Rigid vs. Flexible Packaging: Which Has the Edge in Being Green?

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Determining the level of “greenness” of a given product can be difficult. Most of us have a basic understanding of what a green product entails. However, quantifying greenness is a complex task. Businesses and governments continue to revamp and develop methods and protocols for determining greenness. Essentially, green products can be described as:
- Environmentally friendly
- Low carbon footprint
- Non-hazardous
- Non-toxic
- Energy efficient
- Generally less disturbing of the surroundings

While there may be many additional factors that contribute to a green product, the list of characteristics above provides a basis for discussion. When comparing rigid and flexible packaging in terms of greenness, it is first important to accurately define the differences between the two types of packaging.

Rigid Packaging

Rigid packaging is made from paper, corrugated or fiberboard/paperboard materials. These materials are used to form a box, tray or case. The final product can be without printing, feature one or two color printing schemes, or even feature high performance graphics. Rigid packaging is generally sealed with adhesives, tape or staples. Although rigid packaging has existed for many decades, it continues to evolve to meet the needs of a changing consumer landscape.

Flexible Packaging

Flexible packaging is made of plastic films, ply (one or multiple), graphics, and sealed generally with heat and/or pressure. There are a wide variety of plastic polymers used to produce films for flexible packaging that include polypropylene, polyethylene, nylon and polyester. Aluminum foil and metalized plastic films are very popular.
as well. The plastic films are used to form a bag or pouch to produce a flexible package. Flexible packaging is the newer of the two packaging technologies and has increased in popularity globally over the past couple of decades.

Greenness Comparison of Rigid and Flexible Packaging

In comparing the greenness of rigid vs. flexible packaging, there are many factors to consider:

- Industries
- Materials Used
- Cost to Produce
- Shelf-life Considerations
- Disposal
- Marketing

Industries: __________________________ Greenness Edge? **Flexible Packaging**

Rigid and flexible packaging is used for all major industries including, food, medical and industrial packaging. Food packaging is the largest market for packaging of any industry and includes products that use both flexible and rigid packaging materials.

Rigid packaging has many technological limitations. In contrast, flexible packaging is more highly advanced with modified atmospheric packaging, controlled release of packaged content packaging, security enabled packaging and a host of other smart packaging concepts.

Flexible packaging is growing at an accelerated rate versus rigid packaging, and offers more market and application potential. Finding the balance for performance and environmental impact will be critical in the future regarding the use of different types of packaging in various industries.

Materials Used: __________________________ Greenness Edge? **Rigid Packaging**

Paper and paperboard products used for rigid packaging are derived from natural sources. Although gas powered equipment is used to harvest trees, paper is considered a very environmentally friendly source. Plastic films, on the other hand, are derived from oil and natural gas. There are not substitutes for these materials when producing flexible packaging. Interestingly, as technological advances are made in flexible packaging materials, less packaging material is being used to package the same amount of goods.

Both packaging technologies use inks and adhesives to manufacture. Flexible packaging allows the use of multiple colors and high performance printing to produce aesthetically pleasing packaging. Rigid packaging is optimal for packaging bulk items. Occasionally, the two packaging technologies are combined, like in cereal (bag-in-a-box) and beverage containers.
Cost to Produce: Greenness Edge? Toss-up
While there are many aspects to consider when comparing costs of rigid vs. flexible packaging, it can be determined that the cost of a rigid package is likely less than one of flexible packaging when only considering the materials involved. Speed, on the other hand, favors flexible packaging with faster filling and sealing methods. Speed can be equated to energy efficiency.

Shelf-Life Considerations: Greenness Edge? Toss-up
Plastic materials can be designed to produce a product with integral barriers, whereas paper materials cannot. As a result, flexible packaging materials can be used for applications in which rigid packaging would be ineffective. Conversely, a corrugated box can be reused many times over whereas a plastic pouch is designed for a one time use.

Disposal: Greenness Edge? Rigid Packaging
In theory, paper materials can be land-filled, composted, recycled or burned. Land-filling seems appropriate; however, the sheer bulkiness of paper materials when compared to plastic materials can be detrimental. Composting of paper materials is possible, while composting of plastic films (excluding new technologies such as polylactic acid type) is currently unfeasible. Recycling of paper materials is common while recycling of flexible packaging materials, due mainly to graphics and multiple differential layers, is very much in its infancy. Overall, disposal of rigid packaging is an advantageous compared to flexible packaging.

Marketing: Greenness Edge? Toss-up
The true wild card in the future of either type of packaging can rest with the marketing of the packaged good, meaning the package design. If all packaging was made generically, with a limited amount of print and the use of a single color, the environmental impact would be less. This scenario, however, is very unlikely and it is presumed that the growth of complex graphics will continue with advances in flexible and well as rigid packaging. The more emphasis that is placed on the aesthetics of the package, the less environmentally friendly the package will be.

In the future, as caring for the environment becomes a highly regarded value, packagers will be forced to consider the environmental impact of manufacturing various types of packaging.

And the Winner Is...
So which is a greener package—a rigid one or a flexible one? The answer is—it depends. Many factors influence design decisions about product packaging. As demonstrated in this article, both rigid and flexible packaging have unique performance and “greenness” attributes. Knowledge of these features can help guide future packaging recommendations to maximize the “greenness” factor of products.
About Tom Rolando

Tom Rolando is a technical expert in the adhesives industry with nearly 25 years of experience working with adhesives, coatings and sealants. Tom Rolando serves as the Chief Technical Officer for Wisdom Adhesives, North America's top mid-sized manufacturer of high performance, environmentally safe industrial adhesives. During his tenure at Wisdom Adhesives, Tom has significantly added to the company’s product portfolio including the GreenBond Sustainable Adhesive product line, ClearBond product line among other achievements. Tom has also championed the Wisdom Total Quality Management LSS-FAST and ECO 2 business programs.

Prior to joining Wisdom Adhesives, Tom led H.B. Fuller Company’s Flexible Packaging Program in a dual role as technical and business manager. Tom also has developed coatings and ink experience as Technical Director at both Akzo Nobel and Cargill.