

Meeting Sustainability Goals Using Thermoformed Packaging

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Abstract

Today's growing need for environmentally friendly packaging designs and materials is being driven by an increasing number of global packaging standards, mandates and take back fees. Increasingly, corporations are responding by meeting or exceeding these requirements through internal environmental stewardship and "design for environment" policies. These external pressures, along with ongoing internal cost reduction efforts, have lead to the development of a number of next generation thermoformed packaging products and services for the consumer electronics industry. These developments have been applied to a variety of products at different points in the value chain, but they share some common environmental benefits:

- Decreased per unit packaging costs
- Reduced consumption of packaging materials
- Reduced freight and storage costs for inbound materials
- Increased pallet density for outbound product
- Environmentally friendly materials

This paper examines sustainability in the packaging industry, financial drivers for change, and highlights in detail examples of recent break-through developments in thermoformed plastic packaging.

Biography

Michael Brown has 20 years experience in the thermoformed packaging industry as Vice President of Sales and Marketing for Ivex Packaging Corporation and Crystal Thermoplastics Inc. His company, Packaging 2.0, assembles strategic partners to provide front-end design services, manufacturing and global logistics for delivery of innovative packaging products, including GeoSpring® thermoformed fragility packaging. As an established expert in innovative packaging and a member of the Sustainable Packaging Coalition, he has provided the leadership to take a number of visionary packaging concepts from planning to successful execution.

Sustainable Packaging

According to the Sustainable Packaging Coalition, packaging should be “sourced responsibly, designed to be effective and safe throughout its life cycle, made entirely using renewable energy and once used, is recycled efficiently to provide a valuable resource for subsequent generations of packaging.”

In the packaging industry the term sustainability is most often associated with some form of recycling or recycled material. However traditional recycling usually results in some form of degradation to the environment or to the materials being recycled. For instance, when plastics of different resin types are recycled and reprocessed together, the result is a lower quality plastic soup which is molded into cheap applications like park benches or speed bumps. In fact, most recycling is actually *down-cycling* as materials are reused in less valuable applications in each cycle. For a product and process to be sustainable the materials would have to be *same-cycled* into a product of equal value or *up-cycled* into a product of higher value, while ideally the process would either have no impact on the environment or improve it.

Currently the packaging industry would find meeting the Sustainable Packaging Coalition’s vision virtually impossible. Today’s packaging systems are complicated by commingled source materials with collection and reuse prohibitive due to global manufacturing and distribution, all of which makes proper resource recovery and reuse difficult or unfeasible. As a result most companies are setting attainable environmental packaging goals that are “less bad” when compared to their existing methods.

Reference: www.sustainablepackaging.com

Financial Drivers for Change

Internationally packaging fees exist in over 30 countries with new programs in Canada, Asia and Eastern Europe. There are environmental design requirements in more that 25 countries covering empty space, source reduction, package prevention, recovery, reuse and recycled content.

E.U. Institutions have agreed to adopt CEN (the European Committee for Standardization) standard EN 13427:2000 on packaging which lays down essential requirements which all packaging marketed within the “European Economic Area” must comply. Packaging that does not comply with these essential requirements can legally be banned from EU markets! Essential Requirements Summary:

- Packaging weight and volume should be minimized
- Noxious and hazardous contents of packaging should have minimum impact on the environment at the end of life
- Packaging should be suitable for material recycling, energy recovery, composting or for reuse

Ontario recently passed the Waste Diversion Act of 2002. Beginning June 2003, producers are responsible for 50% of the cost of collection and recycling of the packaging and printed paper material that they place on the market in Ontario.

South Korea sets limits on empty space and restricts the use of expanded polystyrene for use as buffers for electrical, office, Information technology and audio-visual appliances for specified packaging volumes of less than 20,000 cubic centimeters.

The National Peoples Congress in China, effective January 2003 has approved a design requirement that contains the language: “When products and packaging are designed their influence

on mankind and natural environments during their life-cycle must be considered... enterprises should reduce the overuse of packaging and packaging wastes".⁷

Clearly international recycling standards and fees are increasing and companies designing rigid plastic packaging that will be marketed for more than one year should be sure that they address the following requirements:

- Contain 25% post consumer material
- Be reusable or refillable
- Be recycled at a rate of 25-45%
- Be reduced in size by 10% over the last 5 years

Environmental Advantages of Thermoformed Plastic Packaging

Thermoformed packages widely used for the display and transportation of consumer goods can be redesigned to comply with these requirements. Packaging materials can be standardized to feed recycling in both open and closed loop recycling streams, taking advantage of the growing pool of recycled HDPE and PET from plastic bottles.

HDPE has excellent impact strength where product protection is required and PET presents both good clarity for display packaging and stability for engineered structures. Combine these factors with low tool and engineering costs—which make creative design exploration possible—and thermoformed plastic packaging can be an excellent environmental choice.

Recovered materials can be cleaned, extruded and thermoformed into new packages.



The following innovative thermoformed product examples share these common environmental benefits:

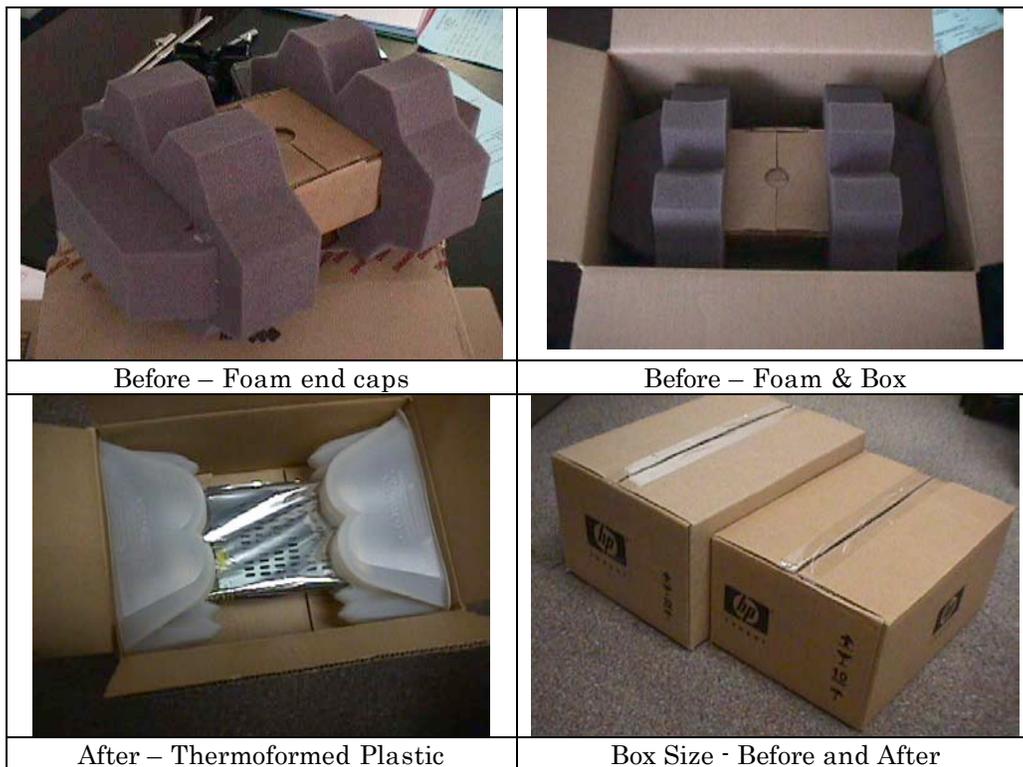
- Decreased per unit packaging costs
- Reduced consumption of packaging materials
- Reduced freight and storage costs for inbound materials
- Increased pallet density for outbound product
- Environmentally friendly materials
- Potential for both *open loop* and *closed loop* recycling

Case Studies: Innovative Applications of Thermoformed Plastics

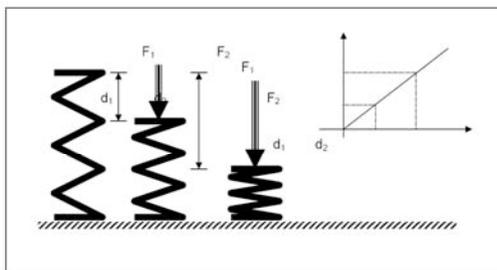
How should the packaging industry respond to the Sustainable Packaging Coalition's challenging vision for the future of packaging? While true sustainability will require systemic changes, companies can position themselves on the road to sustainability today. Below are three case studies where companies have adapted innovative packaging strategies that advance their sustainability goals while at the same time reducing overall costs.

Hot Plug Hard Drive –

Got milk? Well do you still have the jug it came in? If so, recycle it - as it might end up in a Hewlett Packard Hot Plug Hard Drive package. HP's package engineering group took another look at an old disk drive design that initially was in fabricated urethane foam with corrugated paper inserts. They then developed a new solution that eliminated the need for this bulky foam material and replaced it with a thermoform plastic cushion. This new design concept nested nicely together which reduced inbound material transportation and storage (3 truckloads less a month). The new cushions are made up of about 100% recycled material - a combination of Post Consumer (predominantly milk jugs) and Industrial (post manufacturing PE waste) materials which can be easily recycled again. Better yet, this new design saves HP a little over a million dollars a year in material, transportation and warehousing costs.



This light weight, patented GeoSpring® packaging system provides structures for a unitary spring system including flexible harmonic bellows. When a carton containing a product protected by this spring system is dropped from a height, the rapid deceleration caused by the impact engages the spring system and efficiently dissipates the shock and vibration. The system can be adapted to meet a wide range of shock/vibration dissipation requirements without using voluminous amounts of material. The rate of spring compression is a function of the load:



Spring Compression F vs. d

GeoSpring® is a trade mark of Packaging Plus LLC

3R U-PAD™ System

This System uses a global approach to manufacturing and return, built around minimum materials and light weight (the Reduce element), full recovery and remanufacturing (Reuse), nest-ability to reduce shipping bulk before and after use, plus bulk palletized shipment (Return). The system protects the U-Pad™ so effectively that few units approach failure point. The full 3R cycle not only achieves environmental savings of raw material but also delivers bottom-line profit to manufacturers through packaging and shipping cost reduction; this is accomplished via a ‘total-cost-of-ownership’ approach.

3.5" HDD 20 Pack



Digital Cable Set Top Boxes



In material choice, a low elastomeric coefficient was crucial to yield excellent return, i.e. elasticity without plasticity to prevent permanent deformation. Second, the material had to hold its form under load in temperatures up to 140°F and resist cracking under load down to -40°F. Third, the material had to be curbside recyclable with enough feedstock for massive production quantities.

Only one material proved suitable: HDPE. But with post-consumer recycled resin, quality is vital. Care was taken to secure a narrow stream of closely inspected material. In subsequent testing, it was found that only the highest grade RHDPE could deliver the necessary performance, as the U-Pad™ must move up to 2.5", deflect, and return to its original shape under load.



Once the U-Pad™ is manufactured and used to initially ship components, it is collected locally at major end users in reused Gaylord bins. Users are motivated to collect: where they would have paid for packaging disposal, they can now call UPS instead. Through an established program, the product is picked up and shipped to Asian, European, or American extruders at no cost to users which is made possible by the product’s nesting ability—92% more efficient than erected size.

U-PAD™ is a trade mark of Packaging Plus LLC

SmartCycle™ Recycled PET Containers

SmartCycle™ brand food containers are an important step toward sustainable plastics. These clamshell packages are made from bottles, and the distinctive SmartCycle™ tells you so. This is an important message for packagers, consumers and recyclers alike. The mark assures the packager that the container is food grade—an important concern, as the FDA stipulates that recycled PET used in food contact packaging must meet the same standards as virgin resin. For the consumer the mark is informative, building both recycling and sustainability awareness. Finally, at the end of the use cycle, the SmartCycle™ mark facilitates actual recycling—not down cycling—as the container can be reprocessed into new containers along with bottles made from like PET based plastics. Currently, most municipalities collect only bottles and do not recycle plastic clamshells due to concern for mixing resin types.





SmartCycle™ is a trade mark of Packaging 2.0 LLC

Summary:

While strict definitions of the term “sustainable packaging” set the bar fairly high, the projects above prove that achieving incremental progress can pay big dividends in terms of meeting your company’s environmental objectives and cost reduction goals. The light weight nature of thermoformed plastic make it an ideal choice for meeting package “**reduction**” goals, while the high strength to weight ratio of plastics make “**reuse**” feasible. Most collection systems are built around HDPE and PET so a focus on these materials makes “**recycling**” and the inclusion of recycled materials possible. HDPE has excellent impact strength where product protection is required and PET presents both good clarity for display packaging and stability for engineered structures. Combine these factors with low tool and engineering costs—*which make creative design exploration possible*—and thermoformed plastic packaging can be an excellent environmental choice.

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