Sustainability in Vaccine Packaging

Draft

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Executive summary

Sustainability in packaging is a growing area of conversation and collaboration between governments, industry, universities, and regulatory bodies. Design innovations and material development will be critical to increasing the environmental, social, and economic sustainability of packaging. A common framework and metrics system for packaging sustainability has been established building on the methodology of life-cycle analysis.

Australia, Brazil, Canada, China, Europe, Japan, Korea, several US states, South Africa, Taiwan, and Tunisia have some form of packaging regulation. For example, the European Union Packaging Directive establishes recycling recovery rates for all packaging placed on the European Union (EU) market. Directive 4/62/EC, “the Packaging and Packaging Waste Directive,” requires that all packaging on the EU market meet three essential requirements:

1. Efficient source-material usage.
2. Minimum hazardous substances in production and in the product.
3. Lower cost and more extensive recycling and reuse of packaging components.

In 2004, EU Directive 2004/12/EC amended parts of the Packaging and Packaging Waste Directive and set minimum specific recycling targets for materials contained in packaging waste. Australia is also following a similar path to the EU of packaging sustainability development.

Part of this paper provides an overview of collaborative efforts by industry, regulatory, and scientific communities to improve the sustainability of packaging in general. In the final sections, examples of product packaging applicable to increasing the sustainability of vaccine packaging are highlighted and followed by recommendations for opportunities to support more environmentally friendly packaging.
Background: standards and metrics for sustainability in packaging

In response to the increasing concerns about the environmental impact of packaging waste, significant effort has been focused on developing global metrics for sustainability in packaging. Definitions, indicators, and measures of sustainable packaging are outlined in, “A Global Language for Packaging and Sustainability: A Framework and a Measurement System for our Industry.” This packaging and sustainability framework includes input from stakeholders such as GlaxoSmithKline, retailers, packaging converters, and organizations (such as Efficient Consumer Response Europe, The European Organization for Packaging and the Environment, and the Sustainable Packaging Coalition). The framework is designed to help the packaging industry share information on packaging design and optimization and to potentially avoid the need for further regulations.

An example of a national metrics plan for manufacturers is Canada’s, “Action Plan for Extended Producer Responsibility and Strategy for Sustainable Packaging.” The European Union countries have made similar planning directives. In the United States, large retail corporations such as Walmart and Target have made specific packaging and marking requirements to manufacturers. Generally international programs are increasingly holding manufacturers responsible for the entire life cycle of certain products including package disposal.

Since most large companies are international in their business activity, there is a need for conformity in packaging regulations to ensure the production and sale of products worldwide. These new international standards are under development by a technical committee under the control of the International Organization for Standardization (ISO), specifically the ISO/TC 122/SC4. This technical committee intends to publish six standards for review in 2012, and these are to be covered by a seventh umbrella standard.

These six standards will cover:

- Source material reduction.
- Packaging reuse.
- Packaging recycling.
- Energy recovery.
- Composting.
- Biodegradation.

In the United States, the Material Handling Industry of America has joined the ISO initiative. In addition, ASTM International, formerly known as the American Society for Testing and Materials, has developed the D10.19 subcommittee to support this ISO international effort. The goal is to publish ISO standards in 2012.

The life-cycle assessment (LCA) method is the most widely accepted method for measuring packaging sustainability and is at the foundation of packaging standards. However, with the introduction of the LCA method, sustainability claims are moving
from simple, single-attribute claims to more complex claims. This complexity increases the need for harmonized and scientific methods as well increases the availability of data.

Because of the growing interest and application of LCA, there are a growing number of tools to assist with the life-cycle analysis of packaging materials and design. As an example, UPS is using the Comparative Packaging Assessment web application COMPASS® to provide feedback to the customer on the sustainability of packaging through its Eco Responsible Packaging Program. The COMPASS® assessment methodology and processes are verified by Societe Generale de Surveillance, an inspection, verification, testing, and certification company. This tool is also used by Proctor and Gamble packaging engineers to support packaging innovations that promote sustainability.

Certification initiatives are also a growing mechanism to provide consumer information on environmental sustainability of products. However, most environmental seals lack scientific method or rigor to their claims. The US Federal Trade Commission recently produced new guidance on marketing use of product certifications and packaging claims; analysis by a consumer advocacy group claims that this marketing guidance could mean that more than 300 environmental seals of approval are in violation of Federal Trade Commission standards.

### Sustainability issues for vaccine manufacturers

Progress in packaging sustainability will likely be led by corporate initiatives rather than regulation. Anne Johnson, Director of the Sustainable Packaging Coalition, concluded in the webinar, “Sustainability in Packaging: A Deeper Shade of Green,” convened on December 16, 2010, that efforts to improve sustainability in packaging are unlikely to be consumer driven. In the apparent absence of political leadership (in the United States) it will be corporate leadership in development of corporate sustainability initiatives that will drive progress in packaging sustainability.

An article in the World Pharmaceutical Frontiers e-magazine by James Hagan, who leads the Sustainability and Environment Center of Excellence at GlaxoSmithKline, articulates the aspiration that, “Healthcare’s triple bottom line then would be to reduce adverse environmental impacts from operations, lower costs and prices to provide greater access to medicines in a way that is business based, not philanthropy, recognize the societal benefits that come with greater access to medicines in the general uplifting of society.” This aspiration demonstrates corporate willingness at a pharmaceutical company to consider sustainability as part of good business practice.

The document, “Sustainability Reporting of the World’s Largest Pharmaceutical Companies: A Benchmarking Tool for Online Sustainability Reporting,” highlights how several other vaccine manufacturers consider sustainability in their corporate decisions. This report uses the Pacific Sustainability Index (PSI) developed by the Roberts

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1. Webinar: Sustainability in Packaging: A Deeper Shade of Green. Event archive available at: [http://event.on24.com/r.htm?e=267594&s=1&k=0F1836A02E35C55DB77DFC5C3C1E28EC](http://event.on24.com/r.htm?e=267594&s=1&k=0F1836A02E35C55DB77DFC5C3C1E28EC)
Environmental Center at Claremont McKenna College. The PSI uses two systematic questionnaires to analyze the quality of the sustainability reporting, and the questions are based on the most frequently mentioned topics in over 900 corporate sustainability reports analyzed from 2002 through 2007 at the Roberts Environmental Center. Student analysts review relevant English-language web pages from the main corporate website and index based on how corporate accountability, management, and vision/policy reflect environment and social issues. Additional considerations are made for a company’s resource utilization and emission data as well as human rights activities.

Four vaccine manufacturers were included in this report, including their grades: Sanofi-Aventis (A+), Merck (A-), GlaxoSmithKline (B+), Wyeth (B+). Sanofi-Aventis received top marks among the vaccine manufacturers for environmental intent, including vision and commitment, policy and certifications, as well as choice of environmental performance indicators, goals, and targets. However, all vaccine manufacturers included in this report did not score as well on their environmental performance as compared to their intent. “Packaging waste” and “packaging materials” were the lowest-ranked criteria used to measure environmental performance.

Despite being the lowest-ranked criteria on the PSI, pharmaceutical packaging and packaging material is increasingly relevant. In the research and markets report, “The Future of the Pharmaceutical Packaging Industry,” it was estimated that the global pharmaceutical packaging market will reach $68 billion by 2015. The report further notes that, “The fastest growth in pharmaceutical packaging market is expected from preffillable syringes and parenteral vials.” While this growth is largely in primary containers, the secondary and tertiary packaging will by association have an increased impact on the environment.
### Examples of innovation in packaging sustainability

Design and material innovations have the potential to improve the sustainability of vaccine packaging.

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<th>Plastic-based packaging will be the fastest growing sector of the sustainable packaging market over the next five years, representing 35 percent of all packaging materials. The EcoStar™ PC50 and HS 1000 by Placon (Figure 1) are examples of material improvements in plastics for secondary packaging for diluents ampoules and vaccine vials when the primary package/delivery device provides sterility. These materials ensure 50 to 85 percent recycled content and are compatible with several heat-sealing technologies.</th>
<th>Figure 1</th>
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<td>When prefilled glass syringes are needed for vaccine products, a syringe design by Cambridge Consults offers a new concept in prefilled syringes made with COP (cyclic olefin polymer) plastic (Figure 2). COP is a plastic that can be incinerated with minimal ash. This design avoids the need for secondary packaging, reduces the average volume of glass-syringe packaging in half, and reduces the packaging weight by 30 percent.</td>
<td>Figure 2</td>
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<td>If secondary packaging can provide vaccine vial protection to the point of the supply chain at which vials can be managed individually, it is possible that replacing corrugated shippers (as the tertiary packaging) with corrugated pads plus shrink film, such as that illustrated in food products, could reduce packaging materials. In the case of margarine (Figure 3), the change in the secondary packaging reduced the shipping weight by 50 percent and substantially reduced the shipping volume. This type of packaging change helped Procter &amp; Gamble to reduce packaging for laundry detergent by 80 percent.</td>
<td>Figure 3</td>
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Cornstarch-based foam is replacing expanded polystyrene in shipping coolers used to distribute Sandoz pharmaceutical products in overnight mail delivery of temperature-sensitive injectable liquids to US customers from a US-based distribution center. Sandoz uses a cold chain shipping product by Landaal Packaging Systems which is said to provide insulation properties for two days as well as environmental benefits at a cost savings.4

**Coldpack Airliner®** is a new generation of Airliner®, an insulative and inflatable shipping-case liner. This product is the result of a joint-development agreement between DuPont and Coldpack (Paris, France). Airliner is an alternative to conventional insulation materials such as expanded polystyrene which uses a combination of DuPont packaging resins including DuPont™ Surlyn®, DuPont™ Bynel®, and DuPont™ Nucrel®, to create a patented internal heat-barrier technology. Pira International performed a LCA of Airliner and noted that its ability to be shipped flat enabled more Airliner shipping systems to be distributed in the same amount of space than those that are disseminated preassembled. It can also be deflated to occupy less landfill space.

Two additional examples of where sustainability may potentially be improved include reducing vaccine packed volume and reuse of shipping containers.

**Reduce packed volume of vaccines**

Perhaps the quickest opportunity in improving sustainability in vaccine packaging comes from looking at secondary packaging and export packs. In the 1997 article, “How Important are Airfreight Rates and Vaccine Packaging in Cost-Saving Effort for the Expanded Programme on Immunization,” the authors proposed that the World Health Organization should strengthen vaccine packaging standards for net packaging per dose to eliminate uneconomical boxes with 5 to 10 vials. To control or eliminate the airfreight costs from gross weight shipping costs, the authors proposed that vaccines be packaged in larger secondary boxes with 50 to 100 vials. This change in secondary packaging would
reduce the number (and weight) of cold boxes needed for intermediate transport in country.

Souleymane Koné (World Health Organization/Department of Immunization, Vaccines and Biologicals/Expanded Programme on Immunization) in his presentations at the 2008 and 2010 TechNet Consultations suggested that increasing the number of vials per secondary container and minimizing dead space with tighter packaging of vials in secondary boxes would also reduce the logistical burden of intermediate vaccine transport.

**Reuse of shipping containers**

Closed-loop shipping is required in most circumstances when considering a reuse application of durable and expensive shipping containers. Because return and reuse rates will be highest within a company’s own distribution network, reuse of shipping containers has primarily been used when, for example, a vaccine manufacturer ships bulk product to its own distribution centers. There are several examples of reverse-chain logistics models that enable cold chain shipper reuse. For example, Fisher BioServices started using the Minnesota Thermal Science (MTS) Credo 4-1772 4°C containers for shipping flu vaccines to US locations. Fisher Scientific paid for the return shipping in this case study with the cost added to the client’s contracted cost.5

In October 2010, ThermoSafe Brands announced the launch of the **GREENBOX™ reusable system**. This system will combine, “sustainable, reusable, recyclable, biodegradable technology,” to reduce the weight, size, and by association, the potential cost of packaging and shipping. This system will be priced per use utilizing global third-party logistics, couriers, and reclamation vendors to meet customer’s needs.

**Opportunities to support increased vaccine packaging sustainability**

1. Evaluate how the current packaging sustainability framework could apply to vaccine manufacturers.
2. Request that vaccine manufacturers work with packaging suppliers to increase content of recycled materials.
3. Determine whether efforts to make secondary and export packaging more sustainable might increase product loss.
4. Encourage vaccine manufacturers to develop a sustainability mission statement.
5. Reevaluate the recommended intermediate packaging in preferred product profiles for vaccines.
6. Evaluate potential areas to reduce the environmental impact of immunization programs by reducing the export shipping material weight and volume while maintaining the cold chain.
7. Evaluate alternatives to EPS such as Airliner or cornstarch-based alternatives to see if they are applicable to international shipments of vaccines.
References


Annex 1: Organizations active in sustainability in packaging

**European Organization for Packaging and the Environment (EUROPEN)**
EUROPEN is an industry and trade organization open to any company with an economic interest in packaging and packaged products. Members of EUROPEN are identified as companies which support a united industry and trade organization, dedicated to satisfactorily resolving the environmental challenges facing the packaging chain in an active and cooperative manner without favoring any specific packaging material or system.

**Global Packaging Project**
The Global Packaging Project addresses the indicators and measures of sustainable packaging including the environmental impact from product loss due to inadequate packaging as a result of excessive packaging minimization, in its document, “A Global Language for Packaging and Sustainability: A Framework and a Measurement System for our Industry.” This Packaging and Sustainability framework was developed by stakeholders, including manufacturers such as GlaxoSmithKline, retailers, packaging converters, and organizations such as Efficient Consumer Response (ECR) Europe, EUROPEN, and the Sustainable Packaging Coalition (SPC).

**The Institute for Sustainability (IFS)**
IFS seeks to serve the needs of and influence the efforts of professionals, academics, industries, and governmental bodies that contribute to the advancement of sustainability and sustainable development. IFS provides multidisciplinary scientific and technical rigor to sustainability discussions and encourages the incorporation of sustainability concepts in engineering education.

**Societe Generale de Surveillance (SGS)**
SGS is the world’s leading inspection, verification, testing, and certification company. SGS has the capacity to assess the eco-performance of green packaging designs, including the package’s carbon footprint, material toxicity, and life-cycle impact. They are also able to validate thermal shipping package performance and verify manufacturer’s environmental claims.

**World Packaging Organization**
The World Packaging Organization is a nonprofit, nongovernmental, international federation of national packaging institutes and associations, regional packaging federations, and other interested parties including corporations and trade associations. The World Packaging Organization encourages the development of packaging technology, science, and improved information access.

**Sustainable Packaging Alliance (SPA)**
SPA aims to be an international focal point for knowledge, tools, and expertise that catalyze and facilitate continuous improvement in packaging systems’ environmental performance and sustainability. SPA aims to contribute to the positioning of Australia as
an international leader in commercial application and adoption of sustainable packaging systems.

**Sustainable Packaging Coalition (SPC)**

SPC is an industry working group that is a project of the nonprofit institute GreenBlue. SPC activities include the Design Guidelines for Sustainable Packaging, the COMPASS® (Comparative Packaging Assessment) online software application, environmental technical briefs, the Sustainable Packaging Metrics Project, the End-of-Life Labeling Project, and the online Sustainable Packaging Design Library.