



# 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:

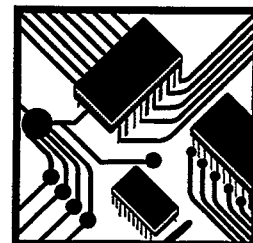
- Incorporate environmental concerns into the traditional decision-making parameters of the business world: *cost* and *performance*.
- Build incentives for behavior change to encourage continuous environmental improvement.

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 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 underlying link between semi-conductors, computer chips, and other electronic components.

Therefore, PWBs are irreplaceable parts of many high-tech products in the electronics, defense, communications, and automotive industries. PWB manufacturing, however, generates a significant amount of hazardous waste, requires a substantial amount of water and energy, and uses some toxic chemicals that pose potential environmental and health risks.

The industry has already committed to making pollution prevention a priority. However, many PWB manufacturers are small businesses that cannot afford to independently develop the data needed to redesign their processes. To facilitate the evaluation and implementation of alternative technologies that reduce health and environmental risks and production costs, the U.S. Environmental Protection Agency (EPA) has entered into a partnership with the PWB industry and other interested parties through its Design for the Environment (DfE) Program.

### How Did the PWB Project Get Started?

In March 1993, Microelectronics and Computer Technology Corporation (MCC), an industry research consortium, released an industry-led study entitled *Environmental Consciousness: A Strategic Competitiveness Issue for the Electronics Industry*. 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)—the PWB industry national trade association—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, including the Silicon Valley Toxics Coalition.

### What Are the Project's Goals and How Will It Affect the Industry?

Since its inception in 1994, the PWB project has established partnerships to foster open and active participation in addressing environmental challenges faced by the PWB industry. The project has also identified, evaluated, and disseminated information on viable pollution prevention opportunities in the industry.

Over the long term, this voluntary, non-regulatory project seeks to encourage companies to consider implementing cleaner technologies that will improve their environmental performance and competitiveness. Toward this end, the DfE Project Team, in close cooperation with IPC's Environmental, Health, and Safety Committee, is working to develop and analyze technical information on pollution prevention technologies that reduce risks to human health and the environment, hazardous waste generation, compliance costs, and chemical and natural resource use.



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

and 3) promoting the implementation of cleaner technologies through education and assistance.

### Technical Studies

In 1995, the DfE Technical Workgroup mapped out the primary steps in PWB fabrication and chose one step—making drilled through-holes conductive (MHC)—for detailed analysis in a Cleaner Technologies Substitutes Assessment (CTSA). A CTSA is a comprehensive analytical tool used to evaluate the health and environmental risks, performance, and cost of alternative materials, processes, and technologies.

As part of the CTSA, the effectiveness of seven MHC technologies has been tested in "real-world" settings. EPA recruited 26 facilities in the United States and Europe that have successfully implemented these technologies to help test their performance. Each company processed three standard boards through its MHC process line. The boards were then sent to one site to complete the final manufacturing steps and were tested for electrical and mechanical reliability. The results have demonstrated that when implemented correctly, the alternative technologies perform as well as or better than the standard electroless copper technology. An analysis of the costs and cost savings associated with each alternative technology will also be conducted and included in the CTSA.

Industry partners also conducted a survey to obtain information about the current use of pollution prevention technologies in the PWB industry. The survey report contains data on waste and chemical use reduction achieved through implementing these technologies (Printed Wiring Board Pollution Prevention and Control: Analysis of Survey Results; EPA 744-R-95-006). The PWB Project Team has also compiled information on PWB markets, products, and technology trends, and current methods for manufacturing PWBs (Printed Wiring Board Industry and Use Cluster Profile, EPA 744-R-95-005), as well as information on federal environmental regulations that affect the electronics industry (Federal Environmental Regulations Affecting the Electronics Industry, EPA 744-B-95-001). All project documents may be obtained by contacting the Pollution Prevention Information Clearinghouse (see below).

The information in the CTSA and other project documents will allow PWB industry decision-makers to evaluate their processes and identify cost-effective pollution prevention options. The MHC CTSA is expected to be completed in early 1997.

DfE's work with the PWB industry and other stakeholders is focused in three main areas: 1) gathering and generating technical data, 2) communicating project and technical information,

### Communication Efforts

Throughout the project, EPA and the project stakeholders have conducted outreach activities to promote awareness of the project and to generate interest in the project's technical and information products. Project stakeholders have given presentations at PWB trade shows, written articles for the PWB trade press, distributed DfE information products at booth exhibits, created project fact sheets, and have created a Web site for the project. In addition, the Communication Workgroup has developed several pollution prevention case studies featuring initiatives undertaken by PWB manufacturers. The case studies provide practical information on substitute materials, processes, technologies, and work practices that result in risk reduction, and are available from the Pollution Prevention Information Clearinghouse (see below).

### Implementation Efforts

The Project's Implementation Workgroup was established to provide education and assistance to individual PWB manufacturers, and to encourage them to consider implementing the cleaner technologies identified in the CTSA. Specific activities of the workgroup include:

- Developing a guidance document for installing and implementing the alternative MHC technologies (expected to be completed by February 1997).
- Conducting seminars in 1997 for PWB manufacturers and local community and government representatives to present technical information about the MHC technologies.
- Creating a Web site that contains all documents generated by the project, with links to other related EPA and industry sites.
- Helping Tellus Institute to design total cost assessment (TCA) software specifically for PWB manufacturers. The software will help companies analyze the expected financial benefits of switching to cleaner technologies.

### 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)

U.S. Environmental Protection  
Agency

401 M Street, S.W. (3404)

Washington, DC 20460

Tel: 202 260-1023

Fax: 202 260-0178

ppic@epamail.epa.gov

You may also visit the DfE Web site at <http://es.inel.gov/dfe> or the DfE PWB Project Web site at <http://www.ipc.org>

