Reducing Environmental Loads in Production Activities at Kawasaki Microelectronics

Preventing Global Warming

Four electrical machinery/electronics industry associations*1 have set a goal of improving unit CO_2 emissions (CO_2 emissions per unit of production) by 25% in comparison with FY1990, to be achieved by FY2010.

Kawasaki Microelectronics' Utsunomiya Works manufactures semiconductor products called ASIC (application specific integrated circuits). Semiconductors are manufactured in clean rooms, which use large quantities of cooling water (circulating water) for air-conditioning, and the power load on the refrigerators which produce this cooling water accounts for approximately 15% of Utsunomiya Works' total power consumption. Since it began operation in October 1990, the works has made great efforts to conserve energy while increasing its production capacity, and also practices load leveling by storing power using a large capacity (2,300 m^3) chilled water heat-storage tank.

Each year since FY1998, Utsunomiya Works has achieved energy savings, for example, by adopting inverter-type pumps for pure water tanks and reducing loss in compressed-air dehumidifiers. The energy saving rate,*2 which expresses the results of these efforts, has shown a trend of 0.5-1.5% in recent years and an average value of 0.825% up to FY2003. The consistent energy saving effects achieved through these ongoing activities have been highly evaluated and were recognized with the Kanto Economic and Industrial Bureau Director General's Award in FY2000.

Unit CO_2 emissions*3 (CO_2 emissions per unit of production*4) in FY 2003 showed a 3.9% decrease from FY2002 (27% decrease from FY1995) due to the fact that CO_2 emissions were held to a 0.2% increase from FY2002 (31.7% increase form FY1995) in spite of a 13.7% increase in production in the same period (41% increase from FY1995). The energy saving rate in FY2003 was 0.82%. To achieve further energy savings, a target of 0.9% was set for FY2004.


Utsunomiya Works

***1) Four electrical machinery/electronics industry associations**
Japan Electrical Manufacturers Association, Japan Electronics and Information Technology Industries Association, Communications and Information Network Association of Japan, and Japan Business Machine and Information System Industries Association.

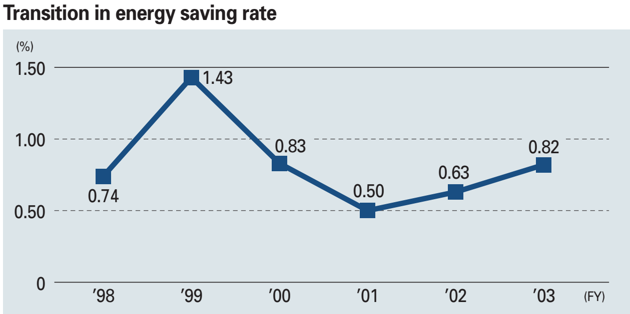
***2) Energy saving rate**
Kawasaki Microelectronics defines the index showing the energy saving improvement effect as "percentage energy saving effect for the year relative to power consumption in the works as a whole." Accordingly, the entire energy saving effect is only manifest in the following year. The equation used to calculate the energy saving effect is as follows:

For each object equipment, assuming former energy consumption is A (kWh/yr) and energy consumption after improvement is B (kWh/yr), the energy saving effect is C = A - B (kWh/yr). The effect of multiple energy saving projects carried out during the year are D = ΣC (kWh/yr). If energy consumption in the works as a whole is E (kWh/yr), the energy saving ratio = D/E (%).

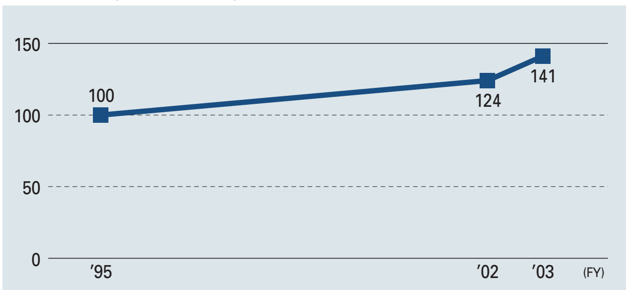
***3) Unit CO_2 emissions**
The four electrical machinery/electronic industry groups set a target of 25% for improvement in unit CO_2 emissions (CO_2 emissions/unit of production) in comparison with FY1990, to be achieved by FY2010. However, because construction of Utsunomiya Works was completed in October 1990 and production was low during the 5 years after startup, until the works achieved mass production, this index could not be applied. Utsunomiya Works therefore uses 1995 as the baseline year.

***4) Production**
Because semiconductor products consist of circuits formed on silicon wafers, "production" can be expressed by the number of wafers. However, the degree of integration differs depending on the product, and the number of manufacturing processes varies greatly depending on this difference. Thus, the size of the operational load cannot be expressed simply by the number of wafers. Utsunomiya Works manufactures products with various different degrees of integration and numbers of processes, from 1 to 0.25μm μproducts. For this reason, an operation index which considers the number of manufacturing processes such as burning circuit patterns is used as "production."

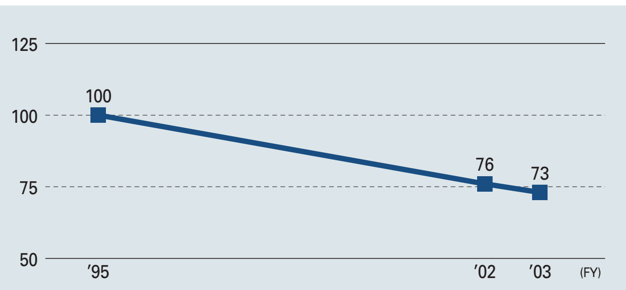
Transition in energy saving rate



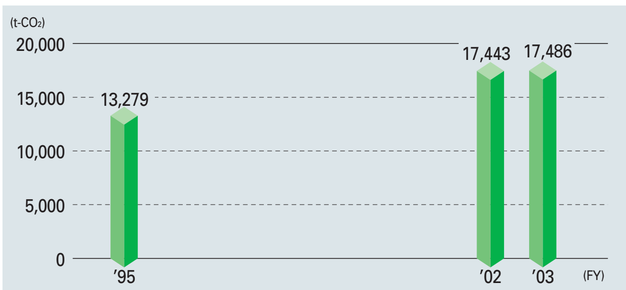
Transition in production (operation index) (1995 = 100)



Transition in unit CO_2 emissions index (1995 = 100)



Transition in CO_2 emissions



Reducing Generation/ Discharge of Waste

Since FY1998, Utsunomiya Works has made active efforts to recycle industrial wastes. In FY2001, the recycling rate[*1] exceeded 98% and has remained on a high level since then.

In FY2001, when the recycling rate had reached virtual saturation, Utsunomiya began industrial waste reduction activities aimed at reducing the amount of industrial waste generated as such. These activities took two directions, reduction of generated wastes and conversion of conventional industrial wastes to valuable resources.

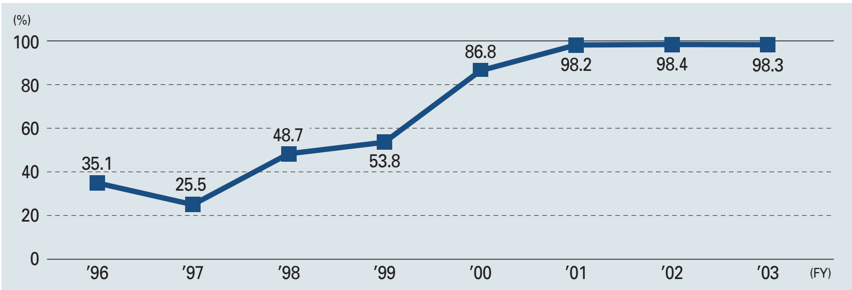
Efforts to reduce waste generation included reduced consumption of polishing agents and chemicals such as fluoric acid which are used to clean wafers and jigs. While maintaining product quality, this reduced waste generation by a maximum of 50%. In the past, waste solution of photosensitive agents used in patterning, which is a central technology in semiconductor manufacturing, were recycled as waste oil fuel. However, as a result of high-priority efforts to reduce consumption of photosensitive agents from FY 2002 to FY2003, a large reduction of approximately 70% was achieved.

As a method of converting conventional industrial wastes to valuable resources, nonferrous metals are sorted and recovered as resources. Continuing into FY2004, Kawasaki Microelectronics is promoting reductions in waste generation and sorting/recovery of nonferrous metals.

Since FY2001, Kawasaki Microelectronics has also recycled raw garbage from the company cafeteria as a material for organic fertilizer.

***1) Recycling rate**
Recycling rate (%) = Amount recycled/Total amount of industrial waste

Transition of recycling rate



Control of Chemical Substances and Reduction of Releases

In response to heightened concern about chemical substances contained in products and their packaging among customers and society, Kawasaki Microelectronics has adopted lead-free and halogen-free alternatives to reduce the environmental load of products. Further expanding the scope of these efforts, company-wide activities to implement a Green Assurance System were begun in FY2002.

During FY2002, the company investigated domestic and foreign laws and regulations related to chemical substances, not limited to customer requirements, and identified substances which should be controlled.

In FY2003, the company implemented a Green Approval system based on its ISO9001 Quality Assurance System and ISO14001 Environmental Management System. Under the new system, suppliers and purchased items are approved from two viewpoints, namely, "Company Green Approval" for the suppliers of parts and materials and "Part/material Green Approval" for the supplied parts and materials for the company's products and packaging, thus expanding the conventional scope of supplier and product approvals. The company plans to introduce this system in FY2004, and will conduct approvals of partner companies and parts/materials.

Where PRTR substances are concerned, in FY2002, 4 listed substances were replaced with substitutes. Additionally 2 substances were replaced in FY2003, reducing the number of PRTR substances used from 16 in FY2003 to 14 in and after FY2004. Among these 14 substances, reporting of two is required under the PRTR Law. The remaining substances are used in smaller amounts which do not require reporting.

Although not a PRTR substance, it was recently been pointed out in the United States that PFOS (Per Fluoro Octane Sulfonate) shows high accumulation in the human body. The company therefore began efforts to use substitutes for chemicals containing PFOS in FY2002. Although potential substitutes were identified and evaluated during FY2002, none was compatible with the company's products. Efforts were therefore made to reduce consumption of the conventional chemicals, achieving a reduction of more than half. In FY2003, other materials not considered in FY2002 were identified/evaluated, resulting in successful substitution.

In FY2004, the company plans a review of manufacturing conditions and reductions in consumption of PRTR substances and other chemical substances.

Substances reported under PRTR (FY2003) (Unit: kg)

No.	Substance	Releases				Transfers	
		Air	Public waters	Soil on-site	Landfill on-site	Sewerage	Off-site
172	N,N-dimethylformamide	66	13	0	0	0	2,800
283	Hydrogen fluoride and its water-soluble salts	190	1,500	0	0	0	1.7
Total		256	1,513	0	0	0	2,801.7
		Total releases 1,769				Total transfers 2,801.7	