Toshiba Environmental Report 1998

TOSHIBA

Contents

Corporate profile

Company name	Toshiba Corporation
Foundation	July 1875
Establishment	June 25, 1904
Paid-in capital	¥274.9 billion (as of August 1998)
Number of employees	Non-consolidated: 68,471 Consolidated: 186,000 (as of March 31, 1998)
Group	Number of consolidated subsidiaries: 220 (Japan), 87 (overseas)

This brochure describes Toshiba's environmental protection activities, including their history, the present situation and plans for the future. This report mainly concerns activities and data for fiscal 1997. Toshiba will issue periodic environmental reports in order to disseminate the latest information. We will be pleased if this report on Toshiba's environmental protection activities enriched your understanding of the depth and nature of Toshiba's commitment to the environment.

President's Message

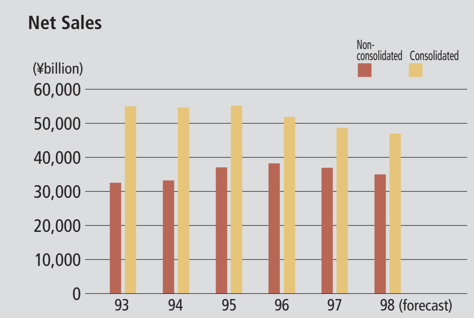
From our vantage point at the threshold of the 21st century—an era in which the environment is destined to be a major theme—it is clear that all of us, whether acting collectively in enterprises or as individuals, need to recognize our common destiny on board spaceship Earth and that it is our job to keep our planet in good working order. The erroneous assumptions that the Earth's resources and capacity to absorb waste are limitless have embroiled us in a vicious circle of mass production, mass consumption and mass disposal. Preoccupied with material considerations, industry has tended to take the Earth for granted.

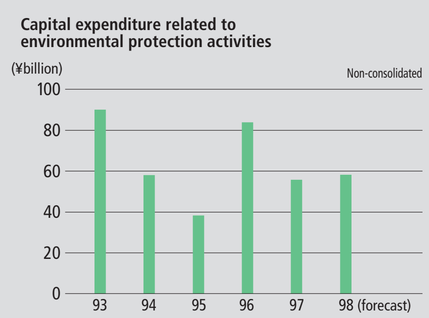
I would like to emphasize the importance of continuous and farsighted voluntary environmental protection activities. In this regard, I deeply regret the pollution of ground water by organochlorine solvent at Nagoya Works, and the consequent anxiety in the community. In response to that occurrence, Toshiba established the Environmental Measure Special Headquarters in October 1997 and is conducting comprehensive checks of all operations and implementing necessary measures under the guidance of local municipalities. Unfortunately, in some media coverage, Toshiba's environmental-protection activities were, without justification, dismissed as ineffective. We are determined to improve our environmental-protection measures and accelerate implementation.

One aspect of our commitment to the environment is the development of environmentally-conscious products. Toshiba is championing the creation of products whose environmental impacts throughout their life cycles—from procurement of materials, manufacture and distribution, through to use and disposal—are kept to a minimum, and which give complete satisfaction to customers. Recycling, much discussed but often a laggard in the world at large, is at the heart of Toshiba's commitment to the environment. Thus, the Recycling Promoting Group established in August 1997 is promoting more effective utilization of resources and reduction of Toshiba's impact on the environment.

Toshiba Environmental Report 1998 describes our philosophy, accomplishments and goals. Toshiba, like all of us, has much to learn and much to do on the environmental front. Let's work together to help make sure the Earth is a wonderful habitat for humankind and the rest of creation in the 21st century and beyond.

Taizo Nishimuro
President and Chief Executive Officer





Foreword

The Earth's environment is humankind's life-support system, and issues associated with it strike to the very foundation of our existence. Given that natural resources are finite, the orientation of society and the economy toward mass production, mass consumption and mass disposal needs to be tempered by adherence to other values. Throughout its operations, Toshiba has embraced preservation of the Earth's environment for future generations as a top priority. Mindful of our responsibility to future generations, we are making a concerted corporate-wide effort to utilize resources with the utmost efficiency. As an enterprise committed to sustainable development, Toshiba is resolved to raise consciousness as well as to innovate technology.

BASIC COMMITMENT OF THE TOSHIBA GROUP

We, the Toshiba Group companies, based on our total commitment to people and to the future, are determined to help create a higher quality of life for all people, and to do our part to help ensure that progress continues within the world community.

COMMITMENT TO PEOPLE

We endeavor to serve the needs of all people, especially our customers, shareholders, and employees, by implementing forward-looking corporate strategies while carrying out responsible and responsive business activities. As good corporate citizens, we actively contribute to further the goals of society.

COMMITMENT TO THE FUTURE

By continually developing innovative technologies centering on the fields of Electronics and Energy, we strive to create products and services that enhance human life, and which lead to a thriving, healthy society. We constantly seek new approaches that help realize the goals of the world community, including ways to improve the global environment.

■■■

Committed to People,
Committed to the Future. **TOSHIBA**

Basic policy for environmental protection

Toshiba Corporation recognizes that the Earth is an irreplaceable asset, and that it is mankind's duty to hand it on to future generations in a sound state. Therefore, Toshiba promotes environmental protection activities, which are undertaken within the company's technological and financial capabilities, and in accordance with the Basic Commitment of Toshiba Group and this Basic Policy for Environmental Protection.

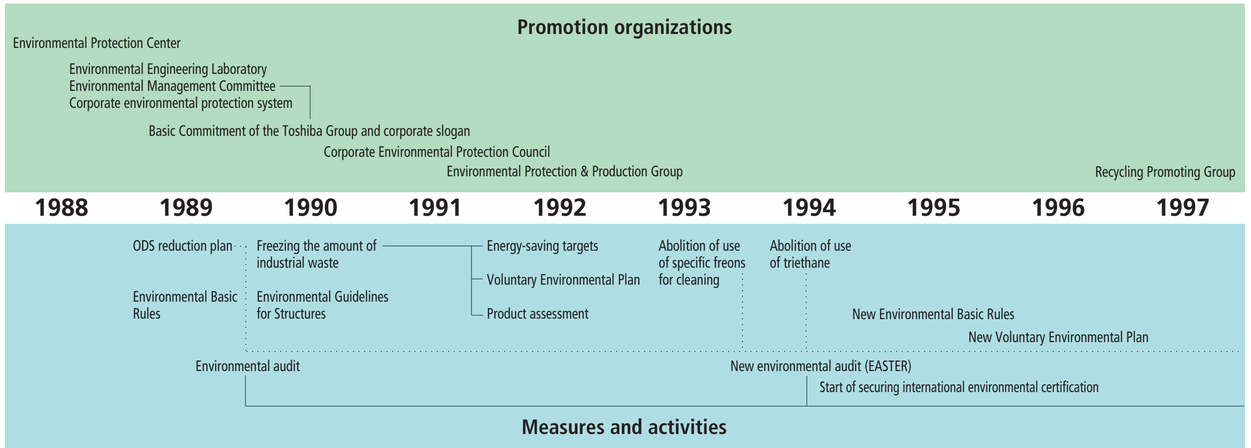
1. Toshiba considers environmental protection to be one of management's primary responsibilities.
2. Toshiba specifies objectives and targets for its business activities, products and services respecting the reduction of environmental impacts and prevention of pollution.
3. Toshiba strives to continuously improve the environment through vigorous implementation of environmental measures.
4. Toshiba contributes to society through its environmental protection activities, which include the development and supply of excellent, environmentally-conscious technologies and products and cooperation with the local community.
5. Toshiba complies with all laws and regulations, industry guidelines which it has endorsed, and its own standards for environmental protection.
6. Toshiba recognizes that natural resources are finite and promotes their efficient utilization.
7. Toshiba strives to enhance the consciousness of the environment of all its employees and requires that they make a practical contribution to environmental protection through their work.
8. Toshiba provides guidance and support to its subsidiaries and affiliates, in order to promote environmental activities throughout Toshiba Group.

History of Toshiba's environmental commitment

Toshiba has developed its anti-pollution activities step by step and put in place an organization to systematize and direct environmental protection activities. Thus, the scope and effectiveness of Toshiba's environmental protection activities have been progressively enhanced. In April 1988, Toshiba established the corporate-level Environmental Protection Center. In January 1989, the Environmental Basic Rules were introduced, in accordance with which organizations devoted to environmental protection were set up in all business groups and factories, staff were appointed to work full-time for environmental protection, and new activities launched. In November 1989, the Environmental Engineering Laboratory was established within the R&D Center to construct databases on materials, and to develop CFC- and trichloroethane-free cleaning technology, analysis and evaluation technology, and disposal and recycling technology.

In April 1990, Toshiba formally embraced protection of the Earth's environment as one of management's top priorities. At the same time, Toshiba Group adopted the slogan "Committed to People, Committed to the Future. Toshiba", and, in the Basic Commitment of the Toshiba Group, declared its resolve to improve the Earth's environment and contribute to society as a good corporate citizen.

In April 1991, Toshiba set up the Corporate Environmental Protection Council, Toshiba Group's top organization for deliberation and decision-making on environmental matters. The council considers and promotes environmental measures covering management, technological development, production and sales. In 1993 Toshiba introduced the Environmental Audit System in Toshiba on the Basis of Eco-Responsibility (EASTER), a reworking of the in-house audit system. In 1995 Toshiba started securing international environmental certification for its facilities; all Toshiba factories in Japan had acquired certification by September 1997.



History of environmental protection activities

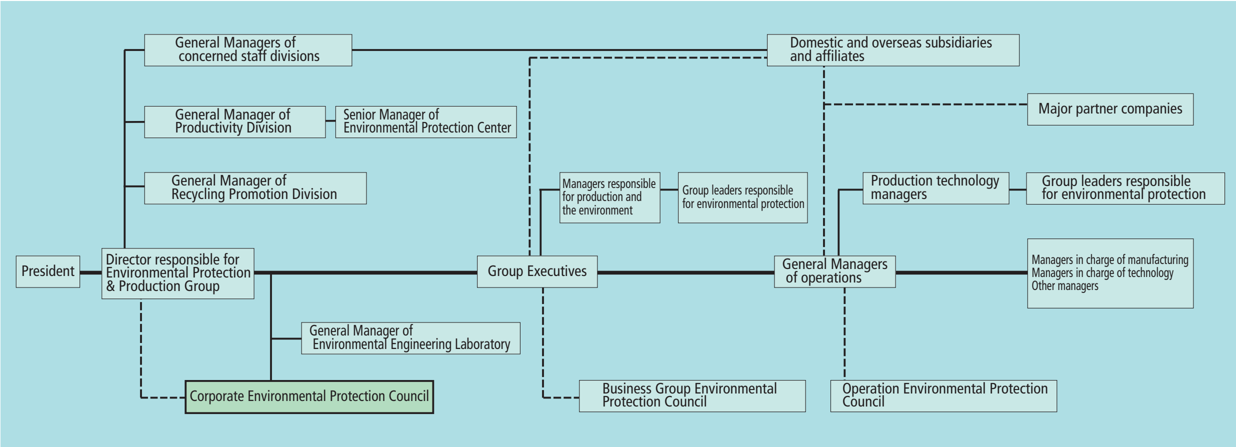
Environmental protection promotion system

With the aims of enhancing Toshiba Group's commitment to environmental protection at the grassroots and making it integral to the operation of every Toshiba Group company, Toshiba set up the Corporate Environmental Protection Council in 1991. Chaired by a director responsible for environmental protection throughout Toshiba, the council has a wide-ranging brief: it proposes solutions to environmental problems affecting management, technological development, production and sales, determines basic policies, and reviews the progress of business groups and factories.

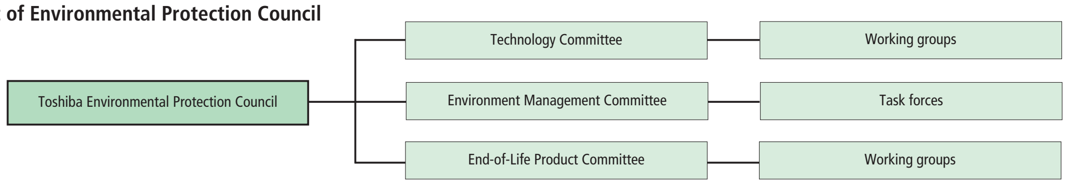
Its subordinate organizations include the Technology Committee, which promotes development of environmentally-conscious products and technologies, the Environment Management Committee, which promotes environmental protection at factories, and the End-of-Life Product Committee. Individual business groups and factories hold environmental protection conferences at which goals are set and projects launched respecting specific products and regions.

To heighten employees' environmental awareness and facilitate exchanges of information, Toshiba holds an annual Environmental Technology Exhibition, in which domestic and overseas subsidiaries participate. In August 1997 the Recycling Promoting Group was established to champion the cause of recycling throughout Toshiba Group. The division reports to the president.

Organizational chart of corporate environmental protection system



Organizational chart of Environmental Protection Council



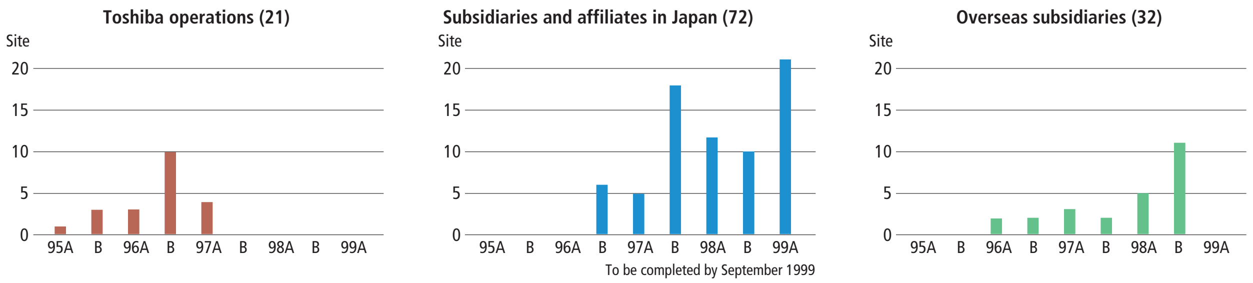
Environmental management system

ISO-14001 certification, the international standard for environmentally-friendly systems and processes, is designed to promote sustainable economic development and an equitable apportionment of responsibilities among countries. The certification process requires that companies maintain a system to evaluate the environmental impact of their operations and products, and make continuous efforts to improve their environmental performance. Toshiba considers ISO-14001 certification to be a passport to inclusion in the ranks of the world's most environmentally-responsible enterprises.

All 21 of Toshiba's domestic production facilities have gained ISO-14001 certification. Overseas subsidiaries and domestic subsidiaries and affiliates are working to achieve certification for all their facilities, an achievement that will strengthen Toshiba's standing as an environmentally-friendly enterprise.

The current plan calls for all domestic subsidiaries and affiliates to gain ISO-14001 certification by September 1999. Regarding overseas subsidiaries, all five Toshiba production facilities in Europe have acquired certification, as have many Toshiba factories in Asia and the U.S.. Factories in China will soon be able to obtain certification, as Toshiba has established a system for that purpose within its operations in that country.

ISO-14001 certification plan for Toshiba Group



Certifications

Japanese certifications

Overseas certifications

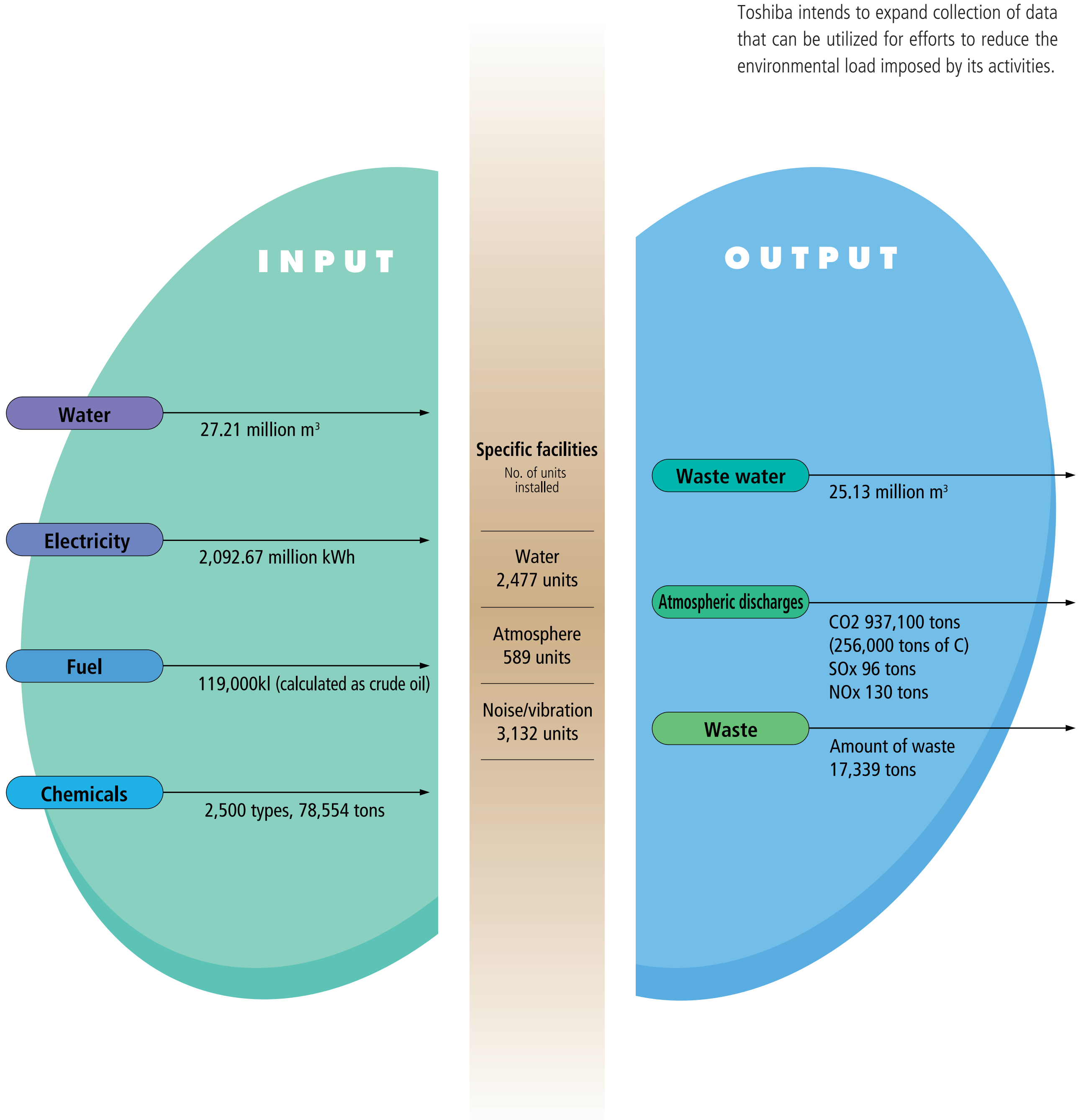
Toshiba's Environmental Impact and Priority Issues

Toshiba is an integrated manufacturer of electronic and electric products ranging from heavy electrical apparatus to consumer electronics, and from information and communications equipment to semiconductors and other electronic components. Among this abundance of products, environmental loads differ widely. This section provides an overview of the environmental impact of Toshiba as a whole, rather than discussing particular products.

This section also introduces Toshiba's commitment to four priority issues, namely prevention of global warming, control of chemical substances, response to the pollution of ground water, and recycling of consumer products.

Environmental aspects

The figure shows inputs of energy, water and chemicals and outputs of waste water, atmospheric discharges and other waste. Toshiba intends to expand collection of data that can be utilized for efforts to reduce the environmental load imposed by its activities.



Measurement of water quality

In Japan, environmental standards indicate the quality expected of the public water supply. They are of two types: environmental standards concerning maintenance of the environment (environmental items) and those concerning the protection of human health (health items).
The 9 environmental items cover BOD (biochemical oxygen demand), pH (index of concentration of hydrogen ions), etc., and the 23 health items cover such substances as cadmium and cyanogen.
The table compares data on waste water discharged by Yanagicho Works with the standards. Toshiba applies voluntary standards that are much stricter than national and municipal standards.

Data on water quality

	Items	Regulation values		Voluntary standards	Measured values					
		National standards	Municipal standards		1993	1994	1995	1996	1997	1998
General items (Environmental items)	pH	5.6〜8.6	5.7〜8.7	6.0〜8.0	7.3	7.1	7.1	7.1	7.3	7.4
	Biochemical oxygen demand (BOO) (mg/l)	160	300	100	—	—	11	26	4	11
	Chemical oxygen demand (COD) (mg/l)	160	Not regulated	—	—	—	—	—	—	—
	Suspensoid (mg/l)	200	300	50	—	—	7	9	4	4
	N-hexane (petroleum) (mg/l)	5.0	5.0	2.0	1.1	0.6	<1	<2	<2	<1
	Phenolic compounds (mg/l)	5.0	0.5	0.1	—	—	<0.1	<0.02	<0.02	<0.02
	Copper (mg/l)	3.0	3.0	1.0	0.02	<0.02	<0.05	<0.01	<0.01	0.03
	Zinc (mg/l)	5.0	3.0	1.0	0.19	0.02	0.22	0.11	0.05	0.19
	Dissolving iron (mg/l)	10.0	10.0	3.0	0.71	<0.02	0.6	0.7	0.6	0.24
	Dissolving manganese (mg/l)	10.0	1.0	0.3	0.09	<0.02	<0.05	<0.05	<0.05	0.01
	General chromium (plme/ml)	2.0	2.0	1.0	0.04	<0.02	<0.1	<0.05	<0.05	<0.05
	Fluorine (mg/l)	15.0	15.0	1.5	—	—	<0.5	<0.5	<0.5	<0.5
	Coliform group (average per day) (mg/l)	3000	Not regulated	—	—	—	—	—	—	—
	Nickel (mg/l)	—	1.0	0.2	0.09	<0.02	<0.1	0.07	<0.01	<0.01
	Total nitrogen (mg/l)	—	150	30	—	3	2	29	5	<2
	Total phosphorous (mg/l)	—	20.0	10.0	—	7.7	0.35	0.35	1.4	0.55
Toxic substances (Health items)	Cadmium (mg/l)	0.1	0.1	0.02	—	—	<0.01	<0.01	<0.01	<0.01
	Cyanogen (mg/l)	1.0	1.0	0.04	—	—	<0.01	<0.02	<0.02	<0.02
	Organophosphorus (mg/l)	1.0	0.2	0.1	—	—	<0.1	<0.01	<0.05	<0.05
	Lead (mg/l)	0.1	0.1	0.05	—	<0.01	0.04	<0.01	<0.01	<0.01
	Arsenic (mg/l)	0.1	0.1	0.01	—	—	<0.01	<0.005	<0.005	<0.005
	Hexavalent chromium (mg/l)	0.5	0.5	0.1	—	—	<0.01	<0.05	<0.05	<0.05
	General mercury (mg/l)	0.005	0.005	0.001	—	—	<0.0005	<0.0005	<0.0005	<0.0005
	Alkyl mercury (mg/l)	Not detected	Not detected	Not detected	—	—	Not detected	Not detected	Not detected	Not detected
	PCB (mg/l)	0.003	0.003	0.001	—	—	<0.0005	<0.0005	<0.0005	<0.0005
	Trichloroethylene (mg/l)	0.3	0.3	0.002	—	—	<0.002	<0.001	<0.001	<0.001
	Tetrachloroethylene (mg/l)	0.1	0.1	0.001	—	—	<0.002	<0.0005	<0.0005	<0.0005
	Carbon tetrachloride (mg/l)	0.02	0.02	0.001	—	—	<0.002	<0.0001	<0.0001	<0.0001
	1,1,1-trichloroethane (mg/l)	3.0	3.0	0.002	—	—	<0.002	<0.001	<0.001	<0.001
	Dichloromethane (mg/l)	0.2	0.2	0.02	—	—	<0.002	<0.01	<0.01	<0.01
	1,2-dichloroethane (mg/l)	0.04	0.04	0.03	—	—	<0.002	<0.02	<0.02	<0.02
	1,1-dichloroethane (mg/l)	0.2	0.2	0.002	—	—	<0.002	<0.001	<0.001	<0.001
	Cis-1,2-dichloroethylene (mg/l)	0.4	0.4	0.01	—	—	<0.002	<0.005	<0.005	<0.005
	1,1,2-trichloroethane (mg/l)	0.06	0.06	0.03	—	—	<0.002	<0.02	<0.02	<0.02
	1,3-dichloropropene (mg/l)	0.02	0.02	0.01	—	—	<0.002	<0.01	<0.01	<0.01
	Thiuram (mg/l)	0.06	0.06	0.01	—	—	<0.005	<0.005	<0.005	<0.005
	Simazine (mg/l)	0.03	0.03	0.02	—	—	<0.002	<0.02	<0.02	<0.02
	Thiobencarb (mg/l)	0.2	0.2	0.1	—	—	<0.005	<0.02	<0.02	<0.02
	Benzene (mg/l)	0.1	0.1	0.01	—	—	<0.002	<0.004	<0.004	<0.004
	Selenium and selenium compounds (mg/l)	0.1	0.1	0.01	—	—	<0.01	<0.002	<0.005	<0.005

Yanagicho Works, Kawasaki

Measurement of the quality of the atmosphere

A cluster of problems is associated with the environmental load imposed on the atmosphere. The atmosphere has no clear boundary and the impact of pollution can range far and wide. In addition to global warming, which often attracts headlines, problems include air pollution caused by optochemical oxidants and air-borne particles. These issues need to be dealt with from a long-term perspective, as the adverse effects on health attributable to substances implicated in toxic atmospheric pollution may not become apparent for decades.
The table shows the values of atmospheric discharges from Nasu Works. Toshiba's approach to control of atmospheric discharges is the same as that for waste water. Data on certain operations involving the discharge of waste water and atmospheric discharges are shown, to illustrate what Toshiba is doing. In fact, all operations at Toshiba factories satisfy voluntary standards stricter than those mandated by law.

Data on atmospheric discharge

	Items	Regulation values		Voluntary standards	Measured values					
		National standards	Prefecture standards		1993	1994	1995	1996	1997	1998
Boiler (2Otons)	Particles of soot (g/Nm³)	0.3	0.2	0.1	0.002	0.003	0.005	0.003	0.002	0.005
	Nitrogen oxide (NOx) (ppm)	250	150	120	71	96	99	50	53	83
	Sulfur oxide (SOx) (K-value)	14.5	14.5	5.8	1.1	2.6	1.84	0.96	2.53	1.84
Incinerator *	Particles of soot (g/Nm³)	0.5	0.5	0.25	0.152	0.13	0.26	0.099	0.05	—
	Nitrogen oxide (NOx) (ppm)	250	250	150	50	220	117	64	54	—
	Sulfur oxide (SOx) (K-value)	14.5	14.5	5.8	0.29	0.38	0.34	0.31	0.26	—
	Hydrogen chloride (mg/Nm³)	700	700	560	120	423	383	190	243	—

* Operation of the incinerator was terminated in July 1998 and it was dismantled in August 1998.

Nasu Works and Nasu Electron Tube Works, Tochigi prefecture

Prevention of global warming

Prevention of global warming is an issue which, by definition, needs to be tackled on a worldwide basis in the 21st century. Toshiba is contributing to the prevention of global warming by providing energy-efficient products and conducting energy-saving activities throughout its operations.

Facilities' energy-saving voluntary action plans and the results

The targets of the Japanese electric/electronics industry's action plan to prevent global warming are as follows:

① 15% improvement in the ratio of energy consumed at facilities to net sales by fiscal 2000 compared with fiscal 1990 (Facilities include laboratories.)

② 25% improvement in the ratio of CO_2 discharge at facilities to net sales by fiscal 2010 compared with 1990.

As shown in the graph, the ratio of Toshiba's energy consumption to net sales in fiscal 1997 was 100% compared with fiscal 1990. This unsatisfactory result is attributable to a great reduction in sales of consumer products and semiconductors and the increase in the consumption of energy for R&D of next-generation semiconductor devices. Meanwhile, the increase in the amount of CO_2 discharged was kept to 2% due to change of fuel and improvement in CO_2 discharge efficiency of purchased electricity, and, as a result, the ratio of CO_2 discharge to net sales was improved by 11%.

Energy consumption for each business group

The energy consumption of Toshiba's semiconductor business group has been rising since fiscal 1990, reflecting the increase in output. In contrast, the energy consumption of the heavy electrical and consumer products business groups has been decreasing. Semiconductor manufacturing is energy-intensive because it takes place in clean rooms where the cleanness of the air, temperature and humidity are strictly controlled.

Promotion system

Since the pattern of energy consumption differs greatly among business groups, each business group draws up a mid-term voluntary energy-saving plan based on corporate guidelines. Each group's voluntary plan is in accordance with the objectives and goals of ISO 14001, a certification which all facilities have gained. Above and beyond adherence to the Revised Energy-saving Act, Toshiba is making a corporate-wide effort to accomplish the goals set out in the industry's voluntary action plan.

Promotion of concrete measures

Management's task is to promote energy-saving measures in a consistent, well-balanced manner. Toshiba applies a threefold approach.

Improvement in control

Toshiba seeks to eliminate waste throughout its production activities and promotes appropriate control of energy consumption by improving production processes and developing technology.

Investment in energy-saving equipment

According to a comprehensive plan, investment is executed in order to replace power facilities, production facilities, air conditioning and lighting systems with those offering higher energy efficiency.

Energy-saving clean rooms

Old clean rooms whose energy efficiency has deteriorated are being retired and energy-saving at clean rooms is promoted by adopting fan filter units (FFUs) and clean benches.

These efforts resulted in energy saving equivalent to 26,000kl of crude oil in fiscal 1997, as shown in the figure.

Case studies (See page 17.)

Commitment regarding greenhouse gases other than CO_2

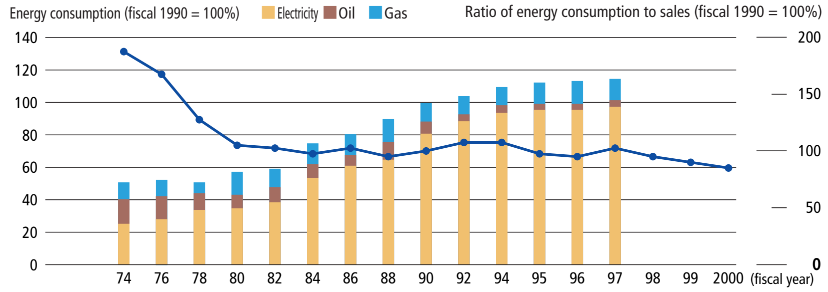
At the third session of the conference of the parties to the United Nations' Framework Convention on Climate Change (COP3), it was decided to control discharge of greenhouse gases other than carbon dioxide, namely hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulfur hexafluoride (SF_6). Toshiba uses HFC as refrigerant and heat insulating material for air conditioners and refrigerators, PFC as etching gas for semiconductor devices, and SF_6 as insulating material for power equipment. Toshiba is promoting collection and recycling of these substances and development of substitute substances and technologies in accordance with the industry's voluntary action plan.

CO_2 discharge and ratio to net sales

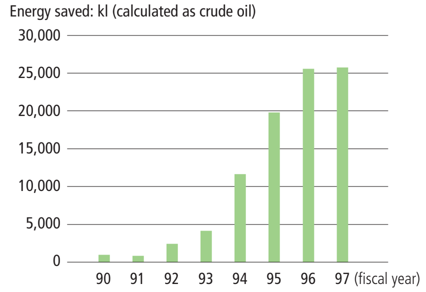
Fiscal year	1990	1997	97／90
Net sales	32,277	36,997	+15%
Energy (calculated as crude oil, kl)	587,888	673,772	+15%
Ratio to net sales (kl/\ hundred million)	18.21	18.21	± 0%
CO_2 discharge (ton C)	250,170	255,560	+ 2%
Ratio to net sales (ton C/\ hundred million)	7.75	6.91	- 11%

Note 1) Energy and CO_2 discharge are the totals at production facilities and laboratories.
Note 2) CO_2 discharge coefficient used is the "discharge coefficient of each fuel for follow-up of Keidanren's voluntary action plan" issued on August 31, 1998.

Use of energy by Toshiba as a whole



Energy saving (result for each fiscal year)



Control of chemical substances

A vast number of chemical substances is employed for a correspondingly huge variety of purposes. Some 50,000 different chemical substances are produced for industrial applications. Although chemical substances are indispensable, they may cause serious pollution and harm human health and the environment if appropriate controls are not implemented at each stage of manufacturing, distribution, use and disposal or if an accident occurs. Recently, pollution of ground water by organochlorine solvent and problems regarding dioxins and environmental hormones have become a focus of attention. Toshiba has been executing the 33/50 Project, which is mentioned above in connection with the Voluntary Environmental Plan. In response to the U.S. Environmental Protection Agency's 33/50 Project, Toshiba is reducing its use of those chemical substances that have the potential to adversely affect human health and the environment. At factories where electronic components and semiconductors are manufactured, Toshiba reduced use of 21 high-toxicity substances, selected by Toshiba for special attention, by 87% in fiscal 1997 compared with fiscal 1994 (comparison of the ratios to net sales). From now on Toshiba will promote activities corresponding to the pollutant release and transfer register (PRTR) system.

Toshiba's PRTR

Toshiba's six facilities in Kawasaki participated in a pilot PRTR project initiated by the Environment Agency in December 1997. Additionally, triggered by the PRTR survey in June 1998 conducted by five industry associations representing the electric and electronics industries, Toshiba executed PRTR at all its facilities and also expanded the scope to include affiliated companies which are not members of any of the five industrial bodies. Characteristics of PRTR are that chemical substances subject to control are specified, and the amounts of those chemical substances released and transferred are calculated and registered. Previously, in its control of chemical substances, Toshiba placed emphasis on the amounts used. However, in the light of the PRTR survey, Toshiba shifted its emphasis to the amounts released, which is a more fundamental consideration. The results of Toshiba's PRTR are shown below. Future actions and issues to be addressed are discussed in the following.

Presented in the table below are the results of the summing up of the results of the company-wide PRTR survey conducted by Toshiba in fiscal 1997. Of 179 chemical substances subject to PRTR, Toshiba uses 41, of which 5 are within the scope of the part of the PRTR survey specifically for the electric/electronics industry. Fukaya Works reported on 19 chemical substances, the largest number reported by any Toshiba facility, and the Manufacturing Engineering Research Center reported none. On average 6.3 chemical substances were reported by each Toshiba facility; less than the result of the PRTR project executed by the Environment Agency (7.9 chemical substances on average for facilities with more than 1,000 employees). Toluene (239 tons), xylene (208 tons) and dichloromethane (8 tons) were among the more heavily discharged chemical substances, and this trend is similar to those revealed by the Environment Agency's pilot project and the Keidanren survey. In the case of both Toshiba and the electric/electronics industry as a whole, releases of sulfur hexafluoride (SF_6), hydrofluorocarbon(HFC) and perfluorocarbon (PFC) were large. Release of hydrogen fluoride to water systems by Toshiba was large at 15 tons per year. No substance whose toxicity is ranked A (carcinogenicity respecting humans) was released by Toshiba to the atmosphere, but hexavalent chromium and nickel compound were released to water systems, although the amounts were very small. Among substances whose toxicity is ranked B (possibility of carcinogenicity respecting humans), releases of dichloromethane (8 tons) and hydrogen chloride (4 tons) were large. According to the Keidanren survey, which covers 80% of industry in Japan, discharges of dichloromethane and hydrogen chloride were 23,500 tons and 4,550 tons, respectively.

Toshiba's PRTR (Results, fiscal 1997)

Substance number	Substance name	Number of facilities	Amount used (ton)	Amount released to atmosphere (ton)	Amount released to water systems (ton)	Amount consumed and treated (ton)	Amount removed (ton)	Amount transferred as industrial waste (ton)	Amount recycled (ton)
1	Zinc compound	5	389.96	0.1	0.407	266.403	0.08	74.75	48.221
6	Acetaldehyde	1	0.1	0.1	0	0	0	0	0
8	Antimony and antimony compound	4	524.757	0	0	516.136	0	0.944	7.677
15	Hydrogen chloride	19	5507.865	4.382	0	0.15	5344.257	6.476	152.6
18	Chlorine	6	1949.31	0.52	0	0	1271.114	67.676	610
21	Xylene	15	314.01	207.702	0	0	16.702	36.361	53.246
22	Silver compound	1	0.19	0	0	0	0	0	0.19
24	Chromium compound (hexa)	3	3.799	0	0.23	1.101	1.6	0.868	0
25	Chromium compound (except hexa)	1	0.34	0	0	0.254	0	0	0.086
32	Chloroform	1	0.73	0	0	0	0.22	0.51	0
34	Cobalt and cobalt compound	3	194.412	0.002	0	186.374	0	0	8.036
37	Cyanogen compound	2	0.87	0.066	0.001	0	0.803	0	0
50	Dichloromethane	7	10.988	8.303	0	0	0	1.517	1.168
58	N.N-dimethylformamide	2	1.145	0.063	0	0	0	0.541	0.541
61	Oxalic acid	2	2.527	0	0	2.39	0.137	0	0
63	Styrene	1	3	0.15	0	0	2.7	0.15	0
67	Tellurium and tellurium compound	1	0.23	0	0	0.13	0	0	0.1
68	Copper compound	2	46.861	0	0.1	0.861	0	6.4	39.5
79	Toluene	14	369.515	239	0	13.1	64.659	15.536	37.22
80	Lead compound B	4	6331.766	0	0.039	6033.305	0	213.25	85.173
81	Nickel compound	5	7.86	0	0.006	5.451	0.094	0	2.309
86	Barium and barium compound	4	2598.614	0.091	0.07	2512.66	0	57.286	28.507
87	Arsenic and arsenic compound	2	0.364	0.018	0.007	0.166	0.007	0.057	0.11
88	Hydrazine	4	2.908	0.002	0.281	0	0.896	1.729	0
94	Hydrogen fluoride	10	466.409	1.777	15.494	0.041	390.441	16.948	41.708
96	Fluorine compound (inorganic)	5	37.272	0.04	0.4	0	0.112	1.972	34.748
99	Beryllium and beryllium compound	2	1.539	0	0	1.406	0	0	0.133
100	Benzene	1	1.8	0	0	1.8	0	0	0
104	Boron and boron compound	4	16.573	0	0.651	13.458	0	2.061	0.403
105	Formaldehyde	2	1.7	0.4	1	0.3	0	0	0
107	Manganese compound	3	1.921	0	0.005	0.258	0	1.565	0.093
110	Molybdenum and molybdenum compound	3	229.705	0	0.6	200.734	0	0.084	28.287
118	Aluminum compound	4	570.303	0	0	446.757	80.597	37.933	5.016
121	Ethanolamine	1	48.27	0.69	0	0	13.16	34.42	0
146	Zirconium and zirconium compound	1	175.7	0	0	160.072	0	12.658	2.97
148	Tungsten compound	1	149.495	0	0.25	147.802	0.136	0	1.307
175	HCFC	2	429.691	6.438	0	423.3	0.11	0	0.043
176	HFC	9	732.845	12.57	0	708.84	0.834	10.601	0
177	PFC	9	124.317	55.22	0	19.6	22.008	27.489	0
178	Sulfur hexafluoride	7	469.709	156.217	0	283.7	0.076	0.716	29
179	Lead solder	15	80.187	0.33	0	52.369	0.064	1.375	26.049

* Number of facilities is the number of facilities which use the substance.
* The amount consumed includes the amount of the substance subject to PRTR that changed to other substances by reaction and the amount that left facilities in products or together with products.
* The amount removed and treated includes the amount of the substance subject to PRTR that changed to other substances by incineration, neutralization, decomposition, reaction treatment, etc. within a facility.

Actions

Toshiba positions PRTR as an important tool in the control of chemical substances and promotes its implementation throughout Toshiba Group. Regardless of whether PRTR becomes mandatory, Toshiba will continue PRTR from this fiscal year onward in order to strengthen control of chemical substances. The issues that need to be tackled are 1) development of a system for efficient summing up and reporting, 2) reduction of the release of chemical substances that have an environmental impact, cessation of the use of toxic substances and their replacement, and 3) preparation for disclosure of data for each business premises.

(1) Development of a system for efficient summing up and reporting

Since 1989 Toshiba has been using a chemical substance control system, but, partly because this system is not Y2K-compliant, replacement with a new system is under way. The basic performance of the new system includes retrieval function from the database on some 8,000 chemical substances, as well as summing up of the amounts used and released. Operability of this system has been verified by a pilot implementation at a business premises, and this system will be implemented at all Toshiba premises and affiliated companies within fiscal 1999. Additionally, marketing of this system as a packaged software is also being considered.

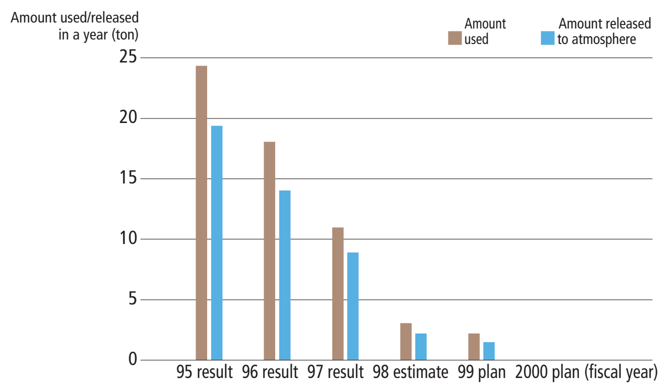
(2) Reduction of release of substances that have an environmental impact, cessation of use of toxic substances and their replacement

Toshiba will classify the chemical substances it uses according to their toxicity and will restructure the control system so as to achieve greater efficiency. Based on classification of chemical substances in accordance with the degree of risk (prohibition of use, reduction in use, control of release, etc.), guidelines for countermeasures for chemical substances in each classification will be issued. According to the results of the PRTR survey, priority for reduction and replacement will be accorded to the three types of organochlorine compounds highlighted in the table. Because dichloromethane is used in open systems and is subject to the Environment Agency's "guidelines for surveys and countermeasures for pollution of soil and ground water by organochlorine compounds", Toshiba will accord the top priority for reduction and cessation of use to dichloromethane. The amounts used and released of dichloromethane and the material balance are shown in the graphs below. Toshiba's use of dichloromethane is scheduled to cease by the end of March 2000.

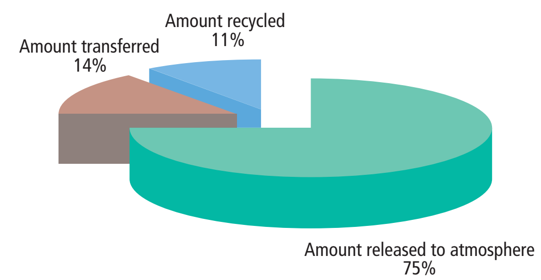
(3) Preparation for disclosure of data for each facility

In this report, summed up data for Toshiba as a whole are presented. By publicizing its policy on chemical substances together with the reduction targets, in addition to disclosure of data, Toshiba desires to facilitate informed discussion and communication with interested parties. Data for each facility are not provided in this report, partly due to constraints of space, but Toshiba is preparing to disclose data for each facility in the future since it will strengthen control of chemical substances and facilitate understanding among interested parties and communication with them. There is a need to determine how best to communicate information regarding risks.

Plan for reduction of dichloromethane



Material balance



Response to ground water pollution

Foreword

In response to the pollution of ground water that occurred at Nagoya Works, the Environment Special Countermeasure Headquarters was established in October 1997.

Regardless of regulations, Toshiba checks the situation regarding pollution within factory sites and information is disclosed to local municipalities. It is Toshiba's policy to do our utmost to prevent pollution and we have conducted a comprehensive environmental check of all factories.

Check procedures

The check was conducted in accordance with the Environment Agency's "guidelines for surveys and countermeasures for pollution of soil and ground water by organochlorine compounds" issued in November 1994. To ensure objectivity, Toshiba secured the advice of third-party specialists and the check of three factories was witnessed by third-party specialists. The check was conducted in the following order: analysis of gases in soil, analysis of permeation of substances into soil, and check of ground water.

Commitment regarding sites that exceeded the environmental standards

As a result of the check, environmental standards for ground water were found to be exceeded at Nagoya Works, Fukaya Works in Saitama prefecture, Yanagicho Works in Kawasaki, Fuji Works in Shizuoka prefecture, Oita Works and Osaka Works.

Nagoya Works

Measures are being implemented in accordance with the guidance of the Pollution Countermeasure Study Committee established by Nagoya City.

At the site of the former plating workshop, in a $223m^2$ area the soil was excavated to a depth of 3m and treated. The method applied removes organochlorine solvent by evaporation using the dehydration reaction and exothermic reaction that occur when soil and slaked lime are mixed. Evaporated gas is treated by activated carbon and released to the atmosphere.

Treatment of soil in a band 3 to 10m from the surface in a $1000m^2$ area is now under consideration.

Regarding another highly contaminated site which is about 100m to the south of the former plating workshop, the site itself and the vicinity were investigated.As a result, Nagoya City's Pollution Countermeasure Study Committee concluded that the source of pollution is located outside the factory site and that chemical substances that had permeated underground flowed into the soil beneath the factory site from the soil beneath the road which is located to the east of the factory site.

Nagoya City took the initiative in deciding the methods for recovery of this site and it was decided to excavate and remove the polluted soil beneath the site and the road. Treatment of ground water is being considered.

Below, water purification systems applied at sites are introduced.

Pumped-up water circulation system

Based on the result of the investigation, and in accordance with the guidance of the local municipality, a water purification system was installed at the boundary of the site, downstream of the ground water, to deal with the pollution.

Ground water is pumped up from pumping wells and organochlorine substances are removed from the water by a dual-system of activated carbon adsorption towers and the treated water is returned to injection wells. The figure below shows the configuration of this system. The design of this system is based on simulations of ground water purification. The details of the simulations are explained below.

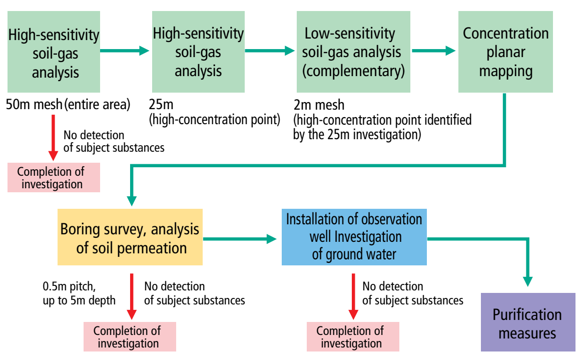
The pumped-up water circulation system achieves efficient purification of water by controlling the flow of ground water by means of wells, and also prevents the drying up of ground water and dispenses with treatment of discharged water since pumped-up water is returned underground.

Pumped-up water aeration

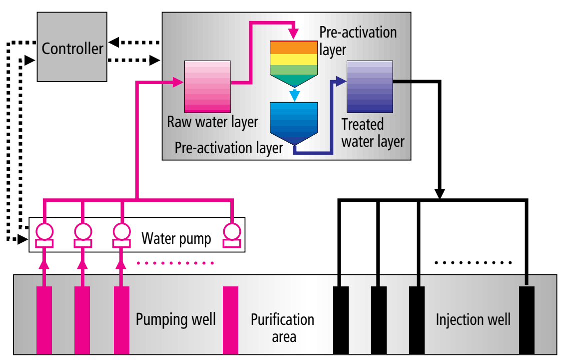
In accordance with the guidance of the local municipality, pumping wells were installed at the boundary of the site, downstream of the ground water. This system aerates pumped-up water and removes toxic substances by active carbon adsorption.

Additionally, the site is divided into four zones and pumping wells were installed for recovery of the site to its original state. At a site where local contamination was found, pumping wells were installed downstream of the polluted points, and the same treatment system was applied.

Investigation flow



Example of configuration of a purification system



Removal of soil by excavation and soil-gas suction

As countermeasures for polluted soil, removal of soil by excavation and soil-gas suction were adopted.

In the method of removal of soil by excavation, excavated soil is heated to evaporate toxic substances that are then treated by activated carbon etc.

In the soil-gas suction method, toxic substances in the soil are sucked by vacuum pumps and pollutants are removed by activated carbon etc.

Pumped-water aeration in combination with soil-gas suction

To recover the site which is relatively deep and includes a thick layer of gravel, the pumped-water aeration method was used in combination with the soil-gas suction method.

Related technologies

Ground water simulation technology and detoxification technology for organochlorine compounds are introduced.

Ground water simulation technology

Flow of ground water and the relocation of pollutants by this flow can be analyzed by ground water simulation. Using this technique, it is possible to forecast progress of purification by a ground water purification system.

For the water purification system for which the above-mentioned pumped-up water circulation method was applied, layout of wells to achieve high purification efficiency is determined by repeated simulations, including simulations of natural flow of ground water and characteristics of the strata. Shown at right are the simulation results.

(Detoxification of ground water pollutants)
Photodisintegration of trichloroethylene

Treatment by ultraviolet ray is suitable for disintegration of highly concentrated organic solvents, and addition of hydrogen peroxide achieves detoxification of 30ppm solution in about 10 minutes. Use of active carbon in combination with this technique achieves a 40% reduction in cost. Addition of catalysts and pH control further increase economy.

Detoxification by biotechnology

Toshiba is developing decomposition technology using microorganisms. Toshiba researchers have sought to exploit the natural cleaning ability of microorganisms and successfully identified a highly effective bacterium which efficiently disintegrates organochlorine solvents. It was found that this bacterium's activity can be greatly enhanced by the addition of certain substances to its culture medium. We are now preparing for practical application of this technology.

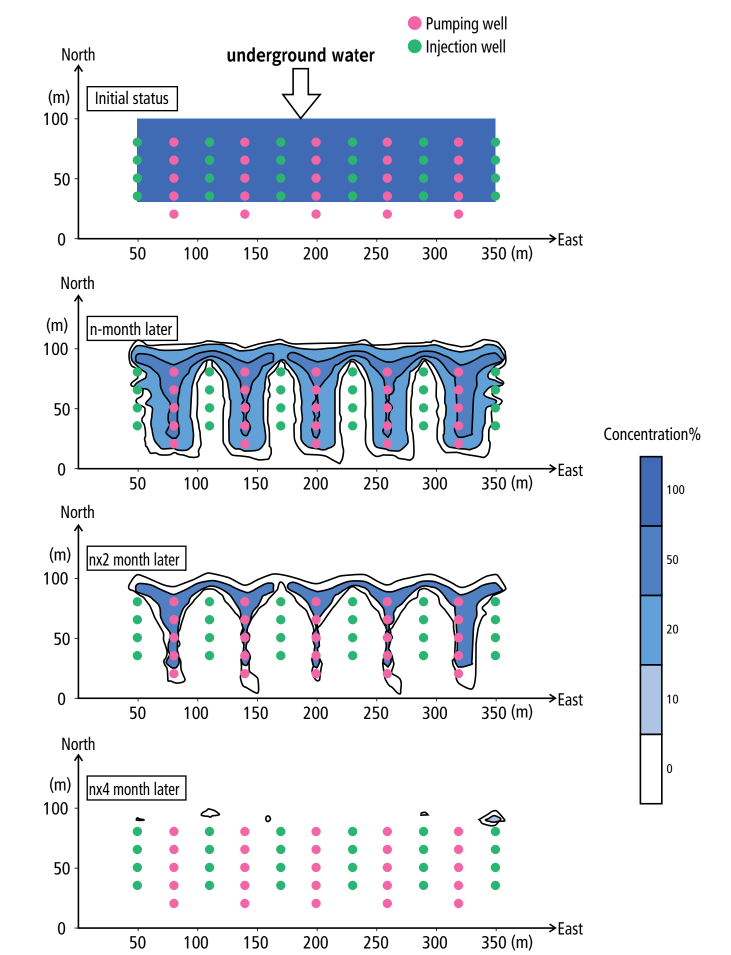
Related actions

In parallel with the above investigations regarding pollution, Toshiba took the following actions.

Firstly, the Basic Rules for Environmental Protection were reviewed and the reporting route in the event of any abnormality and the obligation of reporting to local municipalities were documented. Additionally, the "standards for actions in the event of nonconformity regarding soil and ground water" have been established. These standards require general managers of facilities to report to the organizations concerned within Toshiba and to local municipalities in the event that abnormality of ground water, such as pollution, is detected.

Secondly, Toshiba checked the situation regarding control of toxic substances. It should be noted that Toshiba ceased to use trichloroethylene and tetrachloroethylene, the pollutants of ground water at Nagoya, in 1989 and 1991, respectively. Regarding other substances, it was confirmed that appropriate control is implemented and that there is no problem.

Simulation of underground water



Recycling of consumer products

To achieve a recycling society

Electric and electronic consumer products are integral to contemporary lifestyles. However, these products are disposed of when replaced by new products. Landfill is the most common method of disposal for consumer products.

It is necessary to establish a recycling society in which limited resources are used effectively. Public interest in disposal of consumer products and recycling has been mounting and laws governing treatment of waste consumer products have been announced and will be implemented.

Toshiba is making efforts to establish a recycling system throughout Toshiba Group so as to facilitate reuse and recycling of waste consumer products.

Promotion of recycle demonstration experiments

A law mandating recycling of certain household appliances was announced in June 1998 and from April 2001 it will become mandatory for manufacturers to recycle household appliance specified in the law (televisions, refrigerators, washing machines and air conditioners).

Prior to the law coming into effect, Toshiba is doing research on recycling of consumer products, as part of its ongoing efforts to reduce environmental impacts at every phase of a product's life, from design, procurement of materials and components, and manufacturing through to use and disposal.

Regarding the recycling process, Toshiba is conducting demonstration experiments jointly with Term Corp., an affiliate, on disassembly and classification of materials (preprocesses) of televisions, refrigerators, air conditioners and personal computers, and is gathering data for each product category on the time required for dismantling, volume of materials and parts which can be recycled, etc. and know-how to establish efficient recycling methods.

Recycling technology for end-of-life consumer products

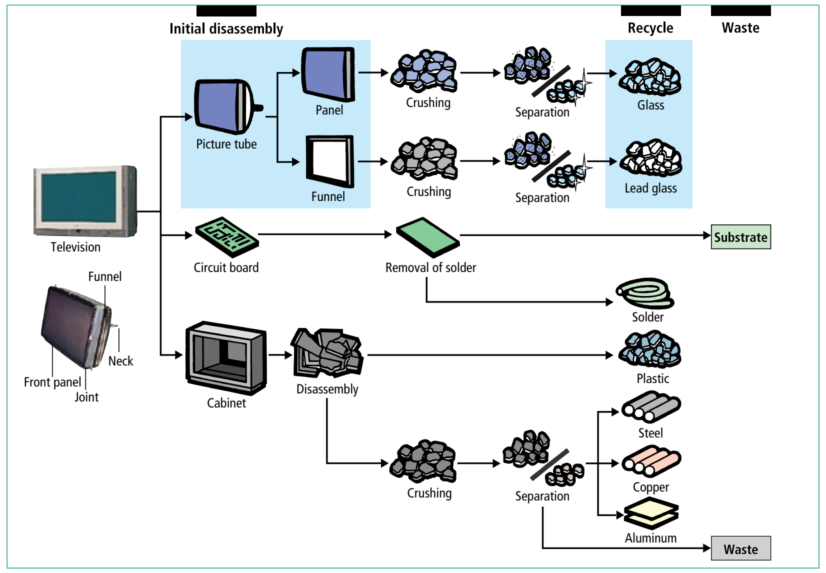
The crucial point in recycling is thorough classification of materials so that a product can be separated into the original materials.

Waste consumer products can be collected and separated into materials, such as steel, copper, aluminum, and glass. Recycling of plastics by reclamation of fuel oil from them or reuse of plastics by separating them by type are being considered.

Televisions

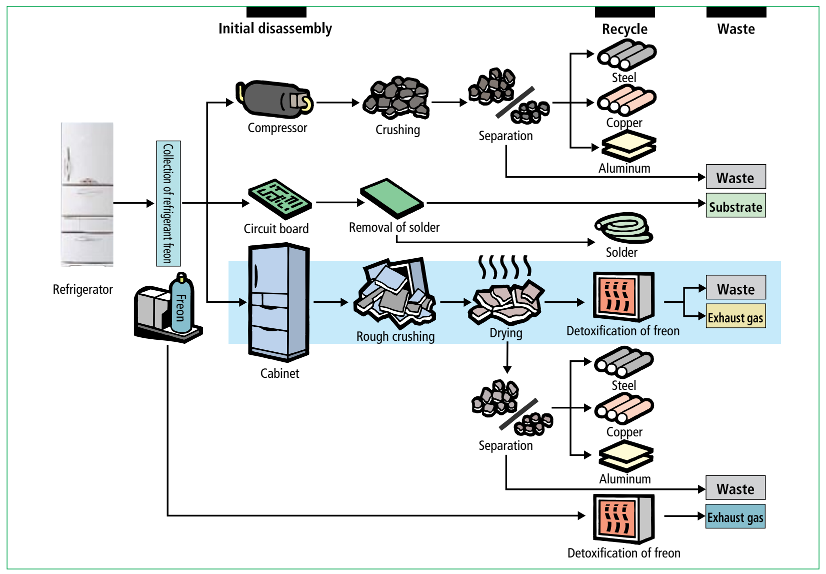
A television can be disassembled into a picture tube, a circuit board and a cabinet. Glass of the picture tube and plastics of the cabinet constitute the bulk of materials used in a TV.

A picture tube consists of a front panel, a rear funnel and a neck. For recycling of glass used for picture tubes, it is critical to ensure that glass used for picture tubes is separated without mixing with colored lead glass used for funnels. Separated glass is crushed into cullets and reconstituted as new glass by glass manufacturers.



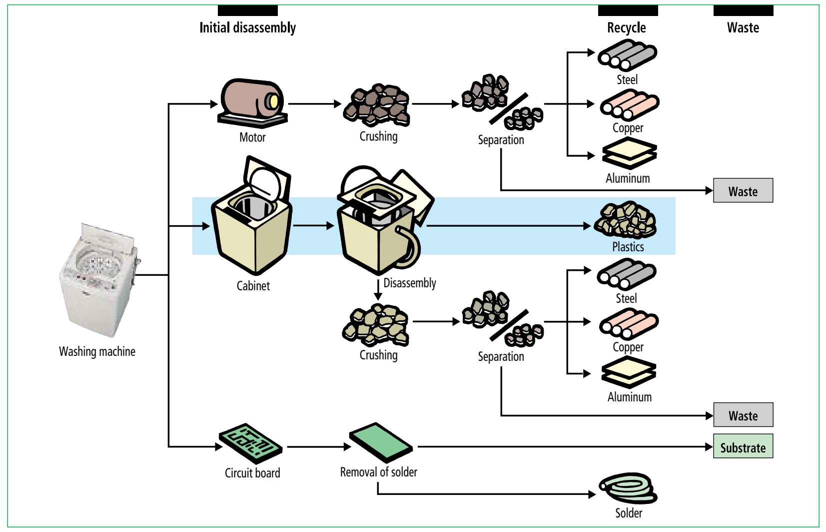
Refrigerators

A refrigerator can be separated into a compressor, a motor, a cabinet and a circuit board. Some former types of refrigerators contain freon which was used for expansion of heat insulation material. Toshiba is vigorously researching detoxification of freon in the recycling process. Toshiba is developing an efficient and low-cost recycling technology in which heat insulating material is crushed together with cabinets and then dried, and gas generated is decomposed at a high temperature of above 1200˚C by a gas transformer and used as clean gas fuel.



Washing machines

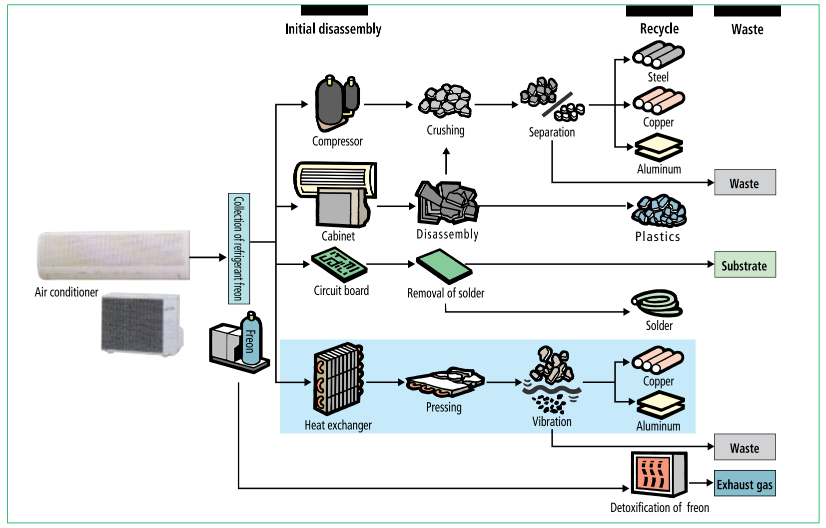
A washing machine can be separated into a motor, a cabinet and a circuit board. Plastics such as polypropylene and polyethylene are used in washing machines. Regarding recycling of these various types of plastics, reclamation of oil from plastics and conversion of plastics into solid fuel for use as a reducing agent in blast furnaces are being considered. Therefore, key technologies are those for achieving selective removal of vinyl chloride from several types of plastics and dechlorination.



Air conditioners

An air conditioner can be separated into a compressor, a cabinet, a circuit board and a heat exchanger. Technology for achieving complete separation of copper pipes and aluminum fins of heat exchangers is the key.

Air conditioners are disassembled after collection of refrigerant freon and separated into major components. Heat exchangers are pressed into thin sheets and then separated into copper and aluminum by vibration. The retrieved copper and aluminum are used in the manufacture of copper products and aluminum products.



Environmentally-conscious packaging

Toshiba is promoting environmentally-conscious packaging from the viewpoint of the "3Rs" (reduce, reuse and recycle).

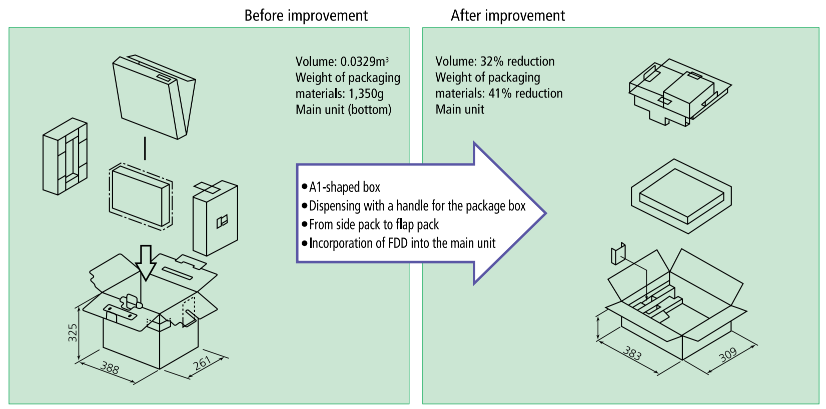
A law on recycling of packaging will come into force in April 2000, making it mandatory for manufacturers to recycle certain types of packaging and to track and control shipments, including registry and retention of records.

Toshiba's commitment to environmental protection regarding packaging goes beyond responding to the law that is to come into effect. Toshiba is promoting appropriate packaging and improvement of packaging from the packaging design stage, based on such factors as the robustness of the product packaged and utilizing its packaging evaluation system, and is reducing waste packaging.

Case study of packaging of PCs in Japan

Points

1) Reduction in cost Improvement in package design (simplified box and buffer)
2) Reduction in volume Improvement in product design (incorporating FDD), dispensing with a box for accessories



Impact of improvement

1) Reduction in packaging cost: 58%
2) Reduction in distribution cost: 32%
3) Reduction in waste packaging: 41%

Implementation of improvements

January 1998

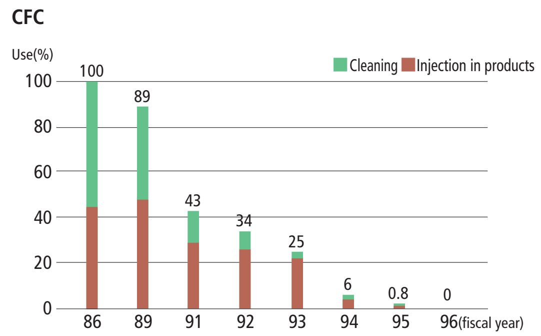
Toshiba's Commitment

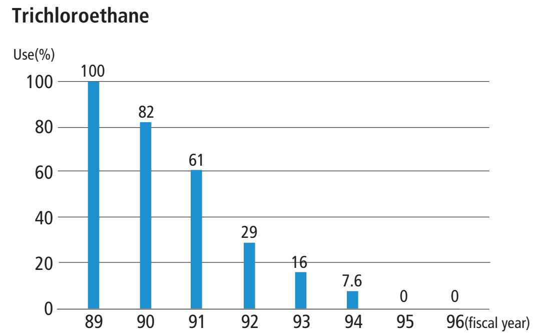
Toshiba works to reduce the environmental load of every product it manufactures. At the manufacturing phase, Toshiba looks ahead, seeking to reduce the load during the product's use and to ensure its suitability for recycling or easy disposal at the end of its life cycle. This commitment extends to every phase of the product's life, from design, procurement of materials and components, and manufacturing through to use and disposal. Thus, Toshiba seeks to attune its activities to the rhythms and capacities of the Earth, taking only what is necessary and recycling as much as possible.

The FREE+2A program is the blueprint for Toshiba's environmental actions. F stands for "freon-less", expressing Toshiba's determination to cut the use of ozone-depleting substances; R for "recycling", representing our drive to reuse as much as possible and minimize what is discarded; the first E expresses our commitment to manufacturing products and developing technologies that reduce energy consumption; and the second E stands for the Earth, signifying the company's wide range of activities designed to prevent the release of harmful substances into the environment, whether into soil, water, or the atmosphere. "plus 2A" highlights the importance of auditing and action plans in our environmental activities. The acronym FREE expresses Toshiba's resolve to help free the Earth from environmental scourges.

All Toshiba employees take part in programs designed to strengthen our credentials as an environmentally-friendly enterprise; one that vigorously recycles and acts decisively to reduce the amount of materials it discards. Our ultimate goal: a world in which everything is recycled and nothing is thrown away.

Freonless : Protecting the ozone layer





Toshiba has either curbed the use of ozone-depleting substances or dispensed with them altogether. Ozone-depleting substances which Toshiba has used in manufacturing include CFCs for cleaning components or used as refrigerant and adiabatic expanding agent in refrigerators; trichloroethane for cleaning components; carbon tetrachloride for dry etching of semiconductors; HCFC as a refrigerant in air conditioners and large refrigerators and as an adiabatic expanding agent in refrigerators.

In 1989 Toshiba established a corporate-level committee to identify suitable replacements for CFCs used in cleaning processes. That committee is complemented by committees in each product division, whose task it is to identify suitable replacements for CFCs according to their applications. As a result, Toshiba eliminated use of CFCs for cleaning in December 1993, of carbon tetrachloride in May 1994, and of the powerful cleaning agent trichloroethane in November 1994. Finally, the use of CFCs for injection in refrigerators and other products was eliminated in September 1995. Toshiba has systematically transferred know-how on non-CFC-based cleaning techniques to subsidiaries and partner companies and, moreover, shared it with society at large by working through industry associations, providing documentation on examples of various applications, dispatching instructors, and so forth. In terms of volume, CFCs have been mostly replaced by water-based cleaning agents. As substitutes for trichloroethylene and tetrachloroethylene, which are substances whose use is prohibited, Toshiba does not use organochlorine solvents such as methylene chloride.

Toshiba still uses turbo-refrigerators containing CFCs for clean-room air conditioning and fire-fighting equipment containing halon. As of March 31 1998, the amount of CFCs contained in turbo-refrigerators was about 32 tons and the amount of halon in fire-fighting equipment was about 270 tons, calculated on the basis of ODP (ozone-depleting power).

For air-conditioning systems, each operation has established a retrofitting plan. Equipment is selected following consideration of such factors as the energy-efficiency of air-conditioning systems, supply and demand of electricity, the trend of atmospheric pollution around Japan, and the adequacy of refrigerant for replenishment.

Toshiba will not install any new fire-fighting equipment which uses halon, and notifies the Halon Bank Council when decommissioning such equipment, so as to ensure proper treatment. In fiscal 1997, 1.5 tons of halon (ODP basis) collected from 49 sets of fire-fighting equipment at Toshiba was transferred to registered enterprises.

On facilities and equipment within Toshiba that use ozone-depleting substances as refrigerant, regardless of whether the facilities and equipment is for manufacturing or non-manufacturing purposes, a label is conspicuously affixed stating that the facility or equipment uses freon. This labeling system ensures employees' awareness of freon, and thus, helps prevent release of ozone-depleting substances to the atmosphere through negligence during maintenance, relocation and disposal. As a result, ozone-depleting substances, including halon, collected from the internal facilities exceeded 20 tons in fiscal 1997.

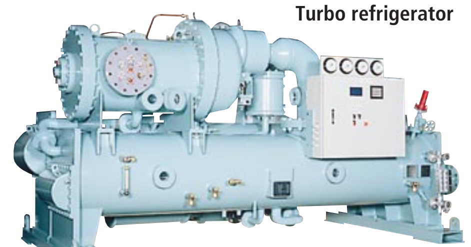
Except in rare, specialized instances, HCFCs, whose production has been regulated since 1996, are no longer used by Toshiba in cleaning processes, since the gas easily ends up in the atmosphere.

With a view to dispensing with HCFCs, which are injected into products, Toshiba is evaluating substitute substances from the viewpoints of impact on global warming, safety and convenience of products, and is developing and commercializing HCFC-free equipment.

Results of collection of refrigerant from equipment in Toshiba facilities

		Amount collected calculated on ODP basis (kg)	
		Fiscal 1996	Fiscal 1997
Ozone-depleting substances	CFC11	13,595.0	19,850.0
	CFC12	41.4	43.7
	HCFC22	919.5	227.2
	Mixed refrigerant R502	93.9	62.0
	Halon 1301	0.0	1,540.0

Turbo refrigerator



Toshiba uses HFC134a for the turbo refrigerator for air-conditioning systems for commercial buildings, factories and hospitals, as it has an ozone layer depleting coefficient of zero

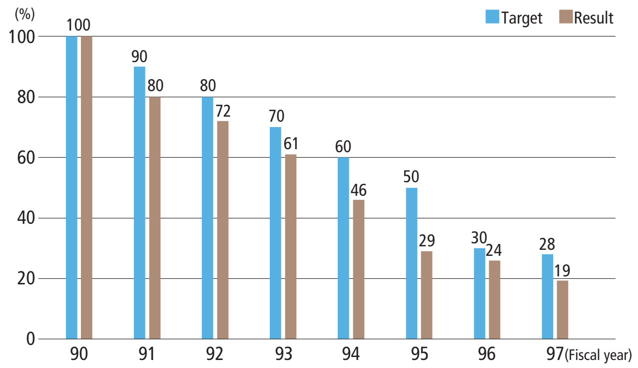
Label indicating facilities which use freon

Facility using freon

This facility uses freon as a refrigerant. In order to protect the ozone layer, inform the Environmental Protection Center if the facility is to be relocated or withdrawn from service, so that the freon can be collected.

Recycling : Reducing waste

Targets and results of reduction of waste



Recycling Center of a manufacturing operation

It is humankind's duty to cultivate a proper sense of the value of the Earth's limited resources, and accordingly to use them sparingly, while at the same time protecting the environment from pollution by waste. Toshiba, by reducing waste and expanding the scope of recycling, is endeavoring to use resources as efficiently as possible.

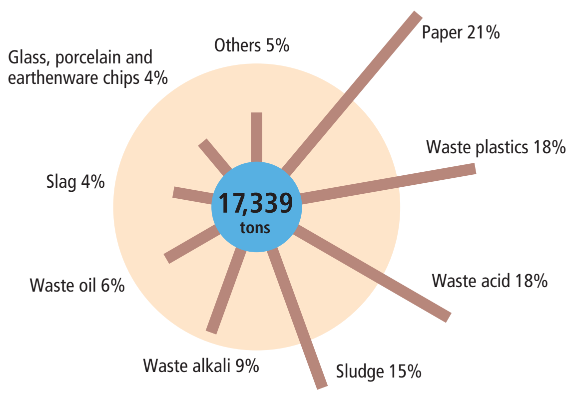
Toshiba pursues two fundamental approaches. One is development of products with low environmental loads, based on assessment conducted at the design stage to evaluate those loads. The other is reduction of waste generated in the course of manufacturing.

Toshiba's corporate-wide drive to reduce waste is spearheaded by the End-Of-Life Product Committee attached to the Corporate Environmental Protection Council. First, the quantity and type of waste associated with a given process or product is determined. Then the focus is on recycling or, preferably, solving the problem at its source by finding ways to avoid generating waste.

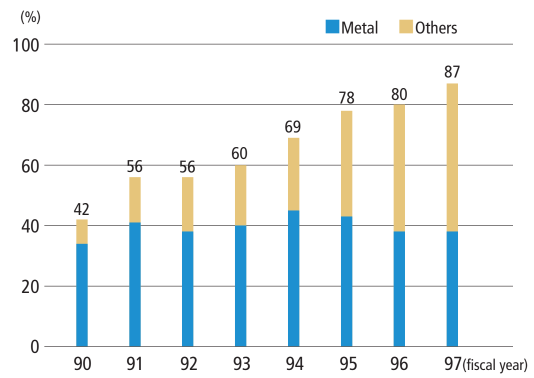
The graph shows the results of Toshiba's efforts to reduce waste. Waste in fiscal 1997 was 81% less than in fiscal 1990, surpassing the target of 72%.This result reflects the thorough implementation of two projects launched in the 90s: one to achieve the efficient and effective separation of materials, the other to implement a comprehensive recycling system for the three most heavily-generated wastes. Since 1994, the proportion of total waste accounted for by the three leading types of waste, namely sludge, plastics and slag, has been slashed from 2/3 to less than half, as a result of Toshiba's efforts to recycle sludge and slag as materials for cement and waste plastics as solid fuel.

As their name suggests, Recycling Centers (an example is shown in the photo above), located at manufacturing operations, focus on recycling rather than storage of waste. Waste, separated into 20-30 types of materials at the sites where it is generated, is transferred to the centers. In many cases, to avoid mix-ups, color coding is used for easy identification of materials. Furthermore, because recyclable materials at the centers are protected from the elements, their quality does not deteriorate.

Types of waste



Rate of recycling



Energy saving : Saving energy (See also page 7.)

At Toshiba, all employees at all facilities are involved in energy-saving activities. Throughout Toshiba, it is second nature for employees to switch off computers and OA equipment during lunch or whenever there is a break in the workflow, switch lights off when they are not required, set air conditioners at fixed temperatures (they are tripped at 28˚C in summer and 18˚C in winter). Throughout its operations, Toshiba has proactively introduced copiers and personal computers that satisfy the International Energy Star standards.

Toshiba has been investing in order to improve facilities systematically. At Fuchu Works the combination of a gas turbine cogeneration system with maximum output of 6,430kW and an ice heat storage system using night-time electricity has enhanced energy efficiency, achieving energy saving of 3,200kl calculated in crude oil (equivalent to 11% of energy used at Fuchu Works) and contributing to a constant level of electricity consumption.

Toshiba provides products that contribute to energy-saving. Toshiba's 200kW phosphoric fuel cell power generation system received a Commendation of 21st Century Type Energy-Conserving Apparatus and Systems for fiscal 1997 from the Energy Conservation Center, an organization affiliated with the Ministry of International Trade and Industry. Toshiba has introduced four units of this system at its operations and they are making a great contribution to energy saving.

Toshiba's high-efficiency motors for the Japanese market satisfy the efficiency standards set by JIS and those for North America satisfy standards set by EPAct (U.S. Energy Policy Act). At Oita Works 275 high-efficiency motors are in operation and use of high-efficiency motors for power facilities has reached 80%. More and more factories are adopting high-efficiency motors.

Toshiba was first in the world to commercialize a general-purpose transistor inverter and its application reduced the noise of motors. A large reduction in energy consumption can be achieved if fan (pump) motors which control flow rate by dampers are inverter-driven. In fiscal 1997 Toshiba installed 49 general-purpose inverters, resulting in energy saving of 10.38 million kW.

Toshiba's ultrahigh-efficiency transformers achieve 50% reduction in loss compared to state-of-the-art motors of 30 years ago, thanks to utilization of optimum materials and the latest technologies. In fiscal 1997 41 such transformers were introduced, achieving 520,000kW power saving.

Toshiba Lighting & Technology, a subsidiary, has commercialized a system which achieves about 50% power saving by combining high-efficiency lighting equipment with a power-saving lighting control system. Many Toshiba factories have adopted this system. There were 38 energy-saving cases concerning lighting equipment in fiscal 1997, realizing power saving of 600,000kW.

In the context of efforts to raise the energy-efficiency of production facilities, precise measurement of energy consumption is indispensable. Toshiba has installed the BUILDAC integrated building monitoring system and TOSCAM computerized energy-control system at every production site. Toshiba is implementing not only control of energy consumption of a factory as a whole, but of each workplace and each major equipment.

Semiconductor factories use cold air for air conditioning. Toshiba is working to enhance the efficiency of refrigerators used to cool water. In fiscal 1997 measures to enhance efficiency were implemented for 16 refrigerators and Toshiba saved energy equivalent to 4,210kl of crude oil.

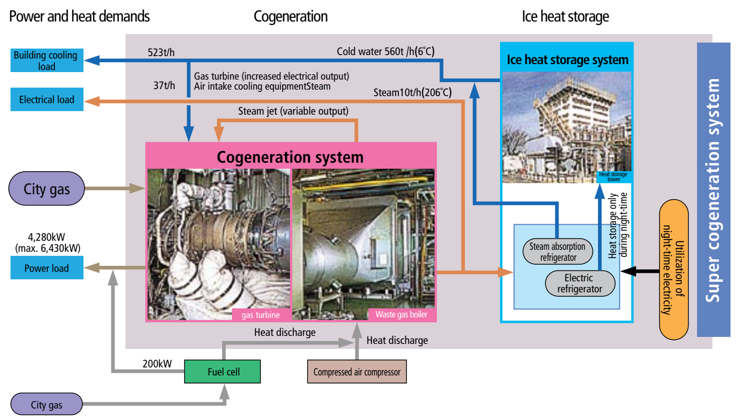
Most Toshiba facilities, based on agreements with regional electric power utilities covering supply and demand, are achieving relatively uniform consumption during the summer. Yokohama Facility Administration Center, Ome Works and Komukai Works use night-time electricity for heating cold water brought into thermal storage tanks, so that they are able to reduce electricity consumption during peak periods during the daytime.

In 1997, the Research and Development Center and Komukai Works received awards from the Electricity Use Rationalization Committee of the Kanto Region. Oita Works was cited for its success in energy conservation by the Japan Energy Conservation Center at its national assembly in 1995 and received the President's Prize of the same organization in 1996.

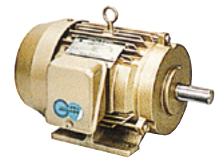
*Electric power is calculated in terms of crude oil at the rate of 10,000kWh=2.65kl.

Flow of the super cogeneration system

The super cogeneration system achieves high efficiency and multifunctionality by combining gas turbine cogeneration with ice heat storage.



Fuel cell system



High-efficiency morter

High-efficiency transformer / mold transformer

Earth protection : Preventing pollution

To prevent pollution, Toshiba is introducing fail-safe systems at its facilities. The company's Environment Structure Task Force consisting of specialists within Toshiba has issued seven sets of guidelines covering structures that pose environmental risks. The first set, issued in November 1990, covers the installation and structure of dikes and pans. Subsequent guidelines deal with exhaust gas scrubbers, waste storage sites, storerooms for chemicals, piping for supply and drainage of liquid chemicals, waste water treatment facilities, and plating facilities. In accordance with these guidelines, Toshiba ensures the integrity of each structure in order to prevent pollution.

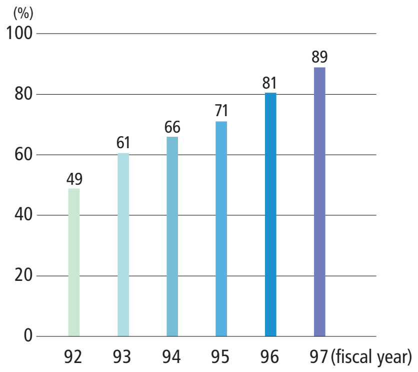
The guidelines covering the installation and structure of dikes and pans are designed to prevent leakage of chemicals into the ground or the public water system, including sewerage systems, in the event of leakage of chemicals from tanks or other containers.

Toshiba requires tanks and containers for storage of corrosive chemicals such as acids, chemicals containing toxic heavy metals, and other hazardous substances, in facilities that are within the scope of the Water Pollution Prevention Law and other regulations and accords, to be equipped with dikes, pans, weirs and pits for fail-safe control in the event of leakage.

For example, Toshiba's guidelines, based on fail-safe analysis, require the capacity of a dike to be more than 110% of the tank capacity when there is only one tank, and more than 150% of the capacity of the largest tank when there are two or more tanks. A dike and an exhaust gas cleaning facility are shown in the photographs.

A survey conducted in fiscal 1992 found 49% of Toshiba's manufacturing operations satisfied the guidelines. By the end of fiscal 1997 the rate had been increased to 89%, as indicated below. The radar chart shows the extent to which the guidelines were satisfied for each type of structure. The rates for exhaust gas scrubbers and waste water treatment facilities reflect the higher cost and longer period of time required for upgrading these structures. Toshiba is continuing to systematically upgrade these two types of structures.

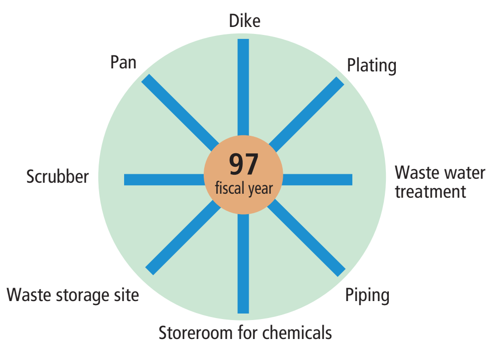
Rate of satisfaction of guidelines for structures



Dikes for tanks containing liquid chemicals

Exhaust gas cleaning facility

Rate by each set of guidelines



Auditing : Environmental audits

Toshiba conducts environmental audits, viewing them as an essential element of corporate risk management.

In accordance with Toshiba's audit system known as EASTER (Environmental Audit System in Toshiba on the basis of ECO Responsibility), Toshiba Group has been conducting annual audits of all its facilities since 1993.

The audit system comprises a basic section and a special section. In contrast with the ISO audit, EASTER emphasizes inspection of workplaces. The basic section consists of a checklist of 256 items comprising environmental protection systems, environmental protection activities, enhancement of safety, measures to cope with abnormalities, the saving of resources and energy, environmental technology, participation of all employees, and cooperation and coexistence with the community. The special section consists primarily of an inspection to ascertain the extent to which priority environmental protection measures have been implemented during the year.

As shown below, the audit starts with a self-evaluation, followed by the main audit, review, and submission of the audit report. Each audit, comprising inspection of documentation and facilities, takes two days to complete. The results of the audit are rated using five grades from A to E and, after approval by the director responsible for environmental protection throughout Toshiba, are reported to the personnel in charge of environmental protection at the subject facilities.

All auditors are required to pass an in-house examination and perform a practice audit. Staff completing the training are certified as in-house auditors by the director responsible for environmental protection throughout Toshiba. At present, there are about 250 certified auditors within Toshiba Group. In order to ensure the independence, objectivity and impartiality of the audit, auditors for any given audit of an operation are drawn from the corporate-level Environmental Protection Center and from organizations within Toshiba. The purpose is to inspect the operation's efforts to involve all personnel in environmental protection activities, and to foster capable human resources through education and consciousness raising. These points are checked against concrete standards.

Each operation engages in various environmental protection activities. For example, at Fukaya Works and Fukaya Display Devices Works, project teams devoted to improving the environment have been formed separately from the organizations in charge of environmental protection, in order to encourage all personnel, including office staff, to participate in environmental protection activities. All personnel display a notice in the workplace indicating their environmental protection goals for the year. Handy manuals on separation of waste for disposal have been created. Also, different workplaces compete to develop the best system of waste separation.

Every operation systematically conducts and records environmental protection activities, and undertakes education and consciousness raising, thus sowing the seeds of future environmental protection activities.

Auditing

Examination for qualification as in-house auditors

Flow of environmental audit

Self-evaluation
Execute prior self-evaluation of the prescribed items by internal audit and submit the results

↓

Presentation
Report on environmental protection at the operation

↓

Document audit
- Evaluation of the degree to which the operation's priority items have been achieved
- Evaluation of environmental protection promotion items

Workplace audit
- Evaluation of the degree of reduction of environmental risk in each workplace and facility and for each item of equipment.

↓

Review

↓

Audit report

Environmental activity file

Action plan: Voluntary environmental plan

The ultimate objective of all environmental endeavors is to create an economy and society that function in harmony with the Earth's environment. For this purpose, it is incumbent on companies to assume greater social responsibility and act as good corporate citizens. Indispensable to this is the formulation of comprehensive voluntary environmental plans (action plans). Toshiba announced its first voluntary plan in March 1993, and achieved the seven initial targets specified as planned, by the end of fiscal 1995.

The company announced a 12-item second voluntary plan, in May 1996, covering more extensive and higher targets that are to be achieved by the year 2000.

Implement product assessments

From the design stage onward, Toshiba strives to create environmentally-conscious products. Product assessment means checking resource saving, recyclability, power consumption, etc. of a product throughout its life cycle. Toshiba aims to apply product assessment to all its products.

Reduce use of parts and materials that are difficult to recycle

For consumer products and information equipment, Toshiba aims to reduce the use of difficult-to-recycle parts and materials by 30% by fiscal 2000, against fiscal 1995, in order to improve the recyclability of products and save resources.

Reduce weight per product function

For information equipment and control devices, Toshiba aims to reduce weight per product function by 10% by fiscal 2000, measured against fiscal 1995.

Reduce electricity consumed per product function

For consumer products and information equipment, which tend to consume a lot of electricity, Toshiba aims to reduce electricity consumed per product function by 10% by fiscal 2000, against fiscal 1995. This goal has already been achieved for air conditioners, personal computers and refrigerators, and higher targets have been set for these products.

Reduce weight of product packaging

Toshiba aims to reduce the weight of product packaging for industrial-use products by 30% by fiscal 2000, measured against fiscal 1995, to save resources.

Reduce time required to disassemble products

In order to cut waste, Toshiba aims to reduce the time required to disassemble consumer products and information equipment by 50% by fiscal 1997, measured against fiscal 1992.

Reduce use of styrofoam packaging

Toshiba is reducing the use of styrofoam packaging and increasing the use of recyclable packaging or dispensing with packaging. Toshiba aims to halve the volume of styrofoam packaging for all products by fiscal 2000, measured against fiscal 1995.

Reduce industrial waste

Toshiba aims to reduce the ratio of the volume of waste consigned to waste disposal companies to net sales by 75% by fiscal 2000, measured against fiscal 1990.

Promote energy conservation

In order to prevent global warming, Toshiba is executing energy conservation measures respecting electricity, gas and oil used in manufacturing. Toshiba aims to reduce the ratio of energy consumption to net sales by 15% by fiscal 2000, measured against fiscal 1990.

Secure ISO-14001 certification

Plans called for all domestic production and research facilities to secure ISO-14001 certification by the end of fiscal 1997. (As of September 1997, all facilities had secured certification.)

Establish and implement an environmental vision covering all products

Toshiba has formulated a vision covering all the products of all its business groups which targets creation of environmentally-conscious products; it is now implementing the vision.

Implement the new 33/50 Project

In response to the U.S. Environmental Protection Agency's 33/50 Project, Toshiba is reducing the amount of toxic chemical substances used in production processes. Toshiba aims to reduce the ratio of the amount of chemical substances used to net sales by 33% by fiscal 1997, measured against fiscal 1994, and by 50% by fiscal 2000.

Implementation of voluntary plan at 50 Toshiba Group companies

Toshiba's voluntary environmental plan is communicated to group companies at the annual Toshiba Group Environmental Protection Council meeting, at which senior executives of Toshiba Group companies participate. The voluntary plan is implemented collectively by Toshiba Group companies acting in concert.

Voluntary plan (announced in May 1996)

	Commitment items	Targets: compared with fiscal 1995	Results in fiscal 1997
1	Implement product assessments	All products (continued implementation since fiscal 1993)	100% implementation
2	Reduce use of parts and materials that are difficult to recycle	Subject : Consumer products and information equipment Target : 30% reduction by fiscal 2000	14% reduction
3	Reduce weight per product function	Subject : Information equipment and control devices Target : 10% reduction by fiscal 2000	12% reduction
4	Reduce electricity consumed per product function	Subject : Consumer products and information equipment Target : 10% reduction by fiscal 2000	24% reduction
5	Reduce weight of product packaging	Subject : All industrial-use products Target : 30% reduction by fiscal 2000	15% reduction
6	Reduce time required to disassemble products	Subject : Consumer products and information equipment Target : 50% reduction by fiscal 1997 compared with fiscal 1992	54% reduction
7	Reduce use of styrofoam packaging	Subject : All products Target : 50% reduction by fiscal 2000	19% reduction
8	Reduce ratio of waste to net sales	Subject : All production and research facilities Target : 75% reduction by fiscal 2000 compared with fiscal 1990	81% reduction
9	Reduce ratio of energy consumption to net sales	Subject : All production and research facilities Target : 30% reduction by fiscal 2000 compared with fiscal 1990	± 0%
10	Secure ISO-14001 certification	Subject : All production and research facilities Target : All production and research facilities by fiscal 1997	(Target achieved)
11	Establish and implement an environmental vision	Subject : All operations Target : Establish vision by fiscal 1996 and then implement	100% implementation
12	Reduce utilization of toxic chemical substances	Subject : Electronic component and semiconductor production facilities Target : 33% reduction of the ratio of toxic chemicals used to net sales by fiscal 1997 and 50% reduction by fiscal 2000, measured against fiscal 1994	87% reduction

This color indicates that the item has been achieved.

Development of Environmentally-conscious Products

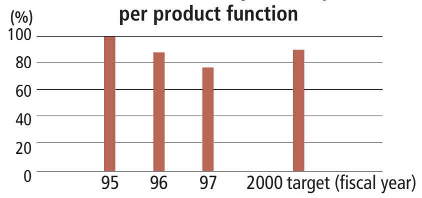
Toshiba strives to create environmentally-conscious products: that is, products whose environmental impact is minimized at every stage of their entire life cycle-from materials procurement, manufacture and distribution, through to consumption and eventual disposal. With this goal in mind, Toshiba has established voluntary plans designating targets for reducing environmental impacts. Thorough product assessment is executed at the development and design stage to achieve environmentally-conscious products. This assessment system ensures that designs incorporate features to lessen the environmental impact of products over their life cycles. The conservation of resources, recyclability and energy-saving features of products are all checked rigorously. This system covers the entire Toshiba product range-from consumer products to heavy electrical apparatus.

The targets set in the initial voluntary plan established in 1993 for major consumer products and office automation equipment were all achieved. For both difficult-to-recycle parts and use of styrofoam packaging, the target was 30% reduction in fiscal 1995 compared with fiscal 1992 and the results were more than satisfactory, at 61% reduction and 58% reduction, respectively. To reduce waste, quantitative targets were also set for reduction in weight per product function. By fiscal 1995, weight per product function was 11% lower than in 1992. This translates into a 15,000-ton reduction each year in the weight of the consumer products and information equipment manufactured by Toshiba. The targets of 50% reduction in the time required to disassemble products and 30% reduction in the volume of product packaging were also achieved.

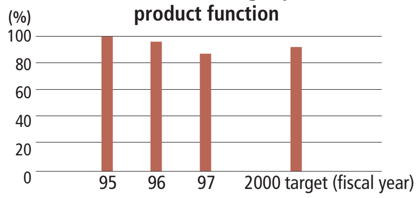
Based on these results, in fiscal 1996 Toshiba articulated a new environmental vision for the company's product ranges, and, at the same time, drew up and announced a new voluntary plan for the fiscal years 1996 to 2000. In the second voluntary plan the scope has been expanded to include information/communication equipment and control equipment, in addition to consumer products and office automation equipment. The graph illustrates the progress that has been made respecting several criteria included in the second voluntary plan. Toshiba sets stringent targets to promote creation of environmentally-conscious products.

In the following pages, we illustrate Toshiba's commitment to the environment by referring to four major consumer products- televisions, air conditioners, washing machines and refrigerators -and the work of the Environmental Engineering Laboratory.

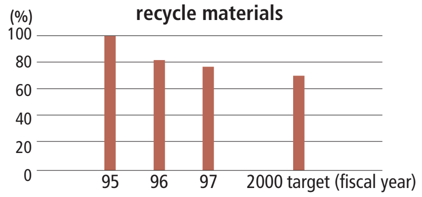
Reduction in electricity consumption per product function



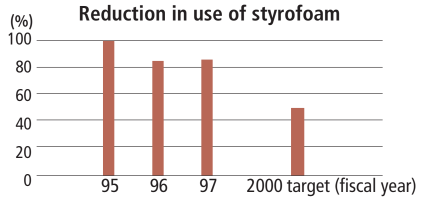
Reduction in weight per product function



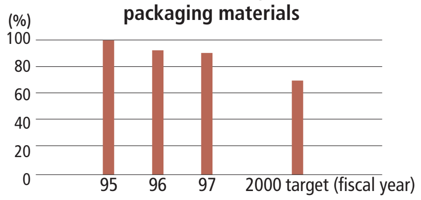
Reduction in use of difficult-to-recycle materials



Reduction in use of styrofoam

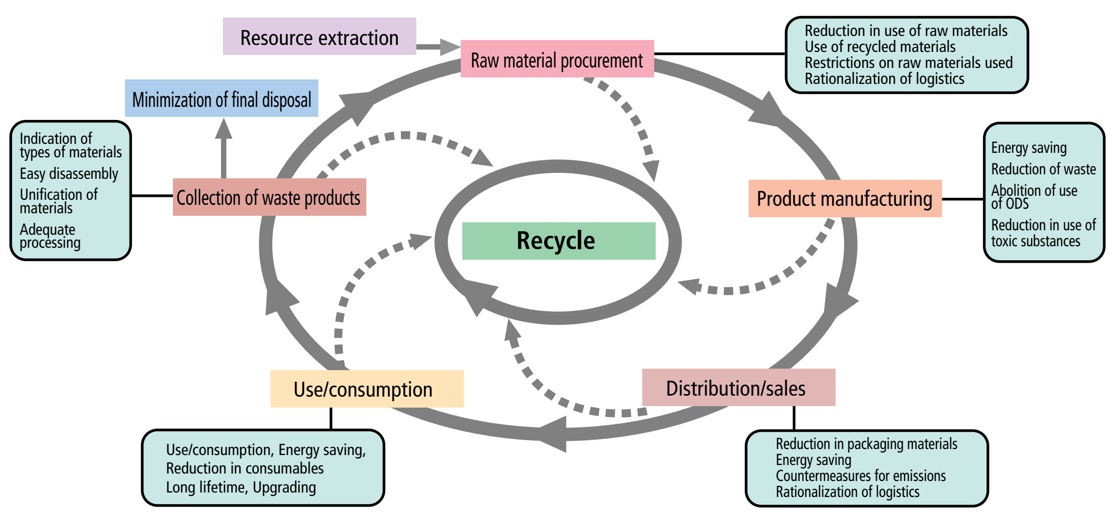


Reduction in weight of packaging materials



The bar graphs show the targets and the results of the second voluntary environmental plan.

Concept of an environmentally-conscious product



Televisions

In Japan, televisions are within the scope of a law announced in 1998 mandating recycling of household appliances, and are already subject to the Recycling Law. Power consumption of televisions is also subject to the Energy-Saving Law.

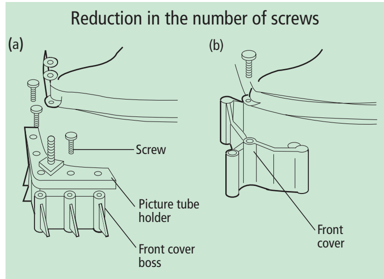
Above and beyond its adherence to laws and regulations, Toshiba is at the forefront of efforts to develop and commercialize televisions that are more environmentally-conscious products.

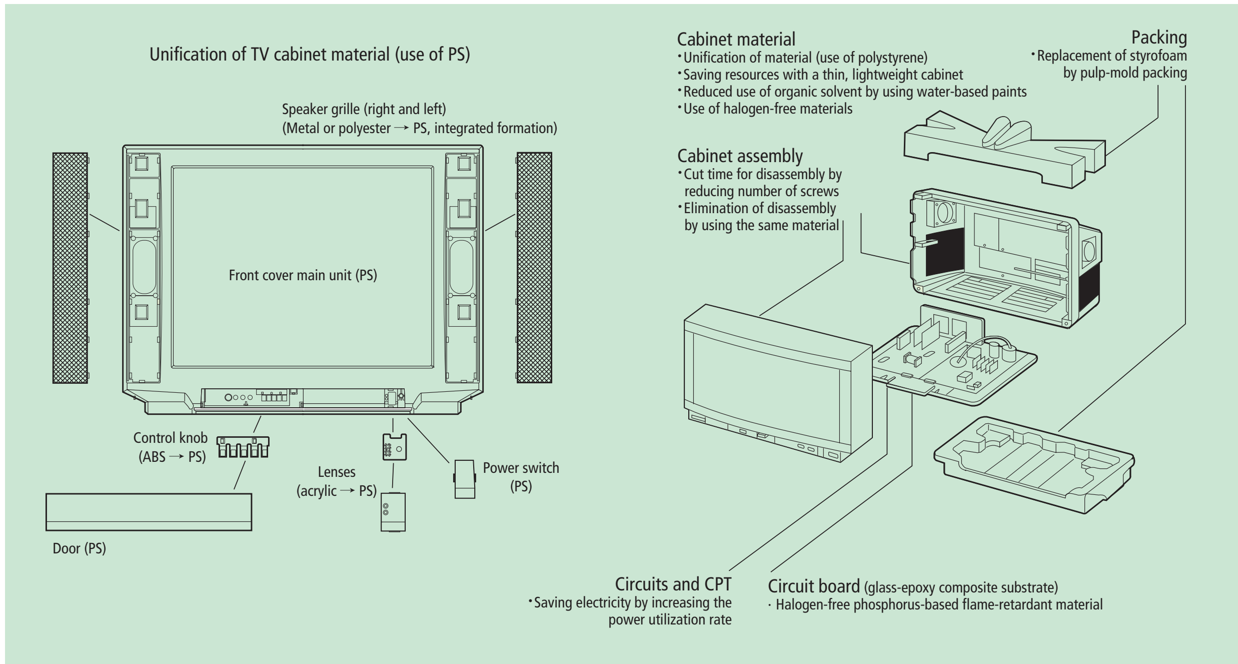
For recycling, a television has to be disassembled and materials of the same type gathered together. Therefore, in Toshiba-brand televisions the name of the material of which each plastic part is made is indicated. Additionally, because both the cabinet and the components incorporated in it are made of the same material, polystyrene, recycling is facilitated because there is no need to remove these components from the cabinet prior to disposal.

Examples of Toshiba's design of TVs for easy to disassembly can be seen in the use of fewer screws and in avoiding the use of components in which metal and resin are employed in combination. The number of separate components has been reduced by incorporating all the components in the front casing into a single molded unit. This integrated design is applied to Toshiba-brand TVs manufactured and sold throughout the world. Furthermore, the company is raising awareness by including disassembly diagrams in service manuals. By designing a new, thinner cabinet and developing a resin suitable for realizing the design, Toshiba reduced the weight of the rear section of the cabinet for a 25-inch TV by 20% in fiscal 1997 compared with fiscal 1996.

Toshiba is widening the use of low-environmental-impact plastics for TV cabinets. In Europe we are using halogen-free flame-retardant plastics for TV cabinets. In manufacturing processes, conventional solvent-based paints, a potential cause of air pollution, have been replaced by water-based paints, and the use of CFCs for cleaning metal components eliminated. Also, because most energy consumption associated with TVs occurs during their use, Toshiba is designing TVs that consume less power. For example, Toshiba has commercialized models equipped with an energy-saving mode that is widely recognized as the hallmark of cutting-edge energy-saving TVs.

Typically, packaging materials for televisions are discarded once the consumer removes the TV from the carton. Toshiba has reduced the amount of styrofoam packaging by 30% compared with fiscal 1995, and adopted easy-to-recycle pulp-mold packing made of recycled paper.





Room air conditioners

Air conditioners account for around a fifth of total household electricity consumption in Japan. The amount of CO_2 discharged during use of an air conditioner accounts for more than 99% of that discharged throughout the product's life cycle. From the viewpoint of preventing global warming, the most import issue regarding air conditioners is to enhance their energy efficiency. Additionally, there is increasing demand for high-quality indoor air.

For products for 1999 (introduced in October 1998) Toshiba adopted a new refrigerant which does not deplete ozone. To bring the characteristics of the new refrigerant into full play, Toshiba developed a high-performance compressor and several new technologies, thus achieving 22% energy saving. Additionally, we introduced the Daiseikai series RAS-285LDR, the industry's first air conditioner that automatically detects the degree of cleanness of air by a sensor and removes dust.

Main features of this new product are:

(1) The highest coefficient of power in the industry (among products for 1999)

① 22% energy saving compared with the comparable 1998 model

Coefficient of cooling power

3.94 → 4.79

Coefficient of heating power

4.09 → 5.00

② Annual power consumption

1.076kWh → 984kWh (9% reduction)

③ Stand-by power consumption

4W → 0.8W (reduced to 1/5)

(2) Adoption of new refrigerant which does not deplete ozone

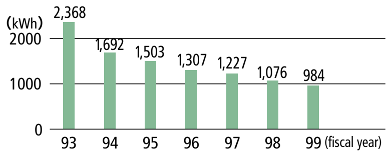
Adoption of HFC refrigerant R410A whose ozone depleting coefficient is 0

(3) Enhanced quality of indoor air

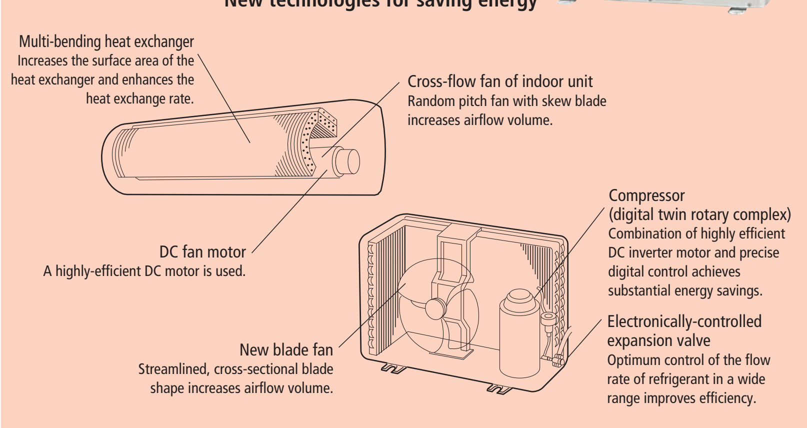
The Air Monitor automatically detects the degree of cleanness of air by a sensor and the newly developed high-efficiency dust collector adsorbs particles as small as 0.01μm, achieving about 20% improvement in dust removal efficiency.

Deodorizing performance is doubled by adoption of zeolite.

Annual power consumption(2.8kW class)



New energy-saving LDR series air conditioners



Automatic washing machines

In parallel with the shift in demand for washing machines from twin-tub models to more convenient fully automatic washing machines, people increasingly wash clothes because they have been worn, rather than because they are dirty. The consequent increased use of water and detergents has had an adverse impact on the environment.

As part of its efforts to conserve resources, Toshiba has commercialized water-saving washing machines. They feature a novel tub design which greatly reduces the amount of water required; additionally, shower rinse and reuse of bath water are possible for further water economy. The main water-saving features are as follows:

① The washing and spin-drying tub features a new hole-less construction which stops water wastage during the washing and rinse cycles.

② The shower rinse system achieves highly efficient rinsing while saving water.

③ Bath water can be used for the washing cycle, supporting recycling of water.

④ Increasing the precision of the sensor that estimates the weight of the laundry allows the water level to be fine-tuned to suit the load.

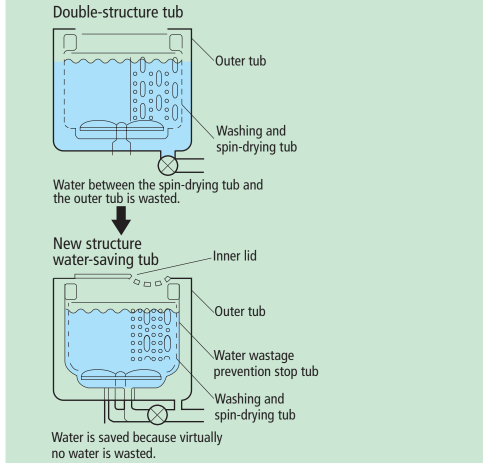
By virtue of these technical developments, these washing machines use only about half as much water as previous models. Furthermore, if the user recycles bath water, the amount of mains water used per wash is also roughly halved.

In addition to these advances, because the new tub design greatly reduces the amount of water required for the washing cycle, the amount of detergent required per wash is reduced by around 30%.

The recyclability of the washing machine's packaging has also been greatly improved by using cardboard instead of styrofoam. And as the time required for the entire cycle, from washing through to spin-drying, has also been approximately halved, the result is washing machines that offer outstanding all-round convenience. Direct-drive-motor-driven, inverter-controlled fully automatic washing machines marketed since 1997 have achieved great reductions in vibration and noise, thus contributing to a better home environment.

Water-saving fully automatic washing machine

New structure water-saving tub



Comparison of the amount of water used at constant rating and capacity

	Capacity of 6.5-7kg	Capacity of 6kg
Double structure tub	210L (6.5kg)	170L
New structure water-saving tub	119L (7kg)	97L

Refrigerators

Regarding refrigerators, the following must be taken into consideration in efforts to reduce power consumption, save resources and enhance ease of disassembly and recycling.

① Refrigerators are used all year round and account for about 20% of the electricity consumed each year by Japanese households. Regarding CO_2 discharge during the life cycle of a refrigerator, the environmental impact is greatest while the product is in use.

② Because refrigerators are large and heavy, disassembly and disposal are not easy.

③ Refrigerators are subject to the law mandating recycling of household appliances and the revised Energy-Saving Law.

The following are Toshiba's achievements regarding the above three aspects.

1) Reduction in power consumption

The GR-470K refrigerator introduced in November 1998 achieves power consumption of 23kWh per month (B method*). Whereas conventional models use a single cooler for cooling of both the freezer and the refrigeration compartment, the GR-470K uses two coolers, one for the freezer and one for the refrigeration compartment. The GR-470K adopts time-sharing control and operates the freezing cycle and the refrigerating cycle alternately in an efficient manner by switching the refrigerant via a control valve, and thereby greatly reducing power consumption. Moreover, further power saving is achieved by variable control of the inverter performance of the compressor, the fan for circulation of cool air and the fan for cooling of the compressor.

2) Enhancement of ease-of-disassembly

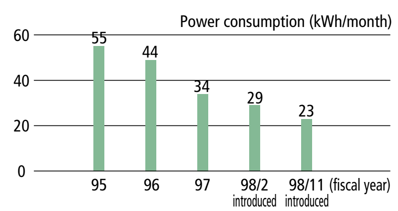
The radiation pipes of a conventional refrigerator are enclosed in heat insulating material at each side of the refrigerator. Consequently, they are difficult to remove. Toshiba solved the problem by incorporating the pipes into a single discrete unit, located on the underside of the refrigerator for easy removal.

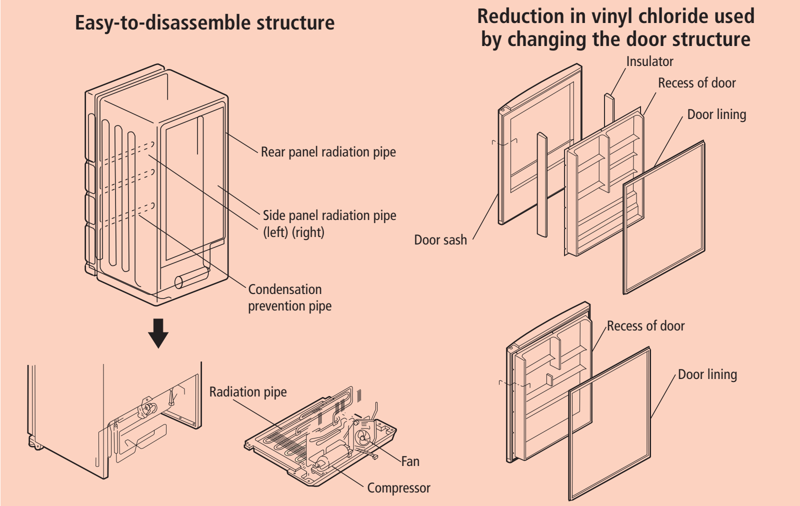
3) Reduction in use of vinyl chloride

The door lining of a conventional refrigerator is fixed to the door by the door sash and vinyl chloride is used for both the door sash and the lining. By directly fixing the door lining to the recess of the door, Toshiba has dispensed with the vinyl chloride door sash. And while assuring the sealing characteristics of the door, the door lining has been reduced in size by optimizing the shape. Thus, the amount of vinyl chloride used for the refrigerator is about half that required for a comparable conventional model.

*B method is a method of a test specified by the Japan Industrial Standards in which a test is carried out without opening or closing the door.

Power consumption (B method)





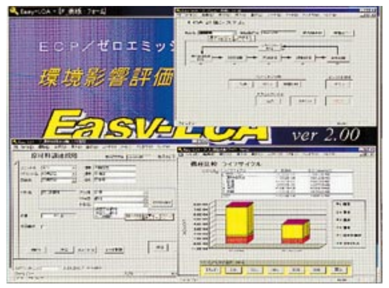
Environmental Engineering Laboratory

The Environmental Engineering Laboratory, established in 1989 within the Research and Development Center, Toshiba's corporate research organization, is devoted to the R&D of environmental technology. The laboratory's research themes focus on technologies to realize environmentally-conscious products that have a low impact on the environment throughout their life cycles from material procurement, manufacture and use to disposal. Notable achievements so far include substitutes for trichloroethane and the development of basic technology for recovery of oil from waste plastics.

Recently the laboratory commercialized a life-cycle-assessment software product that enables evaluation of products' environmental impacts at the design stage. Additionally, the laboratory is engaged in the R&D of eco-friendly materials such as lead-free solder and a copper-iron dual-phase alloy, recycling technology for refrigerators, and thermally-hardening resins.

Life cycle assessment technology

Toshiba developed this tool for quantitative evaluation of a product's environmental impact throughout its life cycle. Its features include simple menu-based input on PCs running Windows, and calculation of environmental impacts corresponding to the types and mix of materials selected. It allows users to easily identify critical factors respecting reduction of environmental impacts.



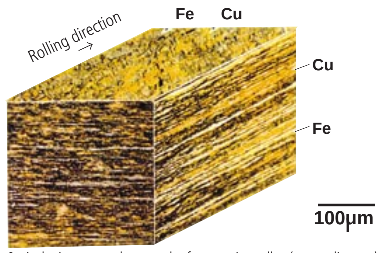
Life cycle assessment tool

The tool can calculate impacts on the atmosphere and on water, and the contemplated product's energy consumption. The laboratory is developing evaluation techniques that take into account the effects of toxic materials, and for that purpose is developing technology to analyze toxic substances contained in products.


Toxic substance microanalysis equipment

Copper-iron dual-phase alloys

The development of an alloy that combines the high electrical conductivity of copper with the strength of iron has always been something of a metallurgist's dream. By controlling the concentration of oxygen in the molten raw material, Toshiba has achieved this goal. Using this technology, alloy can be produced from scrap iron that contains copper. A new raw material can be produced at low cost. Its cheapness and bacterial resistance make it ideal in applications such as IH rice cookers.



Optical microscope photograph of copper-iron alloy (stereo diagram) (Cu-50Fe)

Recycling technology for refrigerators

During fiscal 1996, approximately 3.6 million refrigerators were scrapped in Japan alone. Commissioned by the Japanese Home Electric Appliances Foundation to research recycling technology for refrigerators for three years, the laboratory conducted R&D for reclamation of oil from urethane, which is used as an insulation material, and for detoxification of the CFCs that are used as a foaming agent in the urethane. A bench-scale test confirmed the effectiveness of the technology at a rate of 25kg/hr.

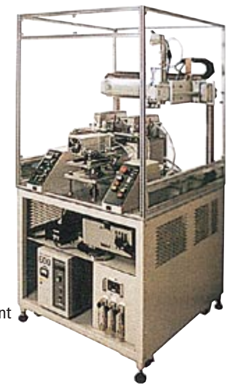

Recycle plant for waste refrigerators

Recycling technology for fire-retardant plastics

The laboratory is developing a technique for production of dioxin-free clean gas fuel by high-temperature decomposition of fire-retardant plastics containing halogen that are used for televisions and personal computers. This technique will enable conversion of plastics that vinyl chloride into fuel and decomposition and detoxification of freon. This technique can also be applied to processing of shredder dust of waste home appliances and waste cars.

Lead-free soldering technology

In pursuit of environmentally-friendly products, the laboratory is developing a new soldering technology. The laboratory has developed a tin-zinc eutectic solder which, unlike conventional solder, does not contain lead, a toxic substance. It has been confirmed that when ultrasonic wave is applied in a low-oxygen atmosphere, this new solder can be used under the same soldering conditions as conventional tin-lead solder. The laboratory aims to achieve practical application of lead-free solder and soldering processes by enhancing the characteristics of the new solder and based on evaluation of its reliability.


Prototype lead-free soldering equipment

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Toshiba Group has long been a source of cutting-edge technologies in the fields of energy and electronics. Now, the group is deploying its expertise and technologies in the environmental arena to develop new environmentally-friendly technologies and expand recycling. These new technologies are rooted in the group's prowess in electromagnetic energy, biotechnology, recycling, new energy, information processing and sensors.

Purifying waste water for reuse

Ozone purification system

Making use of ozone's effectiveness as a bleach, deodorizer and bactericide, Toshiba has developed an ozone purification system that can make waste water reusable. This system has been installed in many water purification facilities in Japan. Water subjected to the ozone treatment can be used by industry, or in fountains and ornamental streams that add delight to everyday life. Ozone ranks second only to fluorine in terms of its oxidizing power and has bleaching, deodorizing and bactericidal properties. Further, since it is generated by the action of electricity on air or oxygen, there is no need for large-scale storage and transportation. Above all, since it eventually reverts back to oxygen, ozone causes no secondary pollution.

This environmentally-friendly system is used for purification of water for the public water supply when the quality of raw water has deteriorated. The combination of ozone processing and active carbon processing is contributing to the provision of clean, good-quality, potable water.

Recovering resources from waste plastics

Oil reclamation system for waste plastics

Most plastics discharged in Japan are disposed of by landfill or simply incinerated. It is becoming difficult to secure new landfill sites and simple incineration causes generation of toxic hydrogen chloride because of the vinyl chloride contained in waste plastics.

The system for reclamation of oil from waste plastics reclaims fuel oil from waste plastics containing vinyl chloride by thermal decomposition after decomposition and removal of toxic chlorine. Recycling of waste plastics is facilitated by this system.

Features of this system are:

1. Chlorine is decomposed from vinyl chloride in the dechlorination process during which continuous heating control is applied.
2. Chlorine is recovered in the chlorine processing process for which a sealed hydrochloric acid absorption tower is used.
3. Oil, discharged gas residue and hydrochloric acid generated in the processes are recycled. The system itself is an energy-saving system which uses the oil reclaimed as a heat source.
4. Oil is reclaimed by decomposition without catalyst.
5. Waste plastics containing up to 50% vinyl chloride can be processed, thus eliminating the need for separation of different types of plastics.
6. The system can be operated even when other solids (soil, sand, metal chips, etc.) are contained to a certain extent.
7. Operation and maintenance are easy because it is a normal-pressure decomposition system.

Filtering out solid impurities from boiler feedwater

Hollow yarn membrane boiler feedwater filtration equipment

Electric power plants use various kinds of water processing filtration equipment. The main requirements are maintenance of high-purity filtered water, control of secondary-waste generation, simple operation of the equipment, and low initial and running costs.

The hollow yarn membrane filter satisfies all these requirements. Its fine porosity ensures a consistently high level of water quality. Further, since its filtration area is very large, the equipment is compact. Unlike conventional filtration equipment, no filter aids are required, and the module is combustible, so little secondary waste material is produced. The hollow yarn membrane filter is suitable for a wide range of applications—from comparatively small-capacity waste-liquid processing systems to large-capacity boiler feedwater purification systems. The hollow yarn membrane filter is made of polyethylene pierced from the outer to the inner surface with innumerable holes which are less than 0.1μm in diameter. Solid impurities within the undiluted solution are captured on the membrane's outer surface, thus achieving clear filtrate.

A single filtration module consists of approximately 10,000 of these hollow yarns bundled and fixed at both ends. The filter consists of many modules. It has a large filtration area but is compact.

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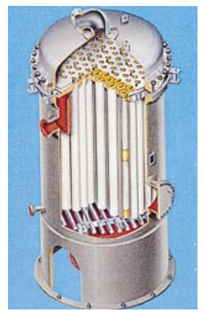
Ozone purification system

Oil reclamation equipment for waste plastics

Hollow yarn membrane module

Bird's-eye view of the filter



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Biotechnology realizes highly-efficient waste water treatment

Treatment system for heavily contaminated waste water

Toshiba has developed a methane fermentation bioreactor for treatment of heavily contaminated waste water containing high concentrations of organic effluent. This system is already in operation at several food-processing plants.

Pelletized methane bacteria are placed in the waste water and proceed to efficiently decompose any organic contaminants into methane and carbon dioxide. 90% of the organic material in waste water can be removed in this way. Because this system uses anaerobic bacteria (which do not need oxygen to survive), it is not necessary to pump air into the bioreactor to feed the bacteria, as it is with the conventional system using aerobic bacteria, and consequently energy is saved. Indeed, energy is recovered from the process in the form of methane gas.

Toshiba's new method has excellent environmental credentials: the volume of sludge is approximately one tenth that generated by methods which use aerobic bacteria.

Treatment system for heavily contaminated waste water

Reusing resources by treating waste water sludge

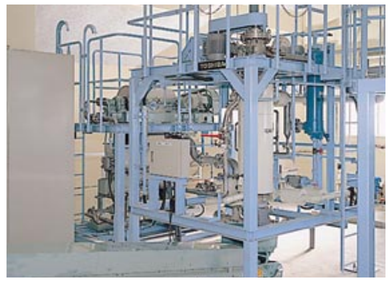
Sludge treatment system

With waste water treatment plants proliferating in Japan, in cities and in the countryside alike, increasing amounts of sludge are being generated. Sludge treatment has become a pressing issue.

Toshiba has developed a revolutionary sludge treatment system that concentrates and dries sludge containing bacteria and organic matter by using a thin-membrane centrifugal drying process. Little odorous gas is produced and the water content of sludge is reduced to around 50%.

This system recycles resources. For example, it can be used in the countryside to treat waste water and return the treated sludge to the soil after natural fermentation. Waste water from marine food processing plants, which is rich in protein, can be processed to form a livestock feed. Urban waste water sludge can be processed and used as a raw material by the construction industry. This system is unitized and highly compact. In one version, it is mounted on a truck, for use wherever it is needed.

Sludge treatment system



Detoxifying the harmful constituents of exhaust gases

Corona discharge processing equipment for exhaust gases

Exhaust gases from incinerators and other industrial processes contain NO_x and SO_x, together with dioxins and a variety of volatile organic constituents. Toshiba is developing equipment that uses electrical discharges to eliminate these toxic substances.

The equipment can be installed as an add-on to both new and existing industrial plant that generates exhaust gas. Control of input power allows quick and flexible response to changes in the composition of exhaust gases. Direct decomposition of toxic substances eliminates the need for secondary processing and makes maintenance easy.

The equipment can flexibly respond to variations in the circuit load or power discontinuities. Because the equipment uses electrical processing, maintenance is simple.

The equipment is able to reduce dioxin levels to below the regulated level of 0.1ng-TEQ/Nm_3 set by the new guidelines.

It is ideal for a society that prizes low levels of pollution.

Corona discharge processing equipment for exhaust gases

Making solid fuels from dechlorinated waste plastics

Dechlorination equipment for waste plastics

Plastics account for about 10% of the household garbage generated in Japan.Vinyl chloride-based plastics are a common constituent. Their incineration produces chlorine gas, which causes problems such as air pollution and corrosion of the inside of incinerators. Also, chlorine is implicated in the production of dioxins.

Toshiba has developed energy-recycling technology that dechlorinates waste plastics separated from other garbage and recycles them as a non-toxic solid fuel. The solid fuel can be used in cement kilns or blast furnaces instead of coal. The hydrochloric acid recovered as a by-product of this process has a very high purity, and so it can also be reused.

Dechlorination equipment for waste plastics

Detoxification, reconstitution and reduction of waste materials to create a zero-emission society

Thermal decomposition gas conversion system

Stricter regulations and standards governing the discharge of dioxins, the illegal dumping of waste and the shortage of waste disposal sites are among the factors contributing to the general public's increasing preoccupation with environmental issues. There is an urgent need to develop better waste-treatment methods.

Unlike waste incineration methods, this system does not involve the burning of waste. Instead, waste is heated indirectly in the absence of oxygen, thereby producing a mixture of gases and a residual char. By means of a high-temperature gas converter, the system processes the gas produced, which contains a lot of tar and oils and has a large molecular structure, into a mixture of carbon monoxide, hydrogen, methane and other common combustible gases and almost completely eliminates toxic substances such as dioxins. This system has the following excellent characteristics:

①It can handle all kinds of common wastes, including urban garbage, shredder dust and waste plastics.

②No toxic substances such as dioxins, NO_x or SO_x are produced.

③Metals can be recovered in their elemental form.

④The gases produced can be recycled to heat the system's furnace or channeled to other uses, such as electric power generation or the heating of water supplies.

⑤The char produced can be safely reduced further in a melting furnace.

This next-generation system is a comprehensive environmentally-friendly solution geared to the needs of a zero-emission society.

Thermal decomposition gas conversion system

On-site reduction of food waste by a factor of ten, plus recycling

Commercial-use food waste processor

In Japan, food waste accounts for just over a fifth of all commercial garbage, more than any other item except paper. Food waste, 80% of which is water, putrefies easily, and thus it is difficult to handle and transport. Food waste also lowers the efficiency of thermal recycling and contributes to the production of dioxins during incineration.

The basic concept of Toshiba's food waste processor is to reduce the volume of food waste and achieve on-site recycling. The food waste processor executes bio-processing using medium-temperature bacteria whose fermentation temperature is 35-55˚C. This method has the following characteristics:

①It achieves double the volume reduction compared with methods that utilize high-temperature bacteria or drying.

②It uses less than half the energy required for high-temperature bacterial bio-processing and less than a third of that required for drying.

③A high degree of degradation of any organic matter is assured, and thus composting of residues is completed quickly.

④It is labor-saving, because there is no need for frequent extraction and storage of residues. Extraction of residues is required only once every four months.

⑤The safety of the biochemicals and the bacteria in the processing tank and in the exhaust has been independently confirmed by a third-party institution.

The TGR-B50K, the most popular model in the range, can process 50kg of waste a day. Models with processing capacities of 25kg a day and 80kg a day are also available.

Commercial-use food waste processor

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Toshiba's Commitment Overseas

As mandated by its Basic Policy for Environmental Protection, Toshiba Group is executing environmental protection activities with the utmost vigor. Moreover, by addressing the items critical to development of business overseas–as identified in the Earth Environment Charter of the Japan Federation of Economic Organizations–each business operation strives to be environmentally conscious, and to act effectively in the light of the actual situation in the country in which it operates.

Environmental protection activities of overseas subsidiaries

Toshiba Group's Basic Policy for Environmental Protection requires the management of overseas subsidiaries to embrace environmental protection as a primary responsibility. Overseas subsidiaries are establishing their own environmental rules and systems, reflecting the shared goals and convictions of their management teams.

Each business group, supported by corporate staff, is responsible for supervising, guiding and supporting the business activities of its overseas subsidiaries. The principles governing the provision of guidance and support on environmental protection activities to factories overseas are as follows:

①Respect the autonomy of subsidiaries

②Encourage local employees to take the initiative

③Respect regional characteristics

From among overseas subsidiaries, based on a consideration of its equity stake and the nature of the business, Toshiba has selected 32 manufacturing operations for intensive guidance and support in order to achieve a far-reaching impact.

Toshiba divides its overseas operations into four regional groupings: the Americas, Europe, Asia and China. Regional Environmental Protection Council meetings in each region facilitate information exchanges and wide adoption of best practices. In Japan, the Corporate Environmental Protection Deputy Leader, who is the general manager of a corporate staff division, and the Environmental Protection Activity Leaders of business groups hold follow-up meetings periodically to grasp the situation of overseas operations. Personnel from business groups, together with local employees, carry out environmental inspections at factories overseas. Local employees in charge of environmental protection come to Japan for practical training and guidance designed to assist them in their efforts to improve the environmental performance of their workplaces.

Providing guidance at a workplace

Europe In line with Toshiba Group's policy, all operations have either secured certification of their environmental management systems, or are working to obtain certification. In accordance with the Eco-Management and Audit Scheme (EMAS), an EU regulation which came into effect in April 1995, Toshiba focused on the introduction of environmental management systems. Since the situation differs from country to country within the EU, each manufacturing operation has obtained the certification for environmental management systems most appropriate for the country in which it is located.

As Toshiba factories in Europe have completed introduction of environmental management systems, Toshiba is emphasizing improvement in the performance of workplaces at these factories by promoting application of Toshiba's unique internal audit system.

To reduce the environmental impact of manufacturing, Toshiba (UK) Ltd. (TUK) in 1996 eliminated the use of trichloroethylene for cleaning heat exchangers at its air-conditioner factory, by adopting a new process.

Recognition by the City of Sunnyvale

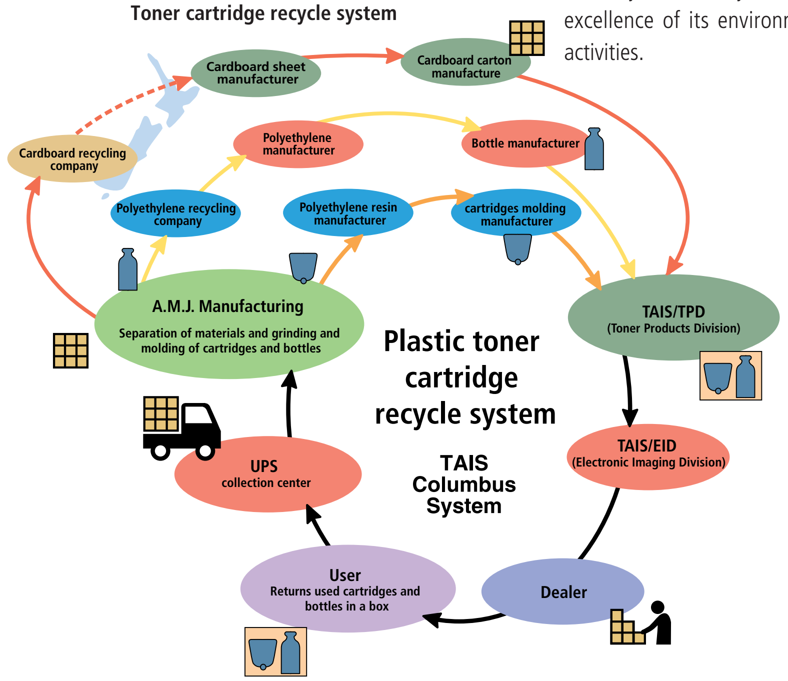
Environmental
Achievement Award
In recognition of outstanding efforts to preserve our ecology,
the City of Sunnyvale, on the 21st of April, 1998
hereby awards to
TOSHIBA AMERICA
ELECTRONIC COMPONENTS, INC.
the 1998 Environmental Achievement Award for
COMMERCIAL SOLID WASTE
REDUCTION & RECYCLING
Jim Roberts
Mayor

United States Generally, U.S. industry has been somewhat slower than its European and Japanese counterparts to introduce environmental management systems. Two of Toshiba's nine manufacturing operations in the U.S. gained ISO-14001 certification during fiscal 1997 and another four sites are aiming to acquire certification by the end of March 1999.

In Sunnyvale, California, the Microelectronics Center (TAIMEC) of Toshiba America Electronic Components Inc., was honored for its outstanding achievements in reducing waste and in promoting recycling by the City of Sunnyvale in April 1998.

Toshiba America Information Systems, Inc. (TAIS) has implemented a copier toner cartridge recycling system, in accordance with state laws and regulations mandating the use of recyclable plastics.

Toner cartridge recycle system



Asia Toshiba's factories in Asia vary greatly in terms of their experience–some have been operating for decades, others are brand new. New factories are emphasizing establishment of systems and rules, and employee education. Factories with great experience have secured or are in the process of securing ISO-14001 certification of their environmental management systems.

Operations in Asia have made great progress in reducing the environmental impact of their manufacturing processes and associated facilities. For example, Toshiba Consumer Products (Thailand) Co., Ltd. (TPT) operates a highly effective waste-collection system; waste is separated by type and stored in a building to protect it from the elements, and thus prevent any risk of soil contamination. Also, in accordance with the Montreal Accord on protection of the ozone layer, TPT implemented controls on CFC use which are as stringent as those endorsed by the developed countries that are signatories to the Accord, and abolished the use of CFCs. Toshiba Display Devices (Thailand) Co., Ltd. (TDDT), a manufacturer of picture tubes, has been honored by the Thai Ministry of Industry for three years running, for the excellence of its environmental protection activities.

China and Brazil Since Toshiba established manufacturing operations in China only relatively recently, the current concern is to establish systems and documentation. In parallel with these activities, personnel from Toshiba's business groups and corporate divisions visit factories to carry out environmental inspections and to advise on environmental facilities and environmental protection activities in the workplace. This helps local personnel in charge of environmental protection to execute effective control of their workplaces.

Although operations in China have been slower than those in other regions to introduce environmental management systems, the certification system is being improved and, in accordance with Toshiba Group's policy, they are striving to secure ISO-14001 certification.

Toshiba's two factories in Brazil are preparing to secure ISO-14001 certification. Toshiba is providing support; for example, local factory managers are invited to Japan to study environmental management at the parent factory.

TDDT's activities

The environmental bulletin board communicates the achievements of TDDT's environmental protection activities to visitors and employees. Awards received by TDDT are displayed.

Contributing to the Community

Working with the community for a better environment

In education, in the cultural sphere, within local communities and through international exchanges of people and ideas, Toshiba is energetically and creatively contributing to society. And while the company works for the common good, our employees are devoting their individual skills and enthusiasm to a host of worthwhile causes on their own initiative.
Here are some examples of how Toshiba is working hand-in-hand with communities on environmental protection and nature conservancy.

Local people tour Toshiba's environmental protection facilities

Environmental facilities open to the public
Toshiba's manufacturing operations invite local people to tour their environmental protection facilities. These visits allow people to find out for themselves what Toshiba is doing to protect their environment. The tours have proved popular with local communities.

Tree planting gives nature a new lease of life

Tree planting brings back the forest
To restore forests after landslides or to conserve nature, volunteers from Toshiba take part in sapling planting campaigns.

Come back salmon! Releasing fry into the River Tama

Releasing salmon fry
Every year employees join local people in releasing salmon fry into the River Tama, which flows through built-up areas where Toshiba has several factories.

Raising public awareness of the importance of environmental protection

Holding Environment Exhibitions
To deepen public awareness of the importance of environmental protection, Toshiba holds Environment Exhibitions and takes part in local events with environmental themes.

A clean-up refreshes the town

Cleaning up the local community
Employees periodically clean up the areas adjacent to Toshiba facilities, as well as parks, stations, bus stops and other public amenities, to keep the locality clean and attractive. Toshiba employees have received public recognition for these voluntary activities.

Collecting recyclable items at the entrance to a Toshiba factory

Volunteer recycling programs
Newspapers, aluminum cans, milk cartons and other items brought from home are collected. The proceeds from the recycling of these items are used to buy wheelchairs for donation to welfare organizations.

From sludge to a brick footpath

Use of products made of recycled materials
Bricks made by processing the sludge from sewage works are used at many of the company's facilities.

Working alongside volunteers from all over Japan

Helping to clean up after an oil spill
Following an oil spill off the Japan Sea coast, Toshiba donated equipment for use in the recovery effort. Many employees volunteered to help with the clean-up.

Toshiba provides information on voluntary activities to employees via the in-house personal computer network.

Please address any comments or inquiries you may have on Toshiba Environmental Report 1998 to the following organization:

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1-1-1 Shibaura, Minato-ku, Tokyo 105-8001, Japan Tel (03) 3457-2403

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