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#### [Introduction to DFE](#)

Many people in our society are beginning to focus on the importance of environmental preservation. Pollution is increasingly making the surrounding air, water and ground contaminated. This is bringing the environmental practices of industry into the neighborhoods, communities and homes of all citizens. As a result, many citizens are becoming concerned with the environmental practices of the industries that surround them. Governments are also stepping up on their environmental regulations, policies, and procedures which restrict industry's environmental practices. This in turned has compelled many industries to improve their environmental record to produce greener products and use greener processes.



Strategies At  
[Clorox Corp.](#)  
[DuPont Corp.](#)  
[Invar Corp.](#)  
[Nortel Corp.](#)



#### [What is DFE](#)

### Need for Green Design/DFE

With stricter government regulations and increased consumer awareness, companies have

come to realize the importance of preserving the environment. This has caused many companies to examine their operations and products to address the environmental issues concerned with the production, consumption, and disposal of the goods that they produce. Companies also realize that changing existing products and processes to address environmental concerns can be very costly. To avoid these unnecessary expenses, design for environment, (also known as green design), has emerged.

### **Green Design/DFE**

The design stage in the new product development process is the most critical stage in the entire cycle. Ideas, objectives, and concerns addressed in this stage have a ripple effect throughout the entire NPD process. As a result, companies have come to realize that in order to produce environmentally safe products in a cost effective manner, they must address environmental issues in the design stages of the NPD process. This is a process called green design or design for environment.

Green design is the systematic consideration of environmental health, safety, preservation, and restoration issues during the new product development process. Some of the issues which DFE addresses include: environmental management, product disposal, product safety, pollution prevention, ecology, resource conservation, accident prevention, waste management, and occupational health and safety. This makes green design a tool which enhances environmental quality, as well as market competitiveness.

[DFE Attempts To...](#)



### **Basic principles of DFE**

#### **Evolution From Traditional Environmental Practices**

In recent years, there has been a fundamental change in the way industry approaches environmental health, safety, and management issues. In the past, companies would only apply environmental

sa fety measures to comply with regulatory standards, or in other words to stay out of trouble. Today m any companies have abandoned this passive approach to environmental protection. Most leading compani es have established environmental programs and policies to manage and control operational effects on the surrounding environment. Most of these companies also publish annual environmental reports on al l of their programs, policies and improvements which have transpired in the previous year to protect, preserve, and restore the environment.

### **Governmental Standards**

Governmental standards are established and enforced to protect and preserve the environment f rom industrial abuse. They are used to assure that a company has an effective environmental managemen t system in place. These standards seek to harmonize industry practices in several areas including environmental management, auditing, performance evaluation, labeling, packaging and life-cycle analys is. Ultimately, compliance with government standards becomes an international passport for companies seeking to do business under each government's jurisdiction.

### **DFE Strategies**


Green design strategies can be broken into the two major categories of source reduction and w aste management. Source reduction strategies attempt to eliminate the pollution at its source, while waste management strategies promote recycling, reusing, reclaiming, and refurbishing of parts and ma terials.

### **Environmental Quality Metrics**

In green design, environmental quality metrics are parameters used to measure the environmental effec tiveness of specific operations and procedures. These metrics are used to evaluate design improvemen ts and to set environmental goals. Because of their fundamental role in the development process, qua lity metrics are essential to the successful implementation of DFE.

#### [Some Environmental Quality Metrics](#)





## Evaluating DFE

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Four phases are considered when evaluating DFE:

### **a)Raw Material Extraction Process**

In this phase, the environmental impact of extracting and processing raw materials to be used in a product, must be evaluated. Using recyclable material and renewable resources in the place of non-recyclable virgin materials is also emphasized during this phase. A major challenge of this process is to identify and specify materials that can enhance environmental quality, while satisfying the product's performance and cost requirements.

### **b)Manufacturing and Production Process**

The main goal of this phase is to eliminate or minimize all of the adverse environmental effects associated with the manufacturing process. These are things such as: the use of manufacturing processes which optimizes material conservation; use of surfaces which will eliminate the need for paint; use of designs that remove the need for fasteners; use of environmentally compatible materials and operations; and so on. The concerns of this phase must be addressed in the design stages of the NPD process in order to avoid processes and materials that which are harmful to the environment.

### **c)Consumer Consumption**

The main goal of this phase is to eliminate or minimize all of the adverse environmental effects associated with the use and consumption of a product. This phase addresses the use of product ingredients which adversely affect the environment while being used such as: aerosol sprays and refrigerator coolant ingredients which deplete the ozone layer; car designs which allow for excessive pollutants to be admitted into the atmosphere; cleaning detergents and laundry products which contaminate water supplies; and so on.

### **d)Product Retirement**

The main goal of this phase is to address the issues associated with the waste and disposal of products and their packaging at the end of

their service life. This stage emphasizes the use of product materials which are biodegradable or recyclable. This phase also considers how multi-material products must be designed for disassemble in order to easily separate out the recyclable contents.



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#### A few DFE strategies

### **LIFE CYCLE ANALYSIS**

Life cycle analysis is an objective analytical tool which organizations use to analyze the environmental costs and benefits associated with different design decisions. This process takes into account all factors which affect the environment throughout each phase of a product's life cycle. The environmental effects of the Raw Material and Extraction, Manufacturing and Production, Consumer Consumption, and Product Retirement phase are all measured and evaluated in the life cycle analysis. This information is then used by project designers to decide on various environmental tradeoff options. Such a analysis may be considered the ultimate environmental evaluations tool in the green design process.

### **SOURCE REDUCTION**

Source reduction strategies are regarded as the most practical solutions to reducing and eliminating waste and byproducts. These strategies attempt to reduce and eliminate waste and toxic byproducts at their source by removing all or some of the material that initially creates them. This may entail dropping or combining product features, improving process controls and yields, or extending the product's life cycle.

[Know more on Source Reduction Strategies](#)

### **WASTE MANAGEMENT**

Waste management strategies are not aimed at reducing the pollutants at its source, rather they concentrate on making waste disposal easier. The goal of these strategies is to design products that are easy to recycle, remanufacture, decompose and incinerate. The products must also be able to disassemble easily in order for the materials to be

recycled and remanufactured.

[Know more on Waste Management Strategies](#)



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 **Why some companies hesitate to apply DFE**

Choose one



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 **How companies can successfully DFE**

Even though almost all major companies have some type of an environmental program, there is a vast difference between the companies that have successful DFE operations and those that do not. There are several reasons for failure or ineffective green design programs. Some of the reasons for DFE failure include: unclear environmental goals and objectives, insufficient organizational support, ineffective leadership, lack of environmental measures, insufficient training and so on. Despite all of these pitfalls that prevent effective DFE, it can be obtained by following the best practices of successful green design operations.

Choose one practice



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 **How does DFE benefit corporations**

Regardless of where DFE is applied, there are significant benefits to the firms or organizations that use such green design programs. These benefits not only affect the participating organizations, but they ultimately affect everyone by having a cleaner and safer global environment.

Choose one benefit





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