



# EPA's 33/50 Program Company Profile

## *Printed Circuit Corporation*



## THE 33/50 PROGRAM

This Company Profile is part of a series of reports being developed by EPA to highlight the accomplishments of companies participating in the 33/50 Program. The 33/50 Program is an EPA voluntary pollution reduction initiative that promotes reductions in direct environmental releases and offsite transfers of 17 high-priority toxic chemicals. The program derives its name from its overall goals -- an interim goal of a 33% reduction by 1992 and an ultimate goal of a 50% reduction by 1995. The program uses 1988 Toxics Release Inventory (TRI) reporting as a baseline. In February, 1991, EPA began contacting the parent companies of TRI facilities that reported using 33/50 Program chemicals since 1988 to request their participation in the 33/50 Program. As of April, 1994, a total of 1,216 companies had elected to participate in the Program, pledging to reduce emissions of the 17 target chemicals by more than 355 million pounds by 1995. Companies are encouraged to set their own reduction targets, which may vary from the Program's national 33% and 50% reduction goals. Company commitments and reduction pledges continue to be received by EPA on a daily basis.

The 1992 TRI data revealed that releases and transfers of 33/50 Program chemicals declined by 40% between 1988 and 1992, surpassing the Program's 1992 interim reduction goal by more than 100 million pounds. This accomplishment, together with evidence from analysis of facilities' projected releases and transfers of the 17 priority chemicals, reported to TRI under the Pollution Prevention Act, offers strong encouragement that the 33/50 Program's ultimate goal of a 50% reduction by 1995 will be achieved.

EPA is committed to recognizing companies for their participation in the 33/50 Program and for the emissions reductions they achieve. The Program issues periodic Progress Reports, in which participating companies are listed and highlighted. In addition, Company Profiles, such as this one, are being prepared to provide more detailed information about companies that have written to EPA describing significant emissions reduction initiatives. Information presented in these profiles is drawn primarily from the company's written 33/50 Program communications and the annual TRI reports submitted by their facilities (including Pollution Prevention Act data reported to TRI in Section 8 of Form R). All company communications to EPA regarding the 33/50 Program are available to the public upon request.

EPA does not endorse the performance, worker safety, or environmental acceptability of any of the technical options discussed in this Profile. Mention of any product or procedure in this document is for informational purposes only, and does not constitute a recommendation of any such product or procedure, either express or implied, by EPA.

### 17 PRIORITY CHEMICALS TARGETED BY THE 33/50 PROGRAM

BENZENE  
CADMIUM & COMPOUNDS  
CARBON TETRACHLORIDE  
CHLOROFORM  
CHROMIUM & COMPOUNDS  
CYANIDES  
DICHLOROMETHANE\*  
LEAD & COMPOUNDS  
MERCURY & COMPOUNDS  
METHYL ETHYL KETONE  
METHYL ISOBUTYL KETONE  
NICKEL & COMPOUNDS  
TETRACHLOROETHYLENE  
TOLUENE  
1,1,1-TRICHLOROETHANE  
TRICHLOROETHYLENE  
XYLENES

\* Also referred to as methylene chloride

For information on the 33/50 Program, contact the TSCA Hotline at (202) 554-1404 or contact 33/50 Program staff directly by phone at (202) 260-6907 or by mail at Mail Code 7408, Office of Pollution Prevention and Toxics, U.S. EPA, 401 M Street, SW, Washington, D.C. 20460.

# Printed Circuit Corporation

Printed Circuit Corporation completely eliminated all use of 33/50 Program chemicals in its operations by the end of 1993, far surpassing its initial goal of a 65% reduction in releases of its 33/50 Program chemicals by 1995. The company achieved these reductions by substituting these chemicals with water-based cleaning processes.

## I. CORPORATE BACKGROUND

Printed Circuit Corporation, located in Woburn, Massachusetts, is a manufacturer of printed circuit boards. The company provides its products to companies in the electronics, instrumentation, telecommunication, and automotive industries.

Printed circuit boards are manufactured in a complex, multi-step process. First, holes are drilled in a copper-coated plastic substrate board. Next, copper is deposited on the hole walls through an electroless chemical process. To apply the circuit board pattern onto the board, the copper surface is coated with a photo-sensitive polymer. The circuit pattern is then transposed onto the polymer-coated board using high-intensity ultraviolet (UV) light, then developed, exposing only the intended circuit pattern for the subsequent electroplating chemical process. The polymer then is stripped away and the board is subjected to a chemical etching process, leaving only the designed pattern.

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*Printed Circuit completely eliminated its use of 33/50 Program chemicals by the end of 1993.*

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An electroplating process is used to deposit nickel and gold on the connector contacts of the board, and a fabrication process is performed which gives the board its final configuration. After the circuit board is completed, various electrical components are attached to the board by Printed Circuit's customers.

Since 1988, Printed Circuit has used two 33/50 Program chemicals in quantities reportable to TRI: dichloromethane and 1,1,1-trichloroethane. Printed Circuit used 1,1,1-trichloroethane as a developing agent to develop the circuit pattern onto the

### Releases of TRI Chemicals by Printed Circuit Corporation (1000 pounds)

	1988	1992
<i>33/50 Chemicals</i>		
Dichloromethane	509	0
1,1,1-Trichloroethane	11	62
33/50 Subtotal*	521	62
<i>Other TRI Chemicals</i>	67	128
<i>Total*</i>	588	189

\* Columns do not sum to totals due to rounding.

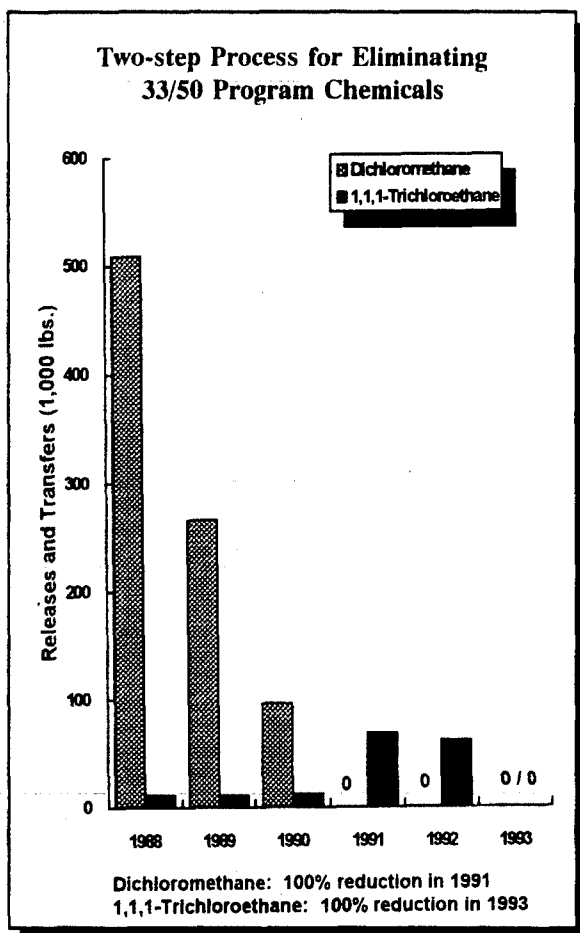
sections of polymer exposed to light, and to wash away the areas of polymer not subjected to light. Dichloromethane was used to strip away residual polymer in the subsequent stage of the manufacturing process. In addition, both chemicals were used as final cleaners to remove contaminants from completed circuit boards.

In 1988, Printed Circuit reported releases of 520,500 pounds of 33/50 Program chemicals. All of these releases were in the form of air emissions. Table I, at the end of this profile, presents the company's 1988-1992 data for releases of all TRI chemicals. The table includes 1993 data obtained from company progress reports.

## II. 33/50 PROGRAM GOALS AND POLLUTION REDUCTION ACTIVITIES

Printed Circuit Corporation initially set a goal of reducing total releases of 33/50 Program chemicals by 35% and 65% by 1992 and 1995, respectively, using 1988 levels as a baseline. The company indicated that source reduction would account for about 75% of the pledged reductions. The remaining 25% would be accomplished through a variety of methods, including process changes, recycling, in-process recovery, and equipment modifications. The company later revised its goal to a complete elimination of releases of 33/50 Program chemicals by the end of 1993.

In order to meet its program goals, Printed Circuit adopted a two-step approach. First, the



company focused its efforts on eliminating all use of dichloromethane in its operations. To accomplish this goal, the company implemented a process that uses a water-based cleaner to strip away excess polymer from the etched circuit boards. In addition, Printed Circuit switched all solvent cleaning operations to 1,1,1-trichloroethane. These changes eliminated all use of dichloromethane at Printed Circuit by the end of 1991. As a result of the process change, the company also was able to minimize its use of methanol, a non-33/50 Program TRI chemical.

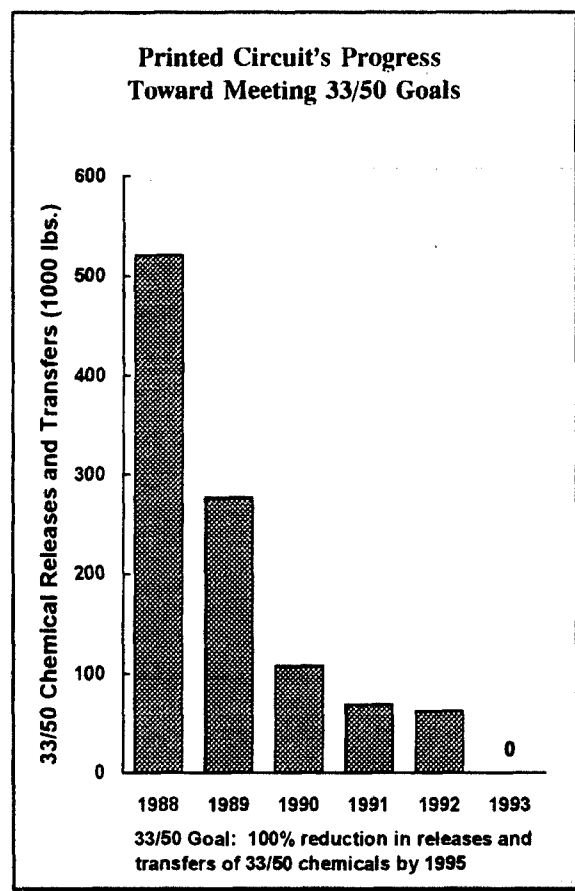
*Printed Circuit focused first on eliminating all use of dichloromethane, then concentrated on eliminating 1,1,1-trichloroethane from its operations.*

Although the switch to 1,1,1-trichloroethane for all solvent cleaning operations caused releases of the chemical to increase between 1990 and 1991,

Printed Circuit showed an overall reduction in releases of 33/50 Program chemicals between the two years. The company believed that by focusing its efforts on one chemical at a time, it would be able to make more rapid progress toward reducing emissions than if it were addressing several chemicals simultaneously.

To eliminate the use of 1,1,1-trichloroethane, the company undertook an evaluation of potential replacements. Printed Circuit worked with six vendors nationwide over a two-year period to identify replacements that would:

- be compatible with other chemicals and materials used in production;
- comply with environmental standards; and
- be economically feasible.



As a result of the study, the company has replaced its use of 1,1,1-trichloroethane as a developing agent with a water-based sodium carbonate solution. In addition, Printed Circuit now uses a mild detergent with water for the final cleaning of completed circuit boards, in place of dichloromethane and 1,1,1-trichloroethane.

### **III. PROGRESS TOWARDS 33/50 REDUCTION GOALS**

As a result of these efforts, Printed Circuit Corporation reduced total releases of 33/50 Program chemicals by 87% from 1988 to 1991 after the elimination of dichloromethane. Furthermore, the company completely eliminated releases of all 33/50 Program chemicals by 1993 after the elimination of 1,1,1-trichloroethane, far surpassing its Program goals.

### **IV. SUMMARY OF PRINTED CIRCUIT CORPORATION'S EXPERIENCE**

Printed Circuit Corporation has had outstanding accomplishments in reducing releases and transfers of 33/50 Program chemicals. The company completely eliminated all use of its two 33/50 Program chemicals -- dichloromethane and 1,1,1-trichloroethane -- exceeding its Program goals two years ahead of schedule. These goals were accomplished using a two-step approach, in which the company focused its efforts on one chemical at a time. This focused approach allowed a more rapid reduction than might have been possible otherwise.

Table I  
Printed Circuit Corporation  
Releases and Transfers of TRI Chemicals, 1988-1992 (1)  
(All data from TRI unless otherwise noted)

Chemical	Year	Total Air Emissions (pounds)	Transfers to POTW (pounds)	Transfers Off-site for Treatment/Disposal/Other (pounds)	Total Releases and Transfers (2) (pounds)	Percent Change 1988-1992
Dichloromethane	1988	509,300	0	0	509,300	
	1989	266,300	0	0	266,300	
	1990	96,000	0	0	96,000	
	1991	0	0	0	0 (3)	-100%
1,1,1-Trichloroethane	1988	11,200	0	0	11,200	
	1989	10,650	0	0	10,650	
	1990	11,925	0	0	11,925	
	1991	68,500	0	0	68,500	
	1992	61,530	0	0	61,530	449%
	1993	0	0	0	0 (3)	-100%
<u>33/50 Program Chemicals</u>	1988	520,500	0	0	520,500	
	1989	276,950	0	0	276,950	
	1990	107,925	0	0	107,925	
	1991	68,500	0	0	68,500	
	1992	61,530	0	0	61,530	-88%
	1993	0	0	0	0 (3)	-100%
Non 33/50 Program Chemicals	1988	66,300	790	0	67,090	
	1989	59,200	408	0	59,608	
	1990	40,780	236	0	41,016	
	1991	32,400	63	0	32,463	
	1992	69,690	130	58,140	127,960	91%
All TRI Chemicals	1988	586,800	790	0	587,590	
	1989	336,150	408	0	336,558	
	1990	148,705	236	0	148,941	
	1991	100,900	63	0	100,963	
	1992	131,220	130	58,140	189,490	-68%
<u>Percent Change, 1988-1992 (1)</u>						
33/50 Program Chemicals		-100%	--	--	-100%	
Non-33/50 Program Chemicals		5%	-84%	--	91%	
All TRI Chemicals		-78%	-84%	--	-68%	

Notes: (1) Includes 1993 data for 1,1,1-trichloroethane.

(2) 1991 and 1992 Total Releases and Transfers do not include on- or off-site recycling or energy recovery.

(3) Based on company progress reports. Company stopped using dichloromethane in 1991 and 1,1,1-trichloroethane in 1993.