



EPA's 33/50 Program Company Profile

Raytheon Company



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.

Raytheon Company

Raytheon Company reduced its releases and transfers of 33/50 Program chemicals by approximately 2,500,000 pounds from 1988 to 1992, a reduction of 65%. These reductions surpass Raytheon's 33/50 Program goal of a 50% reduction by 1995.

I. CORPORATE BACKGROUND

Raytheon Company is a diversified organization whose major interests include manufacturing of aircraft, residential and commercial appliances (including refrigeration, cooking, and laundry equipment), electronics (including guidance systems, guided missiles, printed circuit boards, and communications equipment), and energy/environmental services (including power, transportation, logistics support, and road building equipment). Raytheon is headquartered in Lexington, Massachusetts and had twenty five facilities in the United States that reported releases and transfers of 33/50 Program chemicals to the TRI in 1988.

Table I, at the end of this profile, presents the company's data on releases and transfers of TRI chemicals. Table II presents these data for selected facilities. In 1988 Raytheon reported releases and transfers of eleven 33/50 Program chemicals: chromium and compounds, dichloromethane, lead and compounds, methyl ethyl ketone, methyl isobutyl ketone, nickel and compounds, tetrachloroethylene, toluene, 1,1,1-trichloroethane, trichloroethylene, and xylene.

Raytheon reduced releases and transfers of 33/50 Program chemicals by 65% (2,500,000 pounds) from 1988 to 1992.

Raytheon reported total releases and transfers of 3,883,820 pounds of 33/50 Program chemicals in 1988. Three chemicals - 1,1,1-trichloroethane, dichloromethane, and trichloroethylene - accounted for 65% of these releases and transfers. Dichloromethane was used at several facilities in paint stripping and manufacturing printed circuit boards. 1,1,1-Trichloroethane and trichloroethylene are used primarily as solvents to clean electronics. Lead, chromium, xylene, and toluene are used as solvents and pigments in paints, soldering, and for surface conditioning prior to painting.

Releases and Transfers of TRI Chemicals Reported by Raytheon Company (1000 lbs)

	1988	1992
<i>33/50 Chemicals</i>		
Chromium & compounds	56	13
Dichloromethane	610	NR
Lead & compounds	8	NR
Methyl ethyl ketone	211	151
Methyl isobutyl ketone	41	37
Nickel & compounds	67	6
Tetrachloroethylene	96	NR
Toluene	364	225
1,1,1-Trichloroethane	1,643	611
Trichloroethylene	447	125
Xylene	339	192
33/50 Subtotal*	3,884	1,361
<i>Other TRI chemicals</i>	2,003	668
<i>Total*</i>	5,886	2,029

NR = Not reported to TRI, use below reporting threshold.

* Columns do not sum to total due to rounding.

II. CORPORATE ENVIRONMENTAL STRATEGY

Raytheon's environmental strategy has focused on eliminating the use of suspected or known carcinogens and ozone-depleting substances (ODS), and reducing the use of metals. In 1990, Raytheon's President issued a directive for all Raytheon facilities to eliminate the use of the suspected carcinogens trichloroethylene, perchloroethylene, and dichloromethane.

In addition, Raytheon set a company-wide goal to eliminate the use of all ODSs by the end of 1992. As part of its activities, the company has developed a program called ACT (Alternative Cleaning Technologies) and has shared its findings of alternatives to the use of ozone-depleting solvents at technical conferences throughout the United States.

Raytheon has also established a five-year educational professorship at Tufts University to

develop a pollution prevention program. As part of this program, engineers will learn to consider and incorporate pollution prevention approaches when developing product and manufacturing plans.

III. 33/50 PROGRAM GOALS AND POLLUTION REDUCTION ACTIVITIES

Raytheon set a corporate-wide goal to reduce releases and transfers of 33/50 Program chemicals by 50% by 1995 compared to the 1988 TRI baseline. This translates to a pledged reduction of 1,941,910 pounds.

Raytheon's reductions of 33/50 Program chemicals were achieved as a result of several on-going projects.

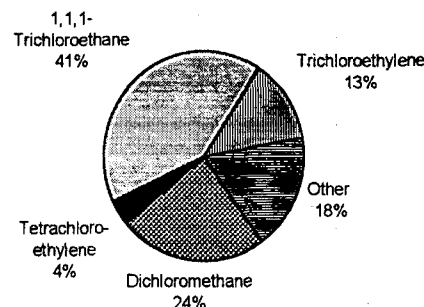
- **Eliminate or reduce solvents in cleaning operations.** Dichloromethane, 1,1,1-trichloroethane, tetrachloroethylene, trichloroethylene, and CFC-113 were all targeted by Raytheon's ODS and suspected carcinogen phaseout goals. In 1988, these solvents were used at 18 facilities for electronics cleaning and metal degreasing, and as general solvent cleaners.

Terpene-based cleaners and mildly alkaline aqueous solutions were identified as alternatives to these solvent cleaners. Raytheon has successfully eliminated its use of dichloromethane, tetrachloroethylene, and CFC-113, and has significantly reduced its use of 1,1,1-trichloroethane and trichloroethylene as a result of the development of these alternate cleaners.

Raytheon identified a terpene-based cleaner and a mildly alkaline aqueous solution which are now used in place of chlorinated solvents at its facilities.

- **Eliminate the use of dichloromethane for paint stripping applications.** At the Wichita facility, dichloromethane was used to strip paint from aircraft. Raytheon implemented a dry media (wheat starch) blasting system for paint stripping that completely eliminated the need for dichloromethane at this facility.

Distributions of Reductions in Releases and Transfers, 1988 - 1992



- **Reduce 33/50 Program chemicals in painting and soldering applications.** Lead, chromium, toluene, and xylene are used at Raytheon facilities in painting and soldering operations. Raytheon has identified and implemented a powder paint system in some facilities which has resulted in a reduction of releases and transfers of these chemicals. For applications in which powder painting is not technically feasible, Raytheon is working with its coating suppliers to reduce the amount of solvent used in its coatings.

IV. PROGRESS TOWARDS 33/50 REDUCTION GOALS

As a result of these and other efforts, Raytheon's releases and transfers of 33/50 program chemicals decreased over 2.5 million pounds between 1988 and 1992 — a 65% reduction from 3,883,820 pounds to 1,360,658 pounds. The major components of this reduction were the elimination of dichloromethane and tetrachloroethylene, and the significant reduction of releases and transfers of 1,1,1-trichloroethane and trichloroethylene.

The phaseout of the use of dichloromethane and tetrachloroethylene resulted in a reduction of 706,701 pounds of releases and transfers of these chemicals between 1988 and 1992. These reductions account for approximately 28% of total reductions of releases and transfers of 33/50 chemicals during that period. The replacement of 1,1,1-trichloroethane and trichloroethylene resulted in a reduction of 1,354,654 pounds of releases and transfers of these chemicals. This reduction accounts for approximately 54% of total 33/50 reductions from 1988 to 1992.

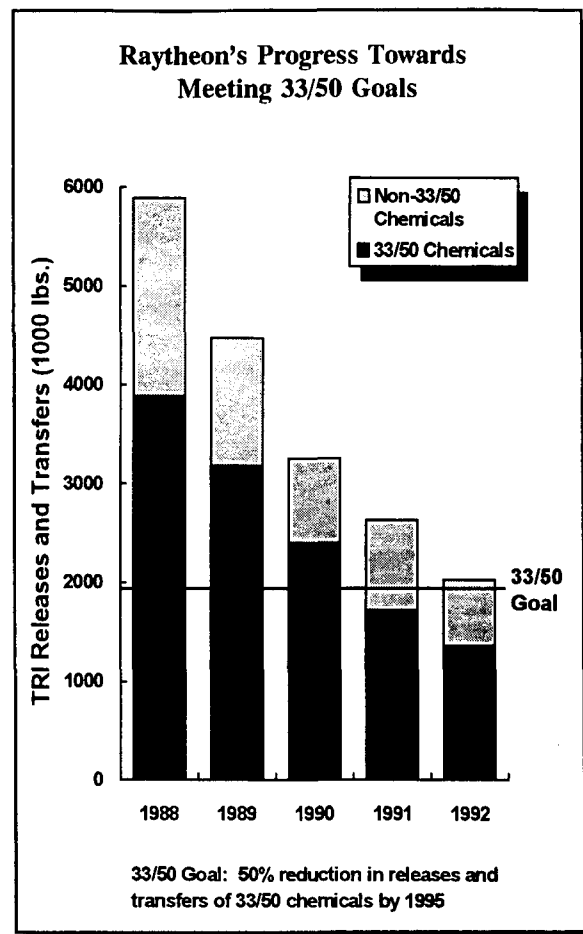
Raytheon has shown its commitment to furthering knowledge of pollution prevention by establishing a five-year educational professorship at Tufts University to develop a pollution prevention program.

Although not part of its 33/50 Program goal, Raytheon was also successful in reducing releases and transfers of non-33/50 Program TRI chemicals by over 1,300,000 pounds -- a reduction of 67%. Reductions of non-33/50 Program chemicals consisted primarily of reductions in releases of ammonia, copper, CFC-12, CFC-11, CFC-113, hydrochloric acid, and manganese from the Lowell, MA, Waltham, MA, and Portsmouth, RI, facilities.

V. SUMMARY OF RAYTHEON'S EXPERIENCE

Raytheon Company has exceeded its 33/50 Program goals by several years. The company pledged to reduce its releases and transfers of 33/50 program chemicals by 50% by 1995, and achieved a reduction of 65% by 1992.

Raytheon has realized its largest reductions in releases and transfers of 33/50 program chemicals by focusing its reduction programs on known or suspected carcinogens and ozone-depleting substances.



By establishing a pollution prevention professorship, sharing its findings in the search for alternatives to ODS solvent cleaners, and working closely with host communities and regulatory agencies, Raytheon has demonstrated a sincere commitment to environmental protection. Furthermore, in looking to the future, Raytheon has adopted a "We're not stopping here" attitude in its efforts to prevent pollution at its source.

Table I
Raytheon Company
Releases and Transfers of TRI Chemicals, 1988-1992
(All data from TRI unless otherwise noted)

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Releases to Land (pounds)	Transfers to POTWs (pounds)	Transfers	Total Releases and Transfers (pounds) (1)	Percent Change 1988-1992 Total Releases and Transfers
						Off-site for Treatment/ Disposal/Other (pounds)		
Chromium & compounds	1988	751	500	22	326	54,709	56,308 (2)	
	1989	1,252	266	0	6,772	72,743	81,033	
	1990	540	5	0	699	20,867	22,111	
	1991	628	250	0	124	11,186	12,188	
	1992	543	5	0	97	12,661	13,306	-76%
Dichloromethane	1988	557,971	1	0	461	51,983	610,416	
	1989	535,786	0	0	263	4,066	540,115	
	1990	58,469	0	0	0	1,894	60,363	
Lead & compounds	1988	250	250	0	278	7,671	8,449	
	1989	0	0	0	40	453	493	
Tetrachloroethylene	1988	72,210	0	0	0	24,075	96,285	
	1989	21,955	0	0	0	4	21,959	
	1990	18,005	0	0	0	0	18,005	
Toluene	1988	348,504	250	0	250	14,924	363,928	
	1989	351,139	3	0	251	16,826	368,219	
	1990	269,251	0	0	250	24,324	293,825	
	1991	178,745	0	0	5	20,052	198,802	
	1992	210,399	0	0	1	14,841	225,241	-38%
1,1,1-Trichloroethane	1988	1,278,960	251	0	503	363,756	1,643,470	
	1989	1,165,608	253	0	602	61,972	1,228,435	
	1990	1,282,914	6	0	510	36,586	1,320,016	
	1991	831,405	5	0	10	123,703	955,123	
	1992	571,848	1	0	5	39,203	611,057	-63%
Trichloroethylene	1988	438,953	0	0	0	7,788	446,741	
	1989	372,345	0	0	0	2,967	375,312	
	1990	115,087	0	0	0	0	115,087	
	1991	100,000	0	0	5	40,000	140,005	
	1992	73,000	0	0	0	51,500	124,500	-72%
Xylene (mixed isomers)	1988	262,751	252	0	0	75,635	338,638	
	1989	259,281	0	0	0	7,965	267,246	
	1990	302,790	5	0	5	3,855	306,655	
	1991	173,549	250	0	5	3,830	177,634	
	1992	177,995	250	0	1	13,895	192,141	-43%
Other 33/50 Program Chemicals	1988	233,448	730	36	799	84,572	319,585 (2)	
	1989	260,566	220	0	312	37,543	298,641	
	1990	227,233	49	0	597	35,497	263,376	
	1991	203,060	0	0	763	29,611	233,434	
	1992	175,881	0	0	750	17,782	194,413	-39%

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Releases and Transfers of TRI Chemicals, 1988-1992
(All data from TRI unless otherwise noted)

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Releases to Land (pounds)	Transfers to POTWs (pounds)	Transfers Off-site for Treatment/Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)	Percent Change 1988-1992 Total Releases and Transfers
<u>All 33/50 Program Chemicals</u>	1988	3,193,798	2,234	58	2,617	685,113	3,883,820 (2)	
	1989	2,967,932	742	0	8,240	204,539	3,181,453	
	1990	2,274,289	65	0	2,061	123,023	2,399,438	
	1991	1,487,387	505	0	912	228,382	1,717,186	
	1992	1,209,666	256	0	854	149,882	1,360,658	-65%
Non 33/50 Program Chemicals	1988	931,073	17,579	0	2,565	1,051,344	2,002,561	
	1989	911,440	4,113	0	33,718	341,325	1,290,596	
	1990	586,201	1,588	0	34,325	237,233	859,347	
	1991	470,239	1,015	0	41,826	397,232	910,312	
	1992	357,673	1,250	0	21,132	288,279	668,334	-67%
All TRI Chemicals	1988	4,124,871	19,813	58	5,182	1,736,457	5,886,381 (2)	
	1989	3,879,372	4,855	0	41,958	545,864	4,472,049	
	1990	2,860,490	1,653	0	36,386	360,256	3,258,785	
	1991	1,957,626	1,520	0	42,738	625,614	2,627,498	
	1992	1,567,339	1,506	0	21,986	438,161	2,028,992	-66%
<u>Percent Change, 1988-1992</u>								
33/50 Program Chemicals		-62%	-89%	-100%	-67%	-78%	-65%	
Non 33/50 Program chemicals		-62%	-93%	--	724%	-73%	-67%	
All TRI Chemicals		-62%	-92%	-100%	324%	-75%	-66%	

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

(2) Includes adjustment for data erroneously reported in Transfers Off-Site for Treatment at Raytheon's Searcy, AR facility.

Table II
Raytheon Company (Selected Facilities)
Releases and Transfers of TRI Chemicals, 1988-1992

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Transfers to POTWs (pounds)	Transfers Off-site for Treatment/ Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)
<u>Raytheon Co. - Andover, MA</u>						
Dichloromethane	1988	234,560	0	0	16,290	250,850
	1989	125,733	0	0	1,422	127,155
	1990	58,469	0	0	1,894	60,363
Other 33/50 Program Chemicals	1988	546,984	0	29	304,002	851,015
	1989	439,521	0	127	49,968	489,616
	1990	359,408	0	0	55,488	414,896
	1991	233,600	0	5	35,934	269,539
	1992	106,621	0	3	27,935	134,559
All TRI Chemicals	1988	926,943	0	674	449,940	1,377,557
	1989	680,875	0	1,032	105,908	787,815
	1990	522,942	0	1,107	119,012	643,061
	1991	291,943	0	1,686	99,079	392,708
	1992	144,628	0	555	89,918	235,101
<u>Raytheon Co. Div. - Waltham, MA</u>						
Dichloromethane	1988	188,000	0	210	31,000	219,210
	1989	284,000	0	13	350	284,363
Other 33/50 Program Chemicals	1988	97,904	0	0	45,003	142,907
	1989	88,755	0	7	4,724	93,486
	1990	78,000	0	10	5,350	83,360
	1991	41,900	0	0	450	42,350
	1992	18,400	0	0	670	19,070
All TRI Chemicals	1988	344,353	0	384	139,957	484,694
	1989	416,890	0	23,268	19,768	459,926
	1990	85,981	0	29,612	36,356	151,949
	1991	45,303	0	38,565	18,716	102,584
	1992	20,586	0	19,800	12,535	52,921

Table II
Raytheon Company (Selected Facilities)
Releases and Transfers of TRI Chemicals, 1988-1992

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Transfers to POTWs (pounds)	Transfers Off-site for Treatment/ Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)
<u>Beech Aircraft Corp. - Wichita, KS</u>						
Dichloromethane	1988	103,711	0	250	750	104,711
	1989	118,103	0	250	2,294	120,647
Other 33/50 Program Chemicals	1988	609,703	0	750	5,782	616,235
	1989	692,775	0	750	77,234	770,759
	1990	820,270	5	755	12,590	833,620
	1991	601,411	5	104	44,904	646,424
	1992	646,846	1	86	45,078	692,011
All TRI Chemicals	1988	746,840	0	1,500	66,782	815,122
	1989	851,430	0	1,250	87,045	939,725
	1990	850,539	5	1,955	41,090	893,589
	1991	629,214	5	104	78,534	707,857
	1992	674,839	1	86	122,335	797,261
<u>Amana Refrigeration Inc. - Amana, IA</u>						
33/50 Program Chemicals	1988	255,450	1,250	0	8,700	265,400
	1989	264,500	0	0	4,350	268,850
	1990	200,100	5	0	2,750	202,855
	1991	129,910	250	0	4,665	134,825
	1992	107,160	250	0	10	107,420
Non 33/50 Program Chemicals	1988	48,750	1,750	0	40,350	90,850
	1989	94,950	750	0	17,500	113,200
	1990	67,915	1,560	0	10,710	80,185
	1991	131,190	10	0	21,155	152,355
	1992	105,135	1,000	0	12,705	118,840
All TRI Chemicals	1988	304,200	3,000	0	49,050	356,250
	1989	359,450	750	0	21,850	382,050
	1990	268,015	1,565	0	13,460	283,040
	1991	261,100	260	0	25,820	287,180
	1992	212,295	1,250	0	12,715	226,260

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