Hello and Welcome to our E-Book,

Trying to integrate sustainability into your brand packaging? Interested in the cost savings incurred from developing more efficient packaging systems? If so, you have come to the right place.

Dordan Manufacturing is a third-generation family owned and operated custom thermoformer of plastic clamshells, blisters, trays and components. Specializing in quality packaging design that equates to seamless manufacture, Dordan is an industry leader.

Our industry expertise doesn’t stop when our product leaves the factory floor, however; we are passionately engaged with the social, environmental, and economical sustainment of the packaging and consumer product goods industries. This engagement has manifested itself in the development of sustainable tools and services, efforts and products, which facilitate our clients' sustainable packaging goals.

This E-Book is a concise compilation of Dordan's sustainability credentials: From LCA-based packaging assessment tools to alternative materials consultation, Dordan has the resources to aid you in the attainment of your sustainable packaging goals. Dordan is an industry thought leader; we invite you to become one, too.

Sincerely,

Dordan Manufacturing Co. Inc.

Celebrating 50 Years of Thermoformed Packaging Solutions
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* Walmart Packaging Scorecard being consumed by integration of GS1 reporting and GPP's metrics for assessing sustainable packaging.
SUSTAINABILITY TOOLS

Introducing COMPASS

COMPASS is an LCA-based, comparative packaging assessment tool created by the Sustainable Packaging Coalition. As such, it offers the credibility of a well informed and rigorous development process; its metrics and methodologies were developed through consensus by some of the best-informed members on packaging and sustainability within the industry and peer reviewed by a variety of outside stakeholders, including the U.S. Environmental Protection Agency.

COMPASS is a design phase tool, intended to inform packaging engineers of the environmental repercussions of different package designs in the developmental phase. Consequently, it has provided Dordan designers with the know-how to manipulate packaging requirements to yield environmental--and economical--savings.

By providing comparative environmental profiles of different packaging scenarios based on life cycle metrics and design attributes, COMPASS provides an easy tool for assessing the sustainability of packaging.

COMPASS Details

COMPASS Life Cycle Impact Phases Included:

- Raw material sourcing/extraction
- Packaging material manufacture i.e. extrusion
- Conversion i.e. thermoforming
- Distribution
- End-of-life
Assessment Metrics:

- Fossil Fuel
- Water
- Biotic Resources
- Mineral
- Greenhouse gas equivalents
- Clean Production: Human Impacts, Aquatic Toxicity
- Eutrophication
- Recycled vs. virgin content
- Sourcing
- Solid Waste
- Material Health

Data Sources:

- U.S. Life Cycle Inventory (LCI) Database
- Ecoinvent (Swiss LCI Database)
COMPASS Case Study: Tom Tom Package Redesign

Tom Tom Goal:

- Reduce total packaging for GPS selling unit

Dordan Approach:

- Redesign package to achieve a lower product-to-package ratio
- While in the redesign phase, Tom Tom directed that the plastic content be reduced by using a 0.015" RPET lid and 0.025" HIPS tray for the GPS unit and incorporating a paperboard carton to house the tray, lid and accessories
Tom Tom Package Redesign Results/Savings:

- 83% cost savings compared to previous package;
- The old package consumed 198.142 grams of plastic; the new package consumes 23.659 grams of plastic. This converts to an 88% reduction in the weight of plastic consumed for the package.
- *The integration of the paperboard box had contradictory effects on new package environmental performance.

COMPASS data output:
SUSTAINABILITY TOOLS

Packaging Modeling Case Study: Go Phone Package Reduction

Go Phone Goal:

• Reduce packaging consumed in Go Phone selling unit packaging

Dordan Approach:

• Achieve lower product-to-package ratio by change the clamshell from convex to flat, thereby eliminating the snap-on lid
• Reduce materials required by down-gauging the clamshell from 0.030" to 0.025" and the inner tray from 0.045" to 0.035"

Go Phone Package Reduction Results/Savings:

• 29% cost savings compared to previous package
• For the same amount of product sold, reduced the total packaging weight by 25%
• Reduced C02 emissions by 25%
• The slimmer design allows for more products per pallet and an increased number of units per foot of retail space.
Reduction in Packaging Scores:

Percentage Reduction in Scores

<table>
<thead>
<tr>
<th>Raw Scores</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co2</td>
<td>25%</td>
</tr>
<tr>
<td>Sust Mat</td>
<td>25%</td>
</tr>
<tr>
<td>Transport</td>
<td>25%</td>
</tr>
<tr>
<td>Prod/Pack</td>
<td>25%</td>
</tr>
<tr>
<td>Cube</td>
<td>15%</td>
</tr>
<tr>
<td>Recycled</td>
<td>25%</td>
</tr>
<tr>
<td>Recovery</td>
<td>25%</td>
</tr>
<tr>
<td>Renew</td>
<td>10%</td>
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</table>
SUSTAINABILITY SERVICES

Introducing Dordan's Bio Resin Show N Tell

In response to inquiries from clients, Dordan began an internal R&D program geared toward understanding the application and limitation of bio-based/biodegradable/compostable resins in 2009. Three years later, Dordan is proud to have the largest compilation of non-traditional resins in the industry, displayed annually at Pack Expo. Today 9 materials converted via thermoforming are included in the Display, presented alongside material specs, environmental profiles, and cost analysis.

Dordan's alternative materials R&D positions us as an ideal partner for those considering non-traditional materials in the packaging developmental process of more sustainable packaging systems.

Bio Resin Show N Tell Materials Library:

- Cellulosic Acetate
- PHA
- TerraPET
- PLA & Starch
- PLA
- Aeris InCycle
- PP/PE + Calcium Carbonate, “Oshenite”
- Algae-plastics
- DPET
**Cost Comparative Example:**

<table>
<thead>
<tr>
<th>Resin</th>
<th>$ Comparative</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDPE (opaque)</td>
<td>0.042</td>
<td>28.85</td>
</tr>
<tr>
<td>Aeris InCycle (white, gloss, satin)</td>
<td>0.043</td>
<td>93.1</td>
</tr>
<tr>
<td>HIPS (opaque)</td>
<td>0.048</td>
<td>26.30</td>
</tr>
<tr>
<td>PLA (clear)</td>
<td>0.049</td>
<td>22.30</td>
</tr>
<tr>
<td>PVC (clear)</td>
<td>0.050</td>
<td>19.67</td>
</tr>
<tr>
<td>PLA + starch (opaque)</td>
<td>0.059</td>
<td>22.10</td>
</tr>
<tr>
<td>TerraPET (clear, white, blk)</td>
<td>0.080</td>
<td>21.00</td>
</tr>
<tr>
<td>PHA (green, opaque)</td>
<td>0.117</td>
<td>21.40</td>
</tr>
<tr>
<td>Cellulosic Acetate (clear)</td>
<td>0.261</td>
<td>23.00</td>
</tr>
</tbody>
</table>

**Show N Tell Listing Example: PHA**

**Physical Properties:**

- Durable and tough
- Ranging from flexible to rigid
- Heat and moisture resistant
- Pending FDA clearance for use in non-alcoholic food contact applications
- The pending clearance will include products such as housewares, cosmetics and medical packaging
Environmental Properties:

- Feedstock: Poly Hydroxy Alkanoate (PHA) polymer made through a patented process for microbial fermentation of plant-derived sugar; only class of polymers that are converted directly by microorganisms from feedstock to the polymetric form.
- End of life: Complies with EN 13432 and ASTM D 6400 Standards for industrial biodegradability and compostability; complies with ASTM D 7081 Standard for marine biodegradation; received Vincotte OK Compost Home certification; and, received Vincotte OK Biodegradable in Soil certification.
- There is no post consumer or post industrial market for this resin; in principal, film is readily recyclable.

Thermoformed Sample Example:
Introducing Dordan's 4-Step Design for Sustainability Process

Since 1996 when Dordan began developing expertise in thermoforming recycled PET (RPET), we have developed a 4-Step Design for Sustainability Process that helps clients achieve measurable sustainability improvements. This process entails:

- Lower product-to-package ratio
- Materials selection
- Materials reduction
- Sustainability documentation

By approaching clients with an executable Design for Sustainability Process, Dordan aids those working toward developing more sustainable packaging options.
DORDAN SUSTAINABILITY EFFORTS

Introducing Zero-Waste via Chicago Waste to Profit Network

Dordan Manufacturing is actively working towards achieving its goal of zero waste to landfill; efforts include conducting several waste audits off which waste diversion progress can be gauged, composting food and yard waste, and recently joining the Chicago Waste to Profit Network.

The Chicago Waste to Profit Network is a working-group dedicated to discovering "by-product synergies" between manufacturers' material inputs and outputs. Through the transparent web-based platform Cirrus, Dordan is able to actualize the parable, "one man's trash is another man's treasure," working to redistribute waste materials and re-source needed materials to achieve the lowest environmental impact.
DORDAN SUSTAINABILITY EFFORTS

Introducing Dordan's Environmental Management Program

Dordan is working with the makers of a streamlined LCA modeling tool on an environmental assessment of Dordan's thermoforming process. This will allow us to establish a baseline off which progress can be gauged, which is crucial for the development and implementation of an Environmental Management Program.

EMPs are necessary for those manufacturers looking to enhance the efficiency of their operations.
INDUSTRY SUSTAINABILITY EFFORTS

Introducing Dordan's Clamshell Recycling Initiative

Clamshell Recycling Initiative Background:

In 2009 Dordan discovered that the plastic clamshell packaging it manufactures is not recyclable insofar as the majority of communities don’t accept it via curbside systems, only PET bottles. Dordan began a blog, Recycling in America, narrating its Sustainability Coordinator’s journey to understand (1) why clamshells were not “recyclable” and (2) how the industry could over come these barriers to clamshell recyclability.

Recycling Initiative takes to Social Media:

Dordan’s blog caught the attention of Walmart Canada’s Sustainable Packaging Director, who subsequently invited our Sustainability Coordinator to co-lead the PET Subcommittee of the Material Optimization Committee. This working group of PET stakeholders looked to increase the recycling of PET containers, bottle grade and thermoform grade, through supply chain collaboration.

Recycling Initiative Gets Exposure:

In September 2011 Dordan was awarded the cover feature of *Green Manufacturer Magazine* for its efforts to recycle thermoformed packaging.

In 2013 Dordan published *The State of PC PET Thermoform Recycling, Past, Present & Future*, which was published in UK-based Plastics in Packaging magazine.

Dordan continues to work with stakeholders to increase the recycling of PET packaging.
INDUSTRY SUSTAINABILITY EFFORTS

Introducing Industry Activism

Dordan believes that the best way to develop a more sustainably robust vision for packaging is cross-industry and supply-chain collaboration. Consequently, Dordan is an active participant in a variety of industry focused working groups.

Dordan presents domestically and abroad on issues of plastics and sustainability and its research is frequently published in industry periodicals. Dordan also continues to maintain its high-trafficked blog Recycling in America, where its Sustainability Coordinator discusses the intersection between sustainability, packaging, and ethics.

Dordan is involved and a member of the following industry associations: The Society of Plastics Industry, the Society of Plastics Engineers, The Association of Visual Packaging Manufacturers, the Chicago Waste to Profit Network, the Editorial Board of Plastics in Packaging.