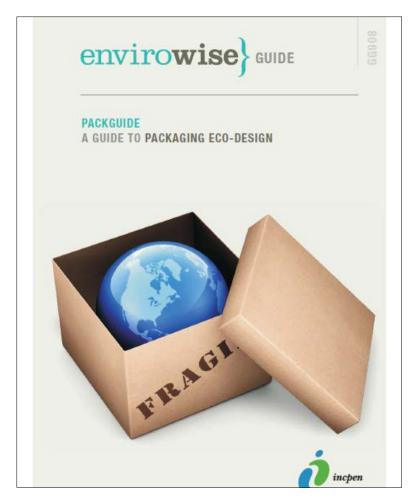
#### TEST PLAN

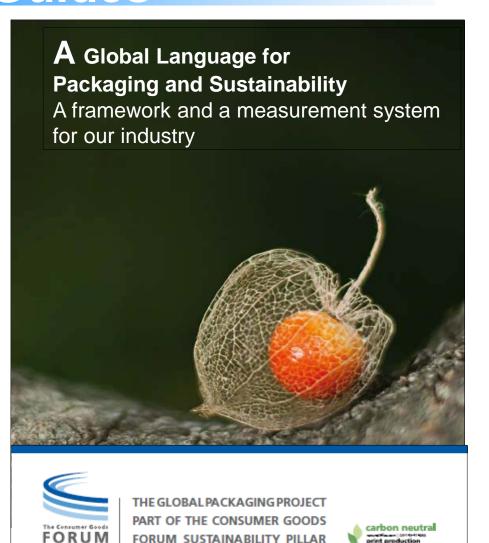
		Master Test Plan			
Master Test	t Plan # 11-011				
Product:		Author:			
Sales Packs	ge Size:	Approved by: Date:			
Shipping Pa	ickage Size:				
Standard			Defect		
Test			Qualification	Sample	Functional
Procedure:	Test Title	Acceptance Criteria	Level	Size	Responsibility
		No degradation of plastic			
		physical properties; product			
		weight loss not greater than			
		1%; product active ingredient			
	Product/Package	loss within regulatory			
	Compatibility - liquids	guidelines; product			Packaging
STP-107	in plastic bottles	properties maintained	Major	21	Development
	Bottle thread				Packaging
STP-113	Dimensions	Within tolerances	Major	20	Development
	Color Match of				Packaging
	Packaging				Development /
STP-101	Components	Within tolerances	Minor	12	Marketing
	Plasticd Bottle Wall				Packaging
STP-102	Thickness Profile	Within tolerances	Minor	20	Development
	Fill Une, Overflow				Packaging
STP-104	and Bulge	Within tolerances	Minor	20	Development
					Packaging
STP-111	Sunlight Exposure	No fading	Minor	12	Development
	<b>Environmental Stress</b>	_			Packaging
STP-118	Crack Resistance	No failures	Major	12	Development
	Leakage from				Packaging
STP-114	Threaded Closures	No leakage	Critical	20	Development
	Bottle				Packaging
STP-110	Rocking/Stability Test	Within tolerances	Major	20	Development
					Packaging
STP-100	<b>Bottle Drop Test</b>	No leakage	Major	20	Development
					Packaging
STP-103	Cap Removal Torque	Within tolerances	Minor	20	Development
	<b>Bottle Compression</b>	Greater than 200% of filling			Packaging
STP-105	Test	equipment load	Major	20	Development
	Distribution				Packaging
ISTA 3A	Simulation	No leakage	Major	3 cases	Development

## **Other Guides**



SPC's Design Guidelines for Sustainable Packaging Ver.1.0 Dec. 2006





#### Global Sustainable Packaging Initiative

- EN (European Norm) Standards EU Directive 94/62/EU 'Packaging and Packaging Waste Directive'
  - Supported by EN standards
  - •EN 13427, General requirement for use of ISO standards in the field of packaging and the environment..
  - •EN 13428, Packaging—Requirements specific to manufacturing and composition— Prevention by source reduction
  - •EN 13429, Packaging, Reuse.
  - •EN 13430, Packaging—Requirements for packaging recoverable by material recycling.
  - •EN 13431, Packaging –Requirements for packaging recoverable in the form of energy recovery, including specification of minimum inferior calorific value
  - •EN 13432, Packaging—Requirements for packaging recoverable through composting and biodegradation.



Understanding the CEN Standards on Packaging and the Environment: Some Questions

and Answers



Part I

**EUR** PEN

THE EUROPEAN ORGANIZATION FOR PACKAGING AND THE ENVIRONMENT

ESSENTIAL REQUIREMENTS FOR PACKAGING IN EUROPE

How to Assess Compliance of Packaging with the EU Packaging and Packaging Waste Directive (94/62/EC)

WITH REFERENCE TO THE EN STANDARDS

INTRODUCTION AND SUMMARY ASSESSMENT RECORD

Ath Edition Rebrainy 2006

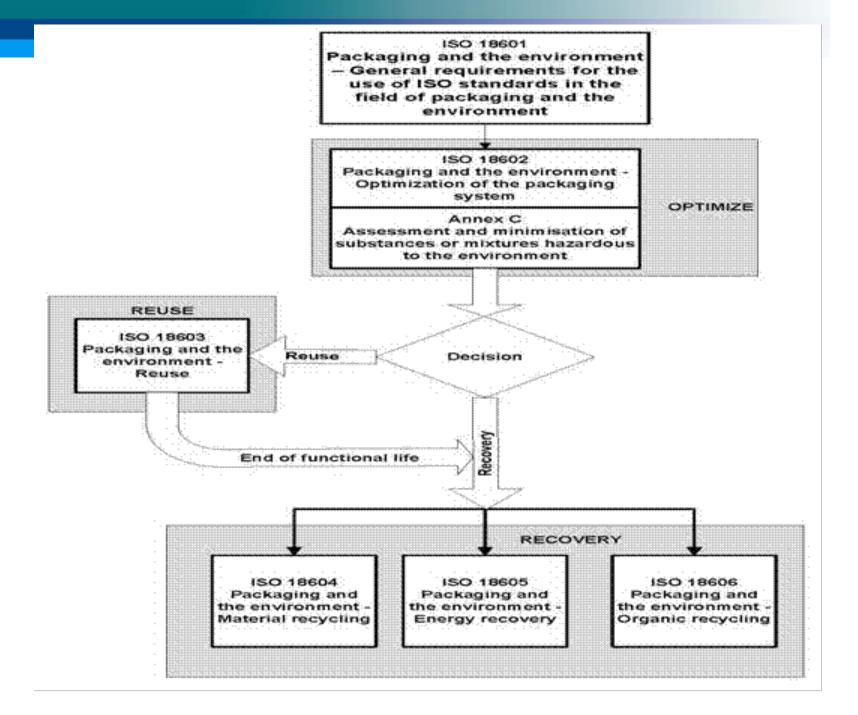
#### ISO Packaging and environment standards...

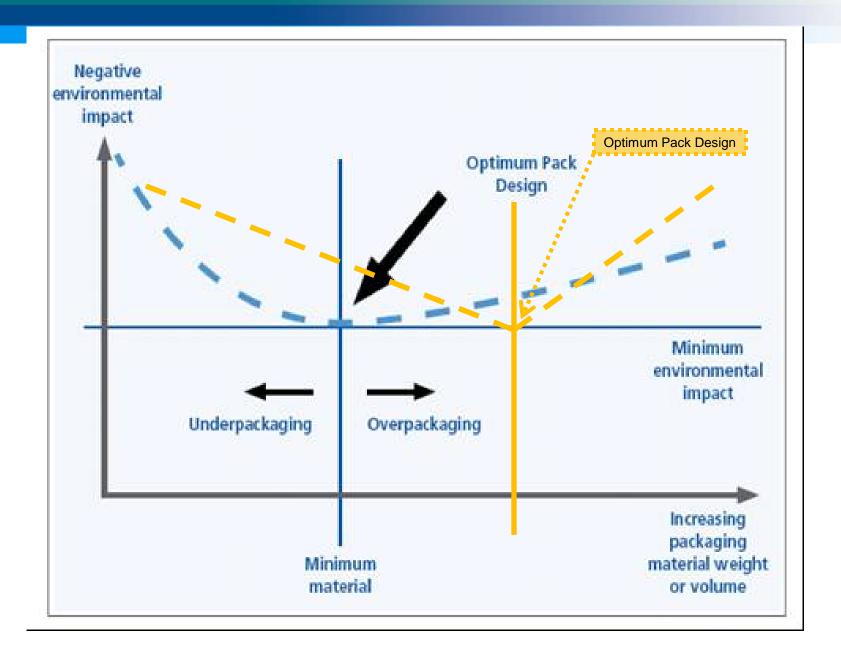
The first draft of the ISO standards were modeled after the EN (European Norm) standards that support the EU (European Union) Directive for Packaging and Packaging Waste. These EN standards have since been revised over a two year period with global input. The Committee Drafts (CD's) of the standards have been approved with comment and will advance to the DIS (Draft International Standard) stage of development by next spring. The CD's have the following designations and titles:

- ISO/CD 18601, Packaging and the environment General requirements for the use of ISO standards in the field of packaging and the environment
- ISO/ CD 18602, Packaging and the environment -- Optimization of the packaging system
- ISO/CD 18603, Packaging and the environment -- Reuse
- ISO/CD 18604, Packaging and the environment Material recycling
- ISO/CD 18605, Packaging and the environment Energy recovery
- ISO/CD 18606, Packaging and the environment Organic recycling

# Standards

# HOW TO USE THE ISO STANDARDS





#### Under-packaging and over-packaging

Under-packaging is usually far worse for the environment than overpackaging.

- Over-packaging by 10% means that 10% of the resources needed to produce the packaging are wasted, and extra fuel will be needed to distribute it.
- Under-packaging that results in the product being spoilt or damaged wastes 100% of the resources used to produce both the contents and its packaging, and all the fuel used to distribute it.



INCPEN - the Industry Council for Packaging and the Environment is a research organisation established in 1974 to study the environmental and social impacts of packaging. Its members span the whole packaging chain.

www.incpen.org

#### Scope

- Specifies the requirements and a procedure for assessment of packaging to ensure that the weight or volume of its materials content is optimized consistent with the functions of packaging.
- Determining the amount and minimization of substance or mixtures hazardous to the environment.
- Determining the amount of four heavy metals (lead, cadmium, mercury, hexavalent chromium) in packaging.

- 3.0 Terms and definitions:
  - 3.1 Packaging optimization process for the achievement of a minimum adequate weight or volume (source reduction) for meeting the necessary requirement, of primary or secondary or transport packaging, when performance and user/consumer ac -ceptability remain unchanged or adequate, thereby reducing the impact on the environment

 3.6 Packaging System - the complete set of packaging for a packaged good, encompassing one or more of the following that are applicable (depending on the packaged goods); Primary packaging, Secondary packaging, Transport (or tertiary) packaging

- 4.0 Requirements
  - 4.2 Packaging Assessment
    - Determination of critical areas
    - Determination of presence of substances or mixtures hazardous to the environment.
    - Determination of the four named heavy metals.
    - Demonstration that the requirements of this standard have been met.

- 5.0 Critical areas to assess when determining the achievable level of packaging optimization.
  - Protection of goods
  - Packaging manufacturing process
  - Packing/filling process
  - Logistics (including transport, warehousing and handling)
  - Presentation and marketing of goods
  - User/consumer acceptance
  - Information
  - Safety
  - legislation

- ANNEX A--Guidelines (informative)—Highlights
  - "it can be used in the assessment of existing packaging or as an aid in the normal dialogue between supplier and customer in agreeing to a specification for (optimized) new packaging"
  - This process aims to achieve a minimum adequate weight or volume of a given package, and hence reduce the environmental impact without increasing damage to or waste of goods, and respecting the critical areas to be met by the packaging.

#### **PACKAGING**

#### Optimization of the packaging system

Assessment Checklist

Packaging: Plastic bag + desiccant pack + corrugated box + cushioning

Product reference Computer 216/14

Packaging reference CB 16/PS27

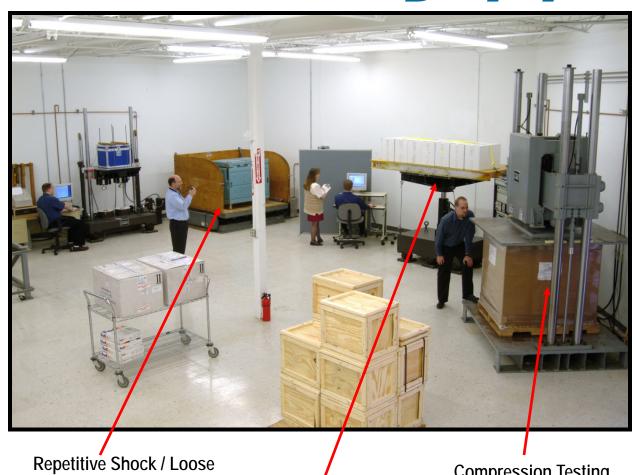
Checklist reference 100127

Criterion	Most important/relevant requirement	Critical Area(s)	References	
Protection of goods	Protection against humidity / mechanical protection	No		
Packaging manufacturing process		No		
Packing/filling process	Cushioning used as a carrier during assembly	No		
Logistics	Suitable for transport and handling	Yes	Test report by XX Laboratory 11/09/10	
Presentation and marketing of goods	No sign of damage on packaging	No		
User/consumer acceptance	Spare space for literature and disc if needed and handles	Yes (volume)	Dimensions of the computer and potential components	
Information		No		
Safety		No		
Legislation		No		
Other issues	Less than 4 ppm failure in packaging	No		

In the light of the ISO 18602.	assessment results	recorded	above,	this	packaging	meets	the	requirements	of
Name : Title : Organization :									
Mailing Address : City :	Country:								
Date :	Signature :								

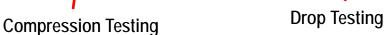
# **Testing Techniques and Tools Optimization**

## Testing Equipment

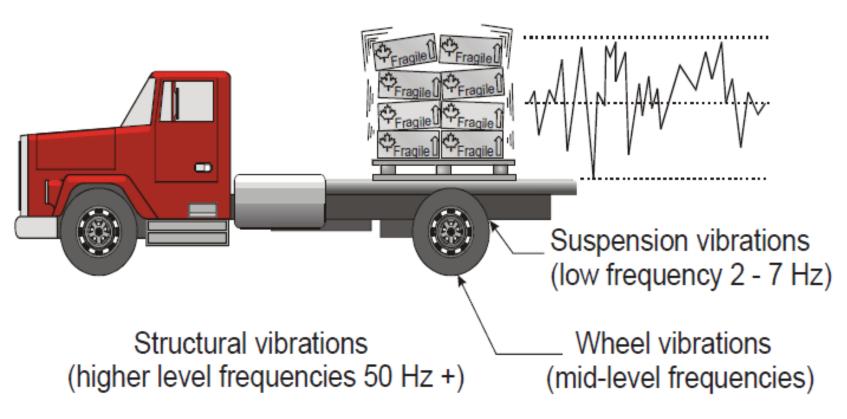


Random Vibration

**Load Vibration** 

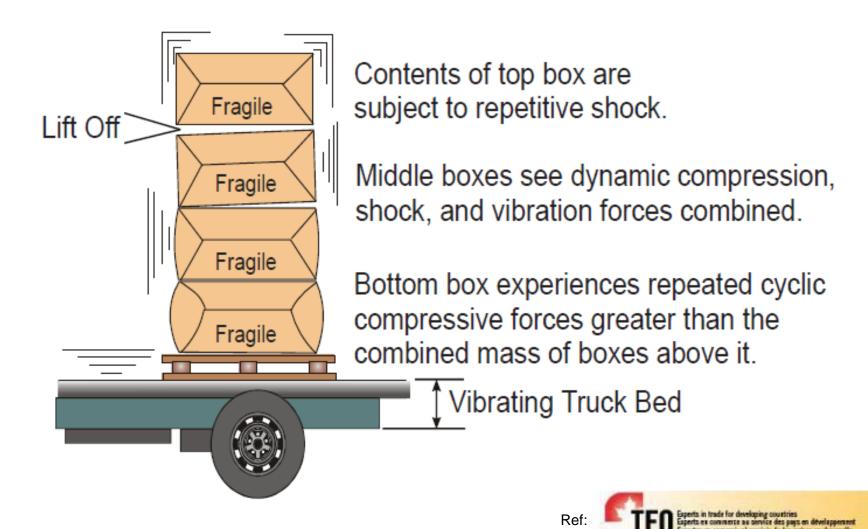


#### Vehicle Vibration Sources



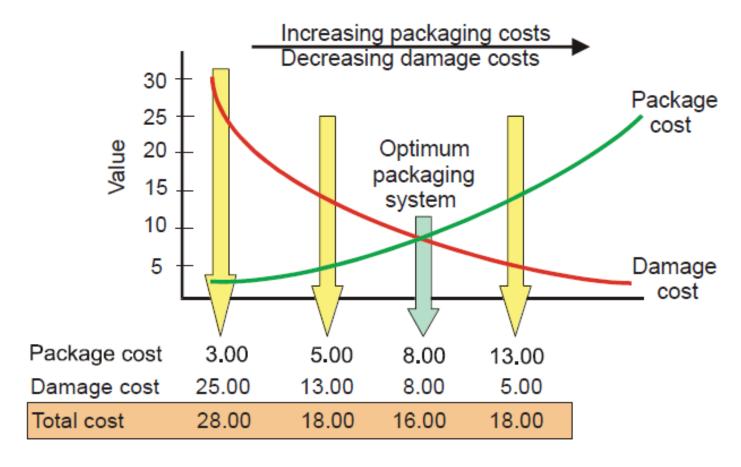
Ref:

#### Stack Resonance





### **Determining Optimum Packaging Cost**



Ref:

### Pallet Load Shear Testing

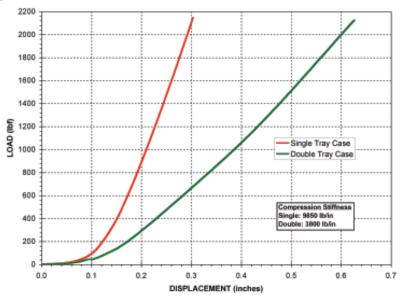


Case Configuration	<b>Loading Direction</b>	Static Shear Stiffness
Corrugate	Long Axis	722.4 lbf/in
	Short Axis	230.5 lbf/in
Tray	Long Axis	60.5 lbf/in
	Short Axis	16.4 lbf/in

Table 1: Static Shear Stiffness Data

## **Compression Testing**

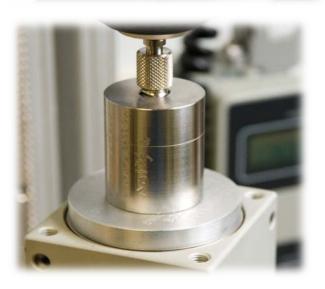






## Product & Material Testing







Product & material division can test the packaging materials that protect your product as well as the medical device itself for safety functionality and performance.

#### **Test Methods for Optimization**

Environmental



#### **Test Methods for Optimization**

Material Testing









requirement gathering

analysis & design

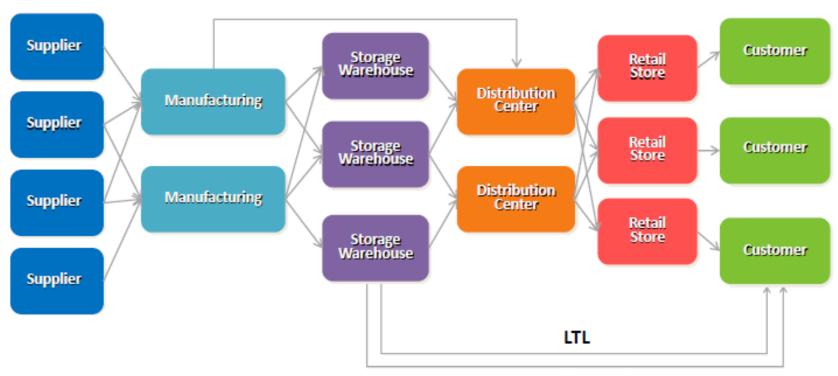
development

testing

deployment



### Packaging's Impact on the Supply Chain



Small Parcel

Smart Packaging for Sustainability and Savings

#### **Unintended Consequences**

• If you're going to change/reduce your packaging materials, in an effort to optimize sustainability, you must consider the unintended consequences (i.e. the cause and effect of changing anything on the continuum).

#### **Unintended Consequences**

- Unintended consequence of reducing packaging may result in:
  - Increased damage (loss of the product)
  - An unusable product (waste)
  - Delayed procedure (poor quality healthcare)
  - Non-sterile product (infection)

Studies by the U.S. Department of Agriculture (USDA) and
University of Arizona Garbage Project indicate that 33-50
percent of all food purchased in America is wasted. This
obviously has enormous economic impact on businesses,
institutions, restaurants, and consumers. Based on U.S. Census
Bureau estimates that Americans purchase over \$1 trillion
worth of food and beverages per year, wasting 33 percent
would result in economic waste of over \$300 billion – \$1,000
per person, or \$2,600 per household.



#### Optimizing the entire system...

• If you're going to reduce your packaging materials, you must test and verify your new materials to ensure they are still in compliance with industry standards and do not cause unintended consequences to the sustainability continuum.



Ameristar award from the **Institute for Packaging** Professionals (IOPP) for the Non-Carb Beverage (NCB) Family of PET containers. The SuperRib geometry developed by SES was a critical part of designing a light-weight, thin-walled PET container to meet Pepsi's specification for non-carb beverages requiring low internal pressure resistance as a result of Nitrogen dosing.

# Coke sparks revolution in bioplastics



In time for Earth Day 2012, Coca-Cola Co. said its Odwalla single-serve bottles will use up to 100% plant-based materials with HDPE; and Dasani PET bottles would use up to 30% plantbased materials

# Coke sparks revolution in bioplastics



PepsiCo gets extra sustainable 'mileage' by using its own agricultural waste, such as orange peels, potato peels, and oat hulls, as a feedstock in producing its 'green' bottle.





FIG. 1: Corrugated container unit load vs. tray-based unit load



Compostable

Reusable

KFC's sustainable sides container is 'sogood'

Destination: zero waste

Material Elimination



Weighting

Weighting

Weighting

Weighting

Weighting

Weighting

**SOURCE:**http://www.greenerpackage.com/optimization/2010\_greener\_package\_awards\_honor\_eight\_sustainable\_innovations

Light





#### 2 Little's coffee jar

We reduced the weight of the product by removing glass from the shoulder," says Taylor. "This enabled us to retain the label area required by the customer, and at the same time move the fill point of the product to fit in with the customer's preference."

**South Africa: Developing a lighter MGD cluster pack** 

Working in partnership with its packaging supplier Nampak Cartons & Labels, SAB Ltd in South Africa developed a new lightweighted cluster pack for Miller Genuine Draft (MGD). This is the cardboard sleeve the surrounds multi-pack bottles of beer. It was designed to survive the rigours of distribution, whilst using a lighter gauge of cardboard reducing the weight from 380gsm to 350gsm. This equates to a reduction of 8% less cardboard – a saving of 51 tonnes of paper annually on the MGD pack alone. This significant improvement has been achieved without affecting the quality and strength of the MGD pack, while maintaining its high quality brand-building look and feel.



Case Study and Package Evaluation of the Fres-co #10 can replacement





The Fres-co System #10 Pouch Provides Major Gains in the Areas of Sustainability, Safety, and Cost Reduction.



©2008 MeadWestvaco Corporation. CNK and Coated Natural Kraft are registered trademarks of MeadWestvaco Corporation. Printed on MWV Tango® Advantage Coated Cover 12 pt C2S. All rights reserved worldwide.

#### Challenge

The manufacturer needed an efficient replacement for its existing multi-pack packaging, which was made from reinforced paperboard.

#### Solution

Working closely with the juice pouch manufacturer, MWV explored a number of scenarios for reducing system costs. The team recommended replacing the reinforced paperboard with CNK® (Coated Natural Kraft®), a paperboard substrate that could be converted using MWV's proprietary FlexiTECH™ machine.

FlexiTECH is an innovative packaging solution featuring an internal I-Beam support structure that provides the vertical stacking strength needed to survive the most rigorous distribution and retail environments. MWV developed this solution in conjunction with the state-of-the-art FlexiTECH machine to create an extremely fast and efficient packaging system that runs up to 600 pouches per minute.

#### Results

The combination of switching to CNK paperboard and FlexiTECH technology resulted in over 20 percent savings in total cost by allowing the company to go from using two packing machines to just one.

The new packaging solution also improved the company's sustainability profile through significant source reductions. An in-depth study of how the new packaging performed in transit to the store shelf proved that the new CNK packaging provided a lightweight solution that met stability requirements, performed well at all levels and provided reduced distribution costs.



Slim Finish: Big savings can be found in small but significant tweaks to package components. LIV Organic reduced the weight of its PET bottle by 14.6% by employing a redesigned neck finish.



Bundling Innovation: Advances in distribution packaging are changing the ways CPGs are unitizing their products. Unlimited Water's use of a staggered-bottle nesting technology eliminates the need for corrugated trays or pads for its bottled-water multipacks.



Dead Weight: Evaluate secondary packaging for unneeded excess. GSK eliminated a secondary carton and insert for its calcium supplements to save nearly 1,500 trees/yr.

#### BY ANNE MARIE MOHAN,

Editor, Greener Package

#### **Standardization Activities**

- SPC Guidelines
- Wal-Mart scorecard
- Proctor and Gamble System
- ISO TC122 SC 4
- ASTM D10 SC 10.19 on Sustainability
- ASTM International Committee E60 on Sustainability
- ISTA Responsible Packaging by Design Guide

# Organizations working on Packaging Sustainability issues...

- ASTM D10.19 Subcommittee
- Sustainable Packaging Coalition (SPC)
- European Bioplastics
- INCPEN
- Europen
- Ameripen
- Greener Package
- Many others

#### THANKS TO...

- Robert States at Stress Engineering Services.
- Anne Mohan at Greener Package
- Tom Blanck at ChainAlytics
- TFO Canada
- INCPEN
- AMERIPEN
- ISTA
- EUROPEN
- Sustainable Packaging Coalition (SPC)

# Questions?



Patrick Nolan
President, DDL
800.229.4235
www.testedandproven.com



## Responsible Packaging Development Group

- Material selection for optimal source reduction
- Compliance to ISO packaging and environmental standard
  - Package design testing for evaluation & product integrity

Your partner in responsible package design and testing!

#### SPECIAL THANKS TO...



Today's host:

IoPP's Transport Packaging Committee

- Shipping guidelines & regulations
- Technical requirements
- Set guidelines
- LinkedIn group

Brian Stepowany, Chairman www.iopp.org/committees