



Design for the Environment Printed Wiring Board Project



What Is Design for the Environment?

EPA's Design for the Environment (DfE) Program is a voluntary initiative that forges partnerships with many stakeholder groups in an effort to:

- Incorporate environmental concerns into the traditional decision-making parameters of the business world: *cost* and *performance*.
- Build incentives for behavior change to encourage continuous environmental improvement.

To accomplish these goals, the program utilizes EPA expertise and leadership to evaluate the environmental and human health risks, performance, and cost trade-offs between traditional and alternative technologies. DfE disseminates information on its work to all interested parties and also assists businesses in implementing new technologies identified through the program.

The program currently has cooperative partnerships with:

- Industry
- Government purchasing authorities
- Professional institutions
- Academia
- Environmental and public interest groups

Making the Connection

Why Is EPA Working With the PWB Industry?

The printed wiring board (PWB) is the building block of the electronics industry. It is the underlying link between semiconductors, computer chips, and other electronic circuitry. PWBs are, therefore, an irreplaceable part of many "high-tech" products in the electronics, defense, and automotive industries. The manufacture of PWBs, however, requires substantial amounts of water and energy, and some toxic chemicals that may pose potential environmental and health risks.

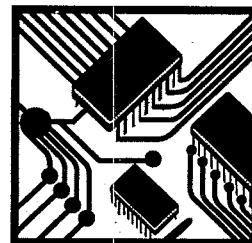
Because the PWB industry is changing rapidly, opportunities abound to integrate environmental objectives into emerging production processes and technologies. The industry has already committed to making pollution prevention a priority. However, many PWB manufacturers are small businesses that cannot afford expensive environmental analyses and subsequent redesign of their processes. To facilitate the evaluation and implementation of alternative materials, processes, and technologies that reduce both environmental risks and production costs, EPA has entered into a partnership with the PWB industry through its Design for the Environment (DfE) Program.

How Did the PWB Project Get Started?

In March 1993, the industry research consortium, Microelectronics and Computer Technology Corporation (MCC), released an industry-led study entitled *Environmental Consciousness: A Strategic Competitive Issue for the Electronics Industry*. In this groundbreaking study, the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), and forty industry partners performed a collaborative life cycle assessment of a computer workstation, focusing on the manufacturing aspects of the life cycle. The study recognized that wet chemical processes, such as those used in PWB fabrication, are a significant source of hazardous waste and consume large amounts of water and energy. The potential for improvement in these areas led EPA's DfE Program to forge working partnerships with the Institute for Interconnecting and Packaging Electronic Circuits (IPC), individual PWB manufacturers and suppliers, research institutions such as MCC and the University of Tennessee's Center for Clean Products and Clean Technologies, and public interest organizations.

What Does the Project Mean for the Industry?

One immediate goal of the PWB project is to cultivate and expand existing partnerships to foster more open and active participation on environmental issues confronting the industry. A second short-term goal is to generate and disseminate information on viable pollution prevention alternatives so that the industry can begin to explore cleaner manufacturing methods.



Over the long term, the project seeks to effect behavior change to improve the competitiveness and environmental performance of the PWB industry. Toward this end, the DfE Project Team, working closely with IPC's Environmental, Health, and Safety Committee, will do the following:

- Evaluate and develop technical information on pollution prevention technologies that reduce compliance costs, environmental releases, risks to human health, and chemical and natural resource use.
- Identify barriers to pollution prevention through the development of industry and regulatory profiles.
- Increase the international competitiveness of the PWB industry through enhanced efficiency and streamlined operations—two common by-products of pollution prevention.
- Facilitate technology transfer among PWB companies to avoid duplication of effort and to cultivate the use of alternatives.

What Type of Work Is Being Conducted by the Project Team?

DfE's work with the PWB industry and other stakeholders is conducted within three project areas: technical studies, communication, and implementation.

Technical Studies

The DfE Technical Workgroup recently mapped out the major steps in PWB fabrication and chose four major functional areas, each of which includes several process steps, for further evaluation. The Workgroup then identified the chemicals used in existing and emerging process alternatives for each of the functional areas, and conducted a preliminary assessment of environmental and human health risks associated with each area.

The DfE Project Team selected one of these functional areas—making holes conductive—for detailed analysis in a Cleaner Technologies Substitutes Assessment (CTSA) to be conducted by EPA and the University of Tennessee. A CTSA is a tool used to evaluate the cost, performance, and environmental and health risks of individual materials, processes, and technologies.

As part of the CTSA, the effectiveness of alternative technologies will be tested in "real-world" settings. These tests will provide crucial information about the cost and performance of the alternatives under various conditions. The information in the CTSA and other project documents will allow PWB industry decision-makers to evaluate their existing processes and practices and identify cost-effective pollution prevention options that perform well. The PWB CTSA is expected to be completed in 1996.

Industry partners have also conducted a survey to obtain information about the current use of pollution prevention technologies in the PWB industry. Survey results are being compiled into a report for use in the CTSA and by companies seeking pollution prevention options. The PWB Project Team is also compiling information on markets, products, and technology trends that will help in assessing the costs and potential markets associated with existing and emerging technologies.

Communication Efforts

Throughout the project, EPA and the project stakeholders will conduct outreach activities to promote awareness of the project and to generate interest in the project's technical products. A Communications Workgroup has been formed to develop an outreach strategy for the project, which includes giving presentations at PWB trade shows, writing articles for the PWB trade press, distributing DfE information products at booth exhibits, and creating other information products. The Communications Workgroup is also developing pollution prevention case studies. These case studies provide practical information on substitute materials, processes, technologies, and work practices, based on the experiences of individual industry practitioners who have successfully used pollution prevention alternatives at their facilities. Later case studies will be based on information contained in the CTSA.

Implementation Efforts

Later in the project, an Implementation Workgroup will be established to provide assistance and incentives for individual PWB manufacturers. The Workgroup will help these manufacturers implement alternatives identified in the CTSA as having low environmental risk, being cost-effective, and being able to perform as required. The Workgroup may consider conducting additional demonstration projects and workshops. Videotapes and other training materials may also be developed to teach PWB manufacturers how to implement new technologies. In addition, the Workgroup may create incentives for implementing new technologies, such as an award or certification program.

How Can I Get More Information?

To learn more about EPA's Design for the Environment Program or Printed Wiring Board Project, contact:

**EPA's Pollution Prevention Information
Clearinghouse (PPIC)**

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