



# Design for the Environment Projects



## ***What is Design for the Environment (DfE)?***

DfE is an approach companies use to make business decisions that consider environmental impacts along with traditional business considerations of cost and performance. Manufacturers are increasingly thinking in terms of “design for” qualities or traits in their products and processes.

For over a decade, EPA’s Design for the Environment Program has promoted voluntary partnerships on safer chemicals, comparative risk analysis, and alternative technology development.

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***DfE is a voluntary, partnership program that works directly with industries and other partners, with a focus on small businesses, to integrate health and environmental considerations in business decisions.***

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***The DfE Program:*** DfE is a testing ground for new approaches to risk reduction through pollution prevention. By balancing business needs and environmental concerns, the DfE Program is serving as a catalyst for lasting change. DfE’s approach is grounded in comparing the risks, performance, and costs, of alternative technologies or processes. Rather than rely on end-of-pipe controls, DfE encourages pollution prevention or front-end innovations through the redesign of formulations and manufacturing and disposal processes.

DfE can help an industry comply with regulations through cleaner technologies and safer chemicals. To move an industry beyond compliance, a DfE project looks at cross-media impacts, energy and resource use, and the risks from unregulated, hazardous chemicals. A DfE project may use a cleaner technologies substitutes assessment (CTSA) to evaluate the environmental risks, performance, and costs of competing technologies.

***DfE Partnerships:*** DfE partners with an entire industry sector, usually through industry leaders and trade association representatives, to conduct an assessment. DfE assessments are disseminated throughout the industry, so businesses can make better informed decisions that reduce environmental impacts and even boost a company’s bottom line. ***DfE partnerships include the following:***

***Printing:*** DfE partnered with all sectors of the printing

industry to improve environmental performance in the printing shop. The Screen Printing Project evaluated 18 screen reclamation technologies. The Lithography Project assessed 37 blanket wash formulations. The ***Flexographic CTSA, published in February 2002***, compares environmental impacts, costs, and performance of the three primary ink systems (uv, water-based, and solvent). The study found that each of the ink systems had different advantages as well as health and environmental concerns. DfE concludes that selecting the best ink formulation is just as important as system selection. ***Contact:*** [\*\*\*Chu.Karen@epa.gov\*\*\*](mailto:Chu.Karen@epa.gov)

***Printed Wiring Board:*** The printed wiring board (PWB) is the critical building block of the electronics industry. The traditional manufacturing process includes the use of substantial amounts of water, energy, and some toxic chemicals. DfE first collaborated on an evaluation of the “making holes conductive” step of PWB manufacturing. The CTSA evaluated nonconveyorized electroless copper and six alternative technologies that use direct metalization, and found that the alternatives perform as well or better, are more efficient, and may pose less risk to workers and the environment. The partnership recently completed it’s second evaluation comparing several “lead-free” surface finish alternatives to the standard hot air solder leveling process. The ***PWB Surface Finishes CTSA, published in June 2001***, indicates that the alternative finishes perform as well as, or better than, the baseline technology, and many of the alternatives cost less, use less water and energy, and appear to pose less potential risk to workers and the environment. ***Contact:*** [\*\*\*Hart.Kathy@epa.gov\*\*\*](mailto:Hart.Kathy@epa.gov)

***Computer Display Screen:*** The Computer Display Screen project used life cycle assessment (LCA) to evaluate the environmental impacts of traditional cathode ray tube (CRT) and the new active matrix liquid crystal display (LCD) technologies. The analysis indicates that CRT has greater impacts than the LCD in all but two impact categories (eutrophication and aquatic toxicity). Further, the results indicate several areas where improvements can be made during the life-cycle of both technologies, such as reducing energy consumption during manufacture, cutting back on usage of chemicals that pose greater aquatic toxicity risks, and eliminating the use of mercury. The ***Computer Display Screen LCA published in December,***

**2001** encourages companies to use the LCA results to conduct their own improvement assessments. **Contact:** [Hart.Kathy@epa.gov](mailto:Hart.Kathy@epa.gov)

**Solder in Electronics:** This project, initiated in late 2001, will be conducted as a life-cycle assessment (LCA) of tin lead solders and 3-4 alternatives. The primary focus will be on the potential impacts of the alternatives. Legislative and market pressures to remove lead from electronics are continuing to increase, both domestically and abroad, due to potential environmental concerns posed by leaded solders. The partnership has concern that if all environmental aspects of replacement solders are not carefully considered, the replacement of lead could have a net negative impact on the environment. **Contact:** [Hart.Kathy@epa.gov](mailto:Hart.Kathy@epa.gov)

**Dry Cleaning:** DfE worked in partnership with the drycleaning industry to reduce exposure to perchloroethylene or "perc.", a chemical solvent used by most drycleaners that poses health and environmental concerns. Through this partnership, greener technologies have become well-established in the dry cleaning industry.

**Industrial/Institutional Formulations Project:** DfE is partnering with detergent and other formulators to design and adopt safer, more efficient products. Billions of pounds of chemical ingredients are used in laundry and other detergents each year and ultimately wind up down the drain and, in some form, out in our environment. DfE is working with companies through memorandums of understanding (MOUs) to reformulate products and, thereby, prevent pollution and reduce impacts to human health and the environment. This approach is being expanded to include other industrial formulations. In addition, the two laundry trade associations (UTSA & TRSA) have adopted the DfE approach as their environmental stewardship program and have identified industry-wide goals to improve chemical formulation ingredients, water, and energy use by 10-25%. **Contact:** [Difiore.David@epa.gov](mailto:Difiore.David@epa.gov) or [Cushmac.Mary@epa.gov](mailto:Cushmac.Mary@epa.gov)

**Automotive Refinishing:** DfE is working with the automotive refinish industry to increase awareness of the risks and pollution issues associated with spray painting and related activities. DfE is promoting adoption of cost-effective technologies and best practices that reduce exposure and emissions of toxic chemicals used in autobody shops such as diisocyanates and volatile organic solvents. Diisocyanates are the leading cause of occupational asthma. There are over 60,000 shops and over 150,000 painters. These numbers do not include other persons in the shops and neighboring areas impacted by odors and toxic emissions from the shops, many of which are located in residential areas. DfE identified technologies that reduce worker exposures, more efficient

workplace practices, and practical ways to adapt new technologies to the real-world parameters of the small shop. DfE also supported a virtual autobody website at <http://www.ccar-greenlink.org/cshops>, containing easily accessible information for painters, shop owners, and technical assistance providers. **Contact:** [Cushmac.Mary@epa.gov](mailto:Cushmac.Mary@epa.gov) or [Difiore.David@epa.gov](mailto:Difiore.David@epa.gov)

**Adhesives:** Environmental and occupational regulations are causing rapid changes in the use of adhesive solvents in the foam furniture industry. The industry's concern is that affordable, effective, and safe adhesives will not be available in the future. DfE is investigating solvents and processes with the goal of providing information on alternative adhesives that are less harmful than the chlorinated and flammable solvents currently in use. Case studies are being developed to share information on alternative adhesives. **The CTSA is expected in fall 2002.** **Contact:** [Sparks.John@epa.gov](mailto:Sparks.John@epa.gov).

**Supplier Initiative:** Original Equipment Manufacturers (OEMs) of products, such as automobiles, depend on a network of suppliers for parts and assemblies. Many of the suppliers are small businesses. A pilot is underway with General Motors, Inc. and Saturn Corporation to investigate using the network to promote prevention and risk reduction. **Contact:** [Sparks.John@epa.gov](mailto:Sparks.John@epa.gov)

**DfE Approaches to Developing an Environmental Management System (EMS):** The DfE Program has integrated DfE, pollution prevention, and risk reduction approaches and methodologies into an EMS framework. The DfE Integrated Environmental Management Systems (IEMS) Manual and the IEMS Facilities Template have been widely distributed. Also, DfE partnered with the Screen printers and Graphic Imaging Association (SGIA) to pilot DfE/EMS with screen printers - SGIA is now implementing a national DfE/EMS program. **Contact:** [Chu.Karen@epa.gov](mailto:Chu.Karen@epa.gov)

**Design for the Environment**



To learn more about the Design for the Environment Program, visit the DfE web site at [www.epa.gov/dfc](http://www.epa.gov/dfc). If you are interested in joining a DfE Partnership Team for any of the projects described above, please contact the appropriate Project Manager. DfE looks forward to working with you as a new partner. We also welcome your ideas on new projects that use the DfE approach to cleaner, safer technologies. Please contact Carol Hetfield at [Hetfield.Carol@epa.gov](mailto:Hetfield.Carol@epa.gov) with your suggestions, or write to:  
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