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# Guidelines for Formulating and Designing Green Products

Earth Friendly Products



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## Introduction

This guide provides advice for chemists and technical staff in order to help them apply a sustainable product design within Earth Friendly Products and across the supply chain. A design-for-sustainability checklist focuses on specific aspects of product design. These are implemented at the start of the detailed design stage and again at the end of this stage to account for any refinements to the specifications. For new products, a life-cycle assessment should be carried out on the final products to measure the improvement in performance compared to the baseline design, as well as to identify target areas for future product development.

### Business Benefits

In addition to saving money, a sustainable product design can also deliver additional business benefits, including the following:

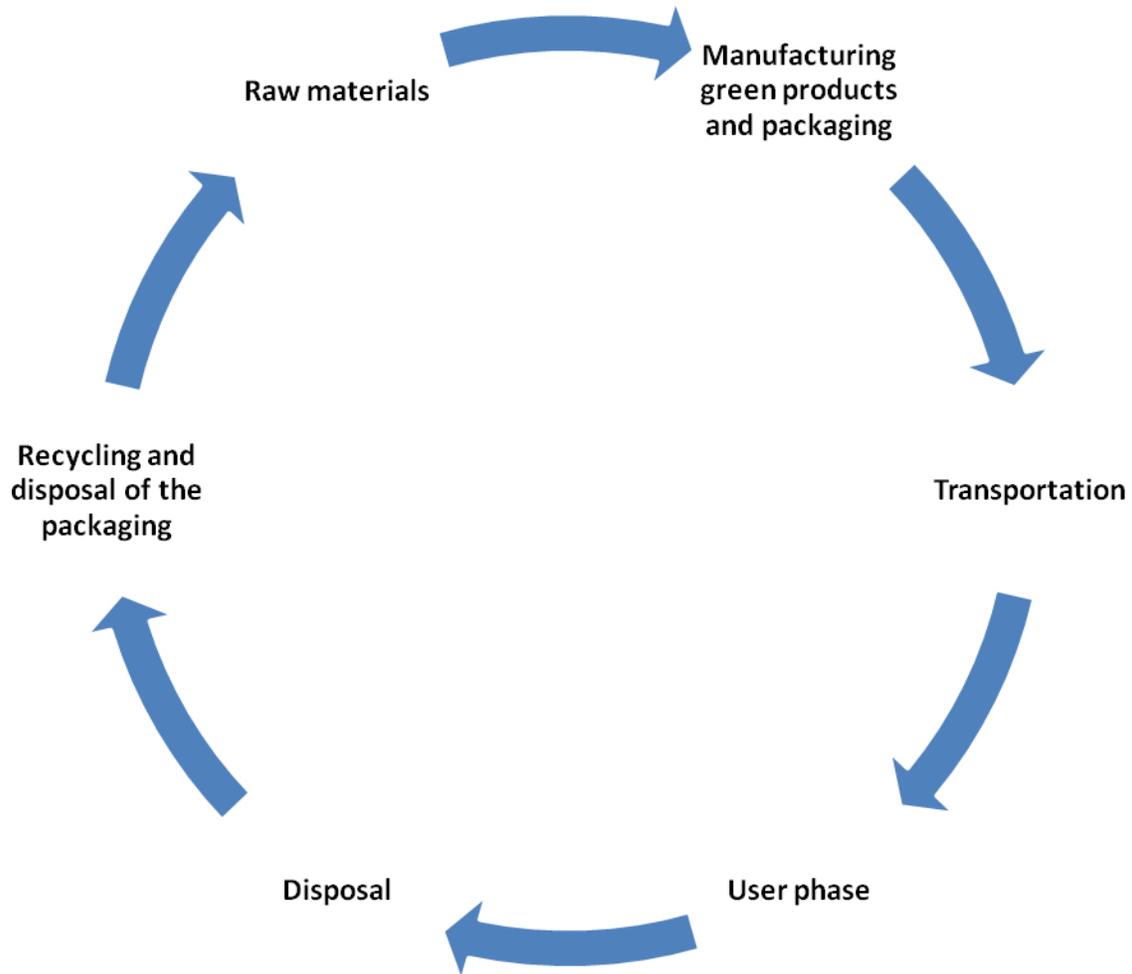
- **Environmental Marketing:** Many customers now include sustainable product design issues in the tender documentation and a “greener” image can increase market share.
- **Enhanced Reputation:** Demonstrating good environmental performance can exchange the company’s standing with shareholders, investors, employees, customers and other stakeholders.
- **Improvements in Workplace Health and Safety:** Reduced waste and emissions combined with safety-conscious management practices all provide a safe and healthy environment.

- **Increased Staff Morale:** There is a growing awareness among staff that business must play a role in working towards sustainable development. This can provide a strong personal incentive to pursue sustainable product design.

### **Life-Cycle Assessment (LCA) Tools**

Sustainable product design aims to minimize costs and environmental impacts. Improving resource productivity – producing more goods and services with fewer inputs of materials and utilities and with less pollution and waste – will reduce business costs and benefit the environment. Sustainable design takes into account the costs and environmental impacts of a product over its entire life cycle (see Fig 1).

LCA is a methodology for evaluating the environmental impacts of a material through its entire life cycle – from its initial production to its eventual reuse, recycling, or disposal. LCA attempts to identify and quantify all relevant environmental impacts for materials so that comprehensive comparisons can be made.



**Fig 1: Stages in the life-cycle of a product**

### **Issues within the Business and along the Product Life Cycle**

As with any design changes, sustainable product design can have upstream and downstream impacts on suppliers, customers, and recyclers. Sustainable product design additionally can have an impact on a wide range of business issues including the following:

- Purchasing
- Manufacturing

- Distribution
- Marketing
- Quality
- Health and Safety

It is important to ensure that these impacts are identified and addressed as early as possible in the design process. This will vary depending on which stage of the product's life cycle the design improvements are focused. For example, formulation design decisions focused on using fewer materials may mainly affect quality, manufacturing and purchasing, whereas design decisions to use more environmentally friendly materials in the manufacturing process will require consultation and increased transparency between suppliers and their customers.

It is also important to consider how design changes will affect other stages in the product's life cycle. For example, materials chosen to reduce costs in the manufacturing process may decrease opportunities for end-of-life reuse or recycling and so reduce the overall cost savings that could be achieved across the entire product life cycle.

### **Description**

The characteristics of green products can vary significantly depending on the material type. Green products should have one or more of the following health and/ or environmental attributes:

- Made using natural and/ or renewable resources
- Safe for human use

- Promote good indoor air quality (typically through reduced emissions of VOCs and/ or formaldehyde)
- Incorporate recycled content (postconsumer and/ or postindustrial)
- Have low embodied energy (the energy required to produce and transport materials)
- Do not contain toxic compounds and their production does not result in toxic byproducts obtained from local resources and manufacturers
- Are biodegradable

### **Design to Minimize Resource Consumption**

The first consideration is to use fewer materials and utilities over the product's life cycle and generate less waste. The goals of sustainable design are to improve resource productivity through the following practices:

- Minimize the use of materials and utilities
- Eliminate the use of hazardous materials
- Maximize efficacy and performance
- Generate zero waste and pollution during production

Using fewer ingredients in the formulas has the benefit of reducing inventory storage, transportation, energy and formula costs. Fewer ingredients also may reduce consumers' overall chemical exposure to potentially sensitizing ingredients and may make products safer for more people.

The key to implementing a minimalist approach is to optimize the formulas.

### **Synergistic Ingredients**

In addition to optimizing the formulas, another important strategy in minimalist formulation is to look for synergistic ingredients. These are ingredients that interact with each other to create even greater beneficial effects. The problem, of course, is that these are difficult to find. This an added bonus of a minimalist approach. Particular attention should be focused on the following:

- Material content (avoiding toxic materials)
- Energy consumption
- Product waste
- Reusability/ Recyclability of the packaging at the end of life
- Emissions during production (e.g. noise, heat)

### **Packaging Design**

Packaging has to protect the goods, facilitate handling and distribution, present information and act as a marketing tool for the product. Inadequate packaging can result in product damage, customer returns and wastage. Poor packaging design can even result in injury.

Changes to product packaging will require consultation with customers, whereas design for materials' recycling at end of life will require consultation with recyclers. Good packaging design has a vital role to play in producing packaging that is both fit for purpose and environmentally appropriate.

Reviewing the materials and design of the product packaging may identify the following opportunities:

- Optimize the packaging's use (i.e. matching the packaging to the level of protection needed)
- Introduce reusable transit packaging

- Design for recyclability whenever possible
- Use lighter weight containers
- Increase cube efficiencies
- Decrease fuel usage
- Reduce transportation costs
- Reduce greenhouse emissions
- Lower costs per piece
- Reduce use of virgin material
- Reduce the amount of plastic that ends up in landfills

### **Evaluate the Distribution System for Space-Saving Opportunities**

Wasted space in packaging results in excess materials, transport, handling and storage.

- To reduce a package size while maintaining its integrity, begin with understanding the known sizing of the transport mode that will be used and then minimizing the package size to hold everything at the lowest possible cost
- By using life-cycle approach, take into account how these materials perform in a recycling stream
- Additionally, know where the raw materials are sourced and ensure that the resulting packaging provides the required functionality for the product.