

# Respecting Nature Serving Communities



## Reverence for Life and Green Management

The environment is the biggest challenge facing mankind in the 21st Century. We at Samsung Electronics envision a richer and better world for tomorrow - a world in which man and nature coexist in harmony. This respect for all living creatures is the basis of our commitment towards preserving the earth's environment through various Green Management activities, including the development of green technologies and green products.

## Green Management - A Corporate Philosophy

Samsung upholds the belief that our corporate activities based on reverence for human beings and all other forms of natural life will contribute to improve the quality of life and to preserve the earth's environment.

### Contents

<b>CEO's Message 03</b>	<b>Greening of Workplaces 24 ~ 28</b>
<b>Green Management Highlights 04 ~ 05</b>	<b>Greening of Communities 29 ~ 31</b>
<b>Green Management Policy 06</b>	<b>Green Management Vision 32</b>
<b>Green Management Systems 07</b>	<b>Indicators of Performance 33 ~ 37</b>
<b>Greening of Management 08 ~ 12</b>	<b>Certificates and Awards 38</b>
<b>Greening of Products 13 ~ 20</b>	<b>Corporate Profile 39</b>
<b>Greening of Processes 21 ~ 23</b>	

This report is a record of all the results achieved by Samsung Electronics' Green Management from Sept. 1999 to Aug. 2001.

Cover Design | The cover illustration symbolizes man in nature surrounded by a cool breeze and green trees.

# CEO's Message



In June of 1992, Samsung Electronics announced its "Environmental Policy," a policy aimed at building an Environmental Management System to prevent pollution-causing accidents and continuously improve the environment. This was followed by the announcement of "Green Management" in May 1996.

The Green Management philosophy indicates our commitment to take part in the global effort to enrich human lives and preserve the environment, by recognizing and actively promoting Environment, Health and Safety (EHS) as key components of our business activities. It is also our commitment to be a responsible corporate citizen by underpinning all business activities with environment and safety, developing environment-friendly products and processes, enhancing efficiency in resources and energy consumption, creating clean and safe workplaces. In addition, we build a foundation for prosperity that is shared with our customers and local communities.

We have implemented numerous Green Management programs within the framework of Greening of Management, Products, Processes, Workplaces and Local Communities. Results are evidenced in many domestic and international environment and safety certifications, the development of environment-friendly products and breakthrough improvements made in our processes. We also won a place in the Guinness Book of World Records as the world's safest workplace. In short, Samsung Electronics has won recognition as a world-class enterprise in terms of environment and safety.

Samsung Electronics will continue to provide customers with world-class products and services that contribute to the well-being of people and the preservation of the earth's environment. We will also continue efforts to make the workplaces environment-friendly, safe and pleasant. Such efforts will establish Samsung Electronics as a company dedicated to our customers and to the preservation of the ecosystem.

The "Green Management Report" is published to communicate to and with our customers, investors, business partners and others interested in the many aspects of Green Management in EHS. I sincerely hope that this report helps you to better understand Samsung Electronics' Green Management activities. We eagerly await your well-respected opinions that we promise to reflect in our future Green Management activities.

Thank you.

November 2001  
Vice Chairman and CEO  
Jong-Yong Yun

# Green Management Highlights

September 1999  
~August 2001

## Giheung Plant, 211.6 Million Hours of Accident-free Operation

Through aggressive investment and management, our Giheung plant, the leading semiconductor plant in Korea, operated 50 consecutive periods or 211.6 million hours without a single accident. The Guinness Book of World Records officially listed Giheung as "the world's safest workplace" in September 1999. In November 2000, the National Safety Council, a safety association body with international prestige, also awarded the Giheung plant the Presidential Special Award in recognition of its outstanding EHS performance.



## Waste Reduction through Improved LCD Panel Process

Samsung Electronics revamped its LCD production process in order to prevent soil contamination resulting from increased disposal of unused materials and parts. The panel design itself was modified and COF (Chip on Flex) was introduced into the process. Furthermore, by eliminating Gate PCB (Printed Circuit Board), we reduced the amount of PBC and ACF (Anisotropic Conductive Film) by 30% and 20%, respectively. This meant a significant reduction in PCB and ACF wastes generated as a result of rework or disposal of defective products.



## Safety Management Award and Clean Water Award

Our Onyang plant is working to create an accident-free, illness-free and pollution-free workplace. The "Tele-Metering System Network" built at effluent discharge points not only brought productivity gains but also allowed the plant to win numerous certifications. In particular, the plant received the Safety Management Award from the Ministry of Labor and the Clean Water Award from the Ministry of Environment and gained the reputation as one of the safest workplaces in the world.



## Voluntary Recycling Agreement at the Suwon Plant

The widespread use of electronic appliances and the introduction of digital products have increased the amount of disposed electronic goods. In order to effectively handle these wastes, the government and the electronic industry reached a voluntary agreement on Extended Producer Responsibility. This agreement enables consumers, the government and companies to share roles and responsibilities in the environment-friendly disassembly of electronic goods, and thus, help to conserve and recycle resources.



### Green Marketing Award for Printers

The ML-6060, a Samsung Electronics laser printer is an environment-friendly product. The printer is designed uses less energy, reduced the amount of ozone generated during operation to 1/50 of the previous level, and also makes less noise. The newly designed solid-frame-type cartridge prevents used toner from leaking. The outstanding environmental features of the product were recognized with the Ministry of Environment's Green Marketing Award.



### Save the Firefly Campaign

Samsung Electronics leads the effort to save fireflies, a Korean Natural Monument, which are at the brink of extinction. Since 1999, Samsung Electronics has engaged in research and public awareness programs to protect fireflies (*Luciola Cruciata*) and their.

Fireflies are one of the insects that serve as an environmental indicator. As part of the campaign, we released melanin snails, a staple food for fireflies, in Mt. Gwang-gyo nearby the City of Suwon to increase the population of fireflies.

### Green Star Children's Song Festival

Since 1985, Samsung Electronics has annually organized the Green Star Children's Song Festival with the YMCA to promote children's songs. The Green Star Children's Song Festival features various programs to increase children's interest in music.

Programs include short musicals featuring children's songs and the team of Green Reporters of Children's Song, a team that works on discovering and disseminating new children's songs.

### Participation in the Eco Products Exhibition 2001

Samsung Electronics participated in the Eco Products Exhibition 2001 and exhibited 13 models of environment-friendly and energy-efficient products, including refrigerators, air conditioners, microwave ovens, monitors and printers. We also introduced our improved packaging materials and recycling technology for used Styrofoam. GMIS (Green Management Information System) and LCA (Life Cycle Assessment) software were also on display while our promotional short film of the Asan Recycling Center received great responses from the visitors.



### Gumi Plant Receives the Environmental Management Award

The Gumi plant that makes mobile communication switches, telecommunication devices and HDD, has carried out many activities to preserve the environment under the motto of "Practical Green Management". The Maeil Business Newspaper and the Ministry of Environment recognized such efforts by awarding the Environmental Management Award in June 2000. The Gumi plant's "Environmental Declaration" provided a sound framework for pollution prevention with a focus on source control rather than the end-of-pipe solutions.



### All Plants Cited/Recited as Environment-Friendly Businesses

With the inclusion of The Cheonan plant in the list of environment-friendly businesses, all of our plants have been certified as green operations. The plants that had been cited earlier also renewed their status thanks to efforts such as developing clean technologies through continuous investment, building recycling systems and switching to clean energy.

### ISO 14001 & OHSAS 18001 Certifications

We overhauled rules and standards to obtain both ISO 14001 (Environmental Management System) and OHSAS 18001 (Safety & Health Management System). As a result, our semiconductor plants (Giheung, Onyang and Cheonan) acquired OHSAS 18001 certification in December 1999, while the Suwon plant acquired both ISO 14001 and OHSAS 18001 certifications in November 2000. Having acquired both certifications, Samsung Electronics has now built an integrated Environment, Safety & Health Management System to consolidate its global position as a green workplace.

### No Claim Bonus Receiving Ceremony

"No Claim Bonus" is a program under which workplaces that were free from accidents including fire or natural disasters, during the whole year are reimbursed 5% of their premium. The Samsung Electronics' plants collectively received a reimbursement of 1.8 billion won and strengthened its reputation as an accident-free corporation. Managers and employees who substantially contributed to this end received awards and were recognized for their efforts.



# Green Management Policy

Based on Samsung Electronics' core values that start with reverence for life, all of our business activities, both home and abroad, respect both people and nature. By implementing Green Management that regards Environment, Health and Safety (EHS) as key elements of good management, we are aiming to become a leading "Green Company" in the 21st Century.

## 1. The Environmental Safety Management System

We shall establish and actively implement the Environmental Safety Management (ESM) system. The system will enable us to minimize any negative impacts of corporate activities, products and services on the environment, health and safety.

## 2. Continual Improvement of EHS

We shall strive for continual improvement by way of aggressive investments and technological developments with the purpose of preventing pollution or safety accidents that can arise in all corporate activities, including development, procurement, production, sales, distribution, use and disposal.

## 3. Minimization of Pollutant Discharge and EHS Accidents

We shall minimize the production of pollutants and incidents of environmental & safety accidents by introducing new EHS technologies and improving existing ones.

## 4. Compliance with Regulations

We shall comply with all domestic laws and abide by international agreements. Meanwhile, we will establish and rigorously implement stricter internal standards.

## 5. Reduction of Product Impact On The Environment and Safety

We shall minimize any detrimental effects on the environment and safety throughout the whole product life cycle, starting from development to manufacturing, use and final disposal.

## 6. Open EHS Management

We will regularly provide managers and employees with training courses on EHS management. Reports on green management will be published and disclosed to all shareholders.

September 2001

Vice Chairman and CEO

Jong-Yong Yun



# Green Management Systems

Samsung Electronics' Green Management is based on the belief that "man and nature must live in harmony." This vision requires enterprises to be responsible corporate citizens and thereby thrive with its business partners and local communities. Our goal is to expand the practice of Green Management to our overseas operations, gain international recognition as a business that places emphasis on EHS and to spearhead the 21st Century when man and nature co-exist in harmony.



## 08 | Greening of Management

Continual Improvement Through  
Information Disclosure



## 13 | Greening of Products

Product Life cycle Accountability



## 21 | Greening of Processes

Implementing Clean Process  
Technologies



## 24 | Greening of Workplaces

Accident-free, Illness-free, Pollution-free  
Workplaces



## 29 | Greening of Communities

Building Green Partnerships



# Greening of Management

Well aware that businesses must be socially responsible for the Environment, Health and Safety, Samsung Electronics has consistently pursued the principle of Green Management at the corporate level. This principle always holds utmost priority in any major decision-making process. Meanwhile, the Environmental Safety Management (ESM) System that included disclosure of the environment-related information allowed Samsung Electronics to become a well-trusted corporation that serves the public well.



## Corporate-wide Green Management Committee

Samsung Electronics' Green Management Committees, chaired by the most senior executives at each plant, are responsible for establishing mid-and-long-term strategies, setting up specific goals, and regularly evaluating performances against the goals. The Committees, which play a pivotal role in the Greening of Management at Samsung Electronics, are attended by senior managers and heads of divisions and convene monthly to assess performance of the ESM, review strategies and implementation, discuss current challenges and find solutions.

### Domestic and International Certifications

Samsung Electronics strictly adheres to its policy of "placing the highest priority on Green Management throughout all corporate activities." Consistent and bold actions based on this policy earned Samsung Electronics numerous domestic and international certifications.

### Domestic and International Certifications on Environment and Safety

With the Cheonan plant acquiring the ISO 14001 certification in 1999, all of Samsung Electronics' domestic plants have become ISO 14001 certified. Moreover, with the continuous support and effort, 9 overseas operations including those in Mexico, U.K., Malaysia and China have all received ISO 14001 certification.

The OHSAS 18001 (International Safety & Health Management System) and the KOSHA 2000 (Domestic Safety & Health Management System) were also awarded to Samsung Electronics. These awards are clear indications that Samsung's Green Management has gained international recognition and will continue to drive us forward.

### The World's Leading Environment-friendly and Safe Company

In September 1999, the Guinness Book of World Records officially recorded Samsung Electronics as "the safest workplace in the world." With the aim of becoming a world-class EHS company, Samsung Electronics has taken aggressive measures. As a result, in December 2000, the Giheung plant recorded 289.6 million accident-free hours and gained the status of the safest workplace in the world. Other recognitions, such as being named an "Environmentally Friendly Company" and receiving the Environmental Management Award and Safety Management Award are all encouraging achievements as Samsung Electronics strives to become a world-class EHS company.



The Green Management Committee establishes Green Management strategies, evaluates performance and searches for constructive solutions.

### ISO 14001 Certification granted to domestic plants

Plants	Date of Certification
Suwon	October 1996
Giheung	September 1996
Onyang	September 1996
Gumi	November 1996
Gwangju	October 1996
Cheonan	June 1999

### ISO 14001 Certification granted to overseas plants

Country	Plant	Date of Certification
Malaysia	SDMA	August 1999
Great Britain	SEMUK	November 1999
India	SIEL	June 2000
China	TSEC	September 2000
Mexico	SAMEX	November 2000
China	TSED	December 2000
U.S.A.	SAS	December 2000
Brazil	SEDA	February 2001
Thailand	TSE	October 2001



By being officially listed as "the safest workplace in the world" in the Guinness Book of World Records, Samsung Electronics became one of the world's leading green companies.



## The Scientific Environmental Safety Management (ESM) System

Samsung Electronics implements ESM in all business activities including process safety management, pre-assessment and computerization. Any area of deficiency is identified, studied and addressed for continuous improvement.

### Process Safety Management

Since 1997, Samsung Electronics has employed the **Process Safety Management (PSM)**, a scientific and efficient system that takes into consideration all potential risks surrounding plant equipment. PSM consists of meticulous and stringent procedures from initial risk assessment to emergency responses. The system minimizes human, material, and resource losses by using a scientific method that identifies and addresses risk elements in order to prevent incidents such as toxic substance leakages, explosions or fires during processes that handle toxic and hazardous materials.

### JIT-Based Storage System for Hazardous Material

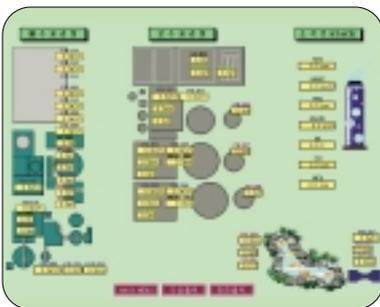
**JIT (Just-In-Time)** is an inventory-free management system that transforms the purchase process. It is an information system in which manufacturers, suppliers and vendors share information on inventory and procurement to build an integrated **SCM (Supply Chain Management)** system. The incorporation of JIT into the hazardous materials handling process enabled the Gumi plant to minimize the storage of such materials. As a result, risk factors decreased, substantially narrowing the scope of potential damages to humans and property.

### TMS (Tele-Metering System)

In an effort to implement future-oriented environmental management, all Samsung Electronics' operations have built and operated TMS since 1995. TMS automatically measures and reports the amount of discharged pollutants. Furthermore, a **TMS Web System** was built to maximize the effectiveness of TMS by linking wastewater treatment facilities, disaster control centers, EHS officials, government offices and the Earth's Environmental Institute.

### GMIS (Green Management Information System)

The **Green Management Information System (GMIS)** was built in 1998 using intranet technology. The purpose was to support corporate EHS programs and to provide systemized data that can be strategically utilized to enhance business competitiveness. GMIS sets pollutant-specific reduction targets and provides incentives to reduce emissions. It also saves cost by system-



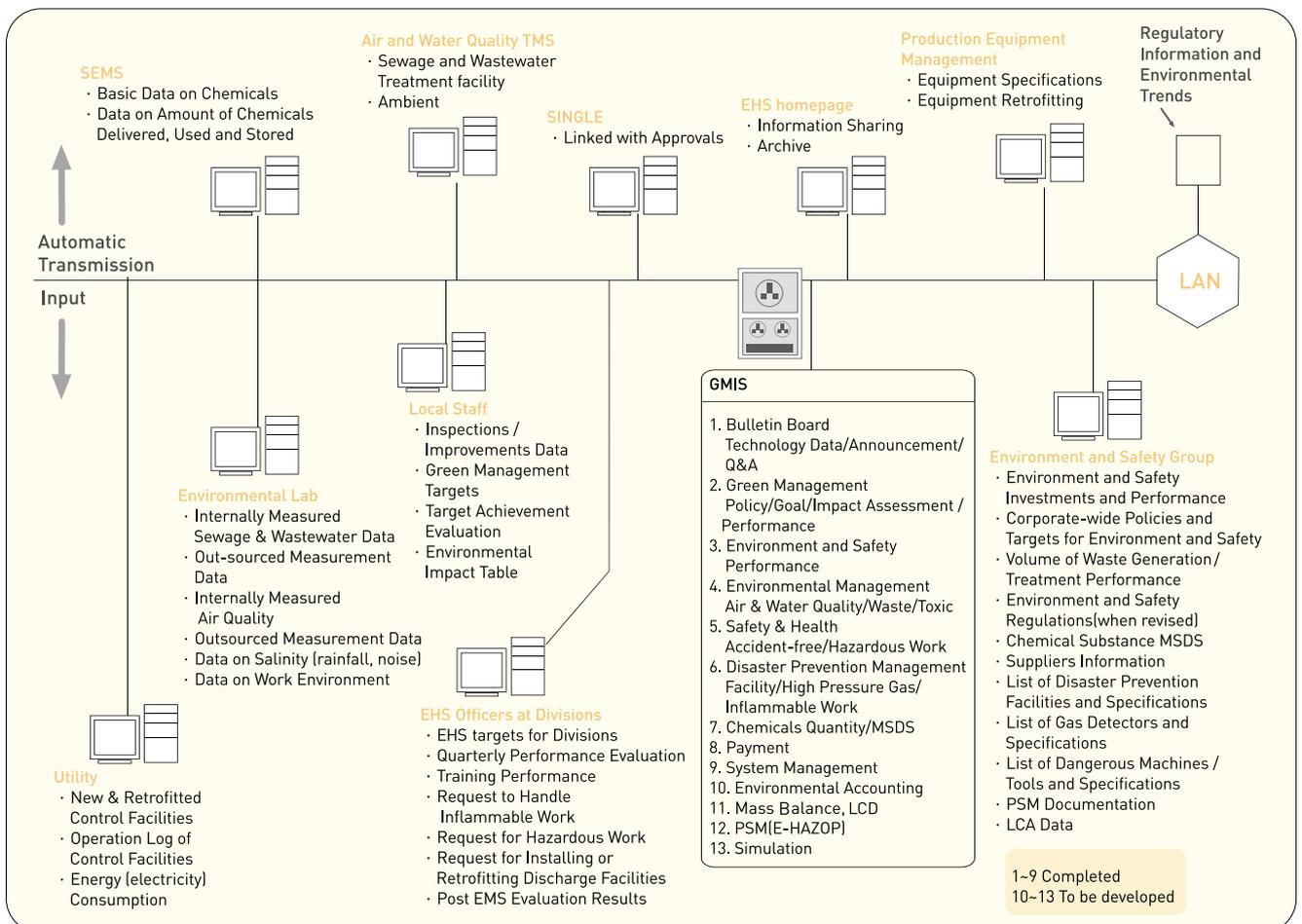
TMS is built and operated to for future-oriented environmental management.

atically managing the cost of environment and safety related activities. Furthermore, GMIS speeds up the decision making process by providing relevant data to managers.

GMIS also manages information regarding regulations, policies and impact assessments. Such information is utilized for post-certification management of ISO 14001 and also provides a basis for responding to international regulations in the semiconductor industry, such as control on PFC (Per Fluoro Compounds), energy and other chemical substances. GMIS also maximizes work efficiency in EHS activities by standardizing the work process.

In addition, GMIS promotes the "P2 Project - Pollution Prevention" and facilitates target management consisting of setting specific targets and

### Green Management Information System





Managers and employees can learn the importance of the environment and safety first-hand at the Environment & Safety Experience Center.



With continuous training courses being provided to environmental and safety managers, Samsung Electronics became one of the world's leading green companies.



The No Claim Bonus system returns 5% of premiums as an incentive to strengthen commitment toward better environment and safety.

evaluating performances. Environmental Performance Evaluation (EPE) and Environmental Accounting (EA) are also utilized to help the company comply with international standards, thus enhancing its environment and safety competitiveness.

### Pre-certified Equipment for Improved Safety

The Korean Occupational Safety & Health Agency (KOSHA) grant **Safety Marks (S mark)** only to manufacturers who fully meet the safety requirements. It is granted after a thorough evaluation on product safety, product reliability and producer's quality management system. Samsung Electronics' semiconductor plants only purchase equipment with the S Mark. By doing so, we can prevent environment and safety related accidents at the source.

### Environment & Safety Experience Center

Our Suwon and Giheung plants have strived to create accident-free workplaces. As part of this effort, the Environment & Safety Experience Center, built in 1991, was revamped and reopened the **Giheung Environment & Safety Experience Center** in June 1999 and the **Suwon Safety & Environment Center** in March 2001. The two Centers consist of the Safety & Health Experience Center that is a miniaturized production site, the Human Engineering Experience Center, the Environment Experience Center and the Safety Experience Center. At the Safety Experience Center, visitors can operate the Internet-based remote surveillance system and fire-safety facilities. These centers make significant contributions to enhance safety in the workplace.

### Education and Training

Samsung Electronics promotes **exchange among the specialists** at its overseas operations in order to meet **international standards** and the need for specialization. This allows Samsung Electronics to set global standards for EHS activities through active human exchanges. In addition, continuous education and training are provided to EHS managers at each operation site to raise their awareness about the issue.

### NCB (No Claim Bonus)

Under Samsung Electronics' **NCB (No Claim Bonus)** program, insurers reimburse 5% of fire insurance premium to workplaces that did not have a single incident of property damage for reasons such as fire, storm, floods, etc. during the whole year. As a result of rigorously practiced safety management, 1.8 billion won has been reimbursed to Samsung Electronics, reflecting our dedication to create a safe and healthy workplace. A variety of other internal rewards were introduced to encourage managers and employees to take the initiative to improve environment and safety.



# Greening of Products

In addition to function, cost, quality and design, "environment" was added as a fifth element to product development at Samsung Electronics. The ease of assembly, disassembly, recycling, and service as well as environmental factors are considered at each stage of the product life cycle, starting from initial acquisition of raw materials to production, use and disposal.



**Implementation of LCA**

**Introduction**

**1996**

LCA methodology was studied.  
A database on basic materials was built.  
LCA was performed on microwave ovens.

**Implementation**

**1997**

LCA methodology was fully established.  
Inventory analysis database was built.  
LCA was performed on TVs, monitors, refrigerators, air conditioners and washing machines.

**1998**

LCA software for product designers, SPEED, was developed.  
A database on components was built.  
LCA was performed on PC and DRAM.

**System Construction**

**1999~2001**

LCA software for product designers was upgraded.  
Optimal designing procedure for green products was established.  
LCA was performed on laser printers and vacuum cleaners.  
LCA was performed on the disposal process of used home appliances.

**Design Support Tools for Environment-Friendly Products**

**LCA (Life Cycle Assessment)**

Life Cycle Assessment (LCA) is a scientific tool for evaluating and improving the environmental aspects of all product-related processes. The first LCA study was performed on microwave ovens in 1996. The LCA studies on TVs, monitors, refrigerators, air conditioners and washing machines were conducted in 1997 and extended to desktop computers, notebook computers and DRAM chips in 1998. And LCA studies on laser printer and vacuum cleaners were conducted in 1999 and 2000, respectively.

The problematic areas that are identified by the LCA are improved. And the results of the LCA are fed into **SPEED (Simplified LCA Program for Effective Eco-Design)** to help designers incorporate the environmental aspects throughout the product life cycle into the design process.

**Design for Assembly/Disassembly/Recycling/Service**

The Design for Assembly/Disassembly/Recycling/Service (DfA/D/R/S) is a tool used to assess and facilitate assembly, disassembly, recycling and service of products. It was first applied to washing machines, TVs, and refrigerators in 1995; microwave ovens in 1996; vacuum cleaners in 1997; monitors in 1998; printers, computers, vacuum cleaners, air conditioners, VCRs; and cellular phones in 2000.

For example, to speed up and facilitate implementation, DfA/D/R/S tools are being **integrated with the 3D-CAD system and Products Data Management (PDM) system** and used in conjunction with the LCA software in the product design stage to improve the environmental features of products. The **Design for Cost (DfC) Module** is also being developed to save costs.

**Environmental Marks (Environmental Labelling, Energy Mark)**

**Korea Environmental Labelling**

The Korea Environmental Labelling was awarded to Samsung's laser printers in 1999. In particular, ML-6060, one of the Samsung Electronics laser printers, received the Korea Environmental Labelling in 2000 for energy savings. It uses less energy and produces only 1/50 of ozone compared to previous models, and makes less noise. Its solid-frame-type toner cartridge prevents any leakage of used toner. In recognition of these environment-friendly features, the Ministry of Environment and The Maeil Business Newspaper granted Samsung Electronics "**The Green Marketing Award**" in 2001.



Samsung Electronics' products come with the Energy Savings Label and Korea Environmental Labelling in approval of their environmental features and energy efficiency.

### International Environmental Labelling

The environmental friendliness of Samsung Electronics' products is recognized by other countries who granted many environmental Labelling to Samsung imported products. In particular, international environmental Labelling such as TCO 95 and TCO 99 of Sweden were awarded to Samsung for its monitors, in recognition of its contribution to the environment.

### Energy Savings Label

All of Samsung's washing machine models received the 1st grade of Energy Efficiency Rating Standards in Korea, while computers, monitors, facsimile machines, TVs, VCRs, DVD players and audios earned Energy Savings Label. The US Environmental Protection Agency also awarded Samsung Electronics monitors, computers, printers and washing machines its Energy Star mark.

## Energy Efficient Products

### Refrigerators

Samsung Electronics developed the SOFT (Split, Oval Fin & Tube) evaporator for the first time in the world. The split oval fin and tube improves heat exchange efficiency by 30% and defrosting capability by 12%. Since the SOFT evaporator has a cross disposition oval refrigerant tube and a separate fin evaporator, it is able to improve heat exchange, and thus, reduces power consumption by 3%. For the same reason, it is 30% smaller than that of previous refrigerators. The Ministry of Science and Technology granted the KT Mark (Korea Good Technology Mark) to refrigerators with SOFT evaporators in recognition of its technological advancement.

### Washing Machines

The inverter motor installed in Samsung Electronics' washing machines reduces its power consumption by 40%. As such, the product was listed among Hit Products and received the "Energy Winner Award" from the Citizens' Alliance for Consumer Protection of Korea.

The inverter motor's Variable Voltage Variable Frequency control technology and the Intelligent Power Module (IPM) with an embedded inverter circuit enable precision processing and increase the efficiency of the motor. The motor speed control gear also enhances efficiency of the motor driving device. Furthermore, the newly shaped tub allows a 25% water savings and has the lowest noise among all comparable domestic machines (37dB during wash mode, 42dB during spin mode). Such features won Samsung Electronics' washing machines the Consumer Satisfaction Award.

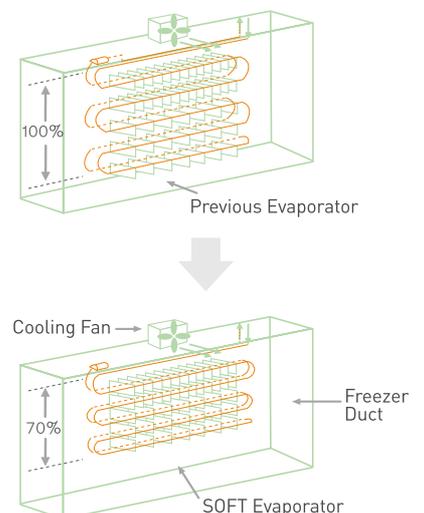


Samsung's laser printer ML-6060 received Korea Environmental Labelling in 2000 for its low energy consumption, recyclable toners and reduced noise.



The environment-friendliness of Samsung monitors is recognized worldwide with TCO 95 and TCO 99 certifications.

### A More Compact-sized Evaporator





Washing machines with inverter motors dramatically improved their performance and received the Customer Satisfaction Award.



The RE-MF70 microwave oven reduced power consumption with its zero stand-by energy feature. It's the first product of its kind developed in Korea.



With a power-saving circuit design, Samsung electronics VCRs use far less energy than previous models.

**Microwave Ovens**

Samsung Electronics developed the RE-MF70, the first microwave oven in Korea with a **Zero Stand-by Energy** feature. The RE-MF70 automatically cuts off power 10 minutes after it finishes cooking, thereby, conserves a significant amount of energy. The oven light may also be turned off to reduce energy consumption.

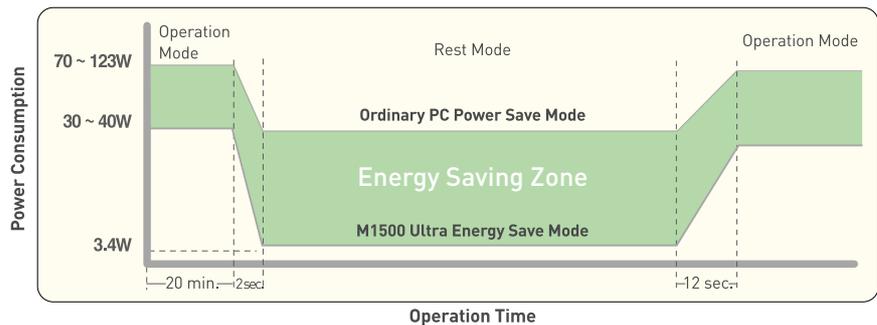
**Monitors**

With the exception of a few special purpose models, all Samsung Electronics monitors comply with E2000 in Europe, the most stringent regulation in the world. In particular, the GH15 monitor, a 15" LCD monitor successfully lowered stand-by energy consumption by 40% - from 2.5W to 1.5W. The 17" 96kHz CRT monitors operate on only 75W of electricity, which is 25% less than the 100W consumed by the previous models.

**Computers**

Samsung Electronics' computers lowered their electrical consumption by 60%, from over 120W to 60W. They also lowered stand-by energy consumption by 90% with the ultra energy save mode. These outstanding performances were recognized with the **Energy Winner Award** for Office Machines.

**Ultra Energy Save Flow**



**VCRs**

Thanks to the **energy saving circuit design**, Samsung Electronics' VCRs consume on less energy for operation. The stand-by energy is also significantly lowered, because the Ultra Energy Save Mode cuts off power supply in most circuits other than MICOM. SV-G1000, in particular, reduces stand-by power consumption from 2W of the previous models to 0.7W.

## Replacement of Harmful Materials

### Disuse of CFCs in Refrigerators and Air Conditioners

Samsung Electronics replaced CFCs with **HFC-134a** as refrigerant and switched to **Cyclopentane** for foaming agent in 1996. Since 1997, all of Samsung refrigerator models have used these materials, which contributed to curbing ozone layer depletion. Moreover, refrigerators using **isobutene (R-600a)**, a natural refrigerant, were developed and exported to Europe. These refrigerators conserve energy with the installation of a **high efficiency compressor** and **high efficiency no-frost cooling system**. Such features earned Samsung refrigerators the status of Grade A in European Energy Efficiency Rating and helped boost exports.

We are substituting the HCFC-22 refrigerant in our air conditioners with **R-407C** or **R-410A** which are substances harmless to the ozone layer. Samsung Electronics pioneered the development of an air conditioner using alternative refrigerants back in 1994. The machine's reliability was proven through 4 field tests in 1995, 1997, 1998 and 1999. In 1998, it developed the wall-mounted type air conditioners using R-410A for small size, and received the Grade 1 Energy Efficiency and the KT Mark for the first time in Korea. Moreover, a European style wall-mounted type and a window type model using R-407C were released in March and April 2000, respectively. The European style cassette type models using R-407C and the European style wall-mounted type models using R-410A were shipped to the European market in 2001.

### Green Chips Free of Lead and Halogen Compounds

Samsung electronics developed **green memory module products** that do not use lead (Pb) or halogen compounds such as chlorine, bromine and antimony, substances that are harmful to health and environment. The "Green Semiconductor" concept was first applied on the 128MB Synchronous DRAM and 256MB modules but will be extended to all chips once the tests on properties, life span and environmental impact produce positive results.

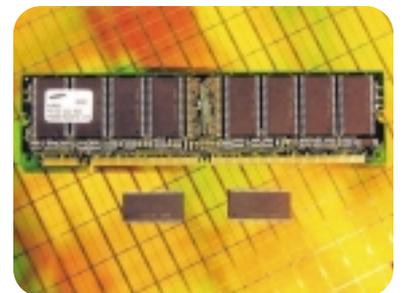
This latest green chip completely eliminated lead from the solder paste and plating material, and the epoxy molding compounds and circuit boards are also free of halogen compounds. So far, a few companies have successfully developed lead-free chips, but Samsung Electronics was the first in the world to mass-produce both lead & halogen compound-free semiconductor chips.

### Disuse of Halogen Flame-retardant

Halogen compounds are harmful to humans and the environment because of their strong toxicity and corrosiveness. Samsung Electronics is switching from halogen flame-retardant to **phosphoric flame-retardant**. The per-



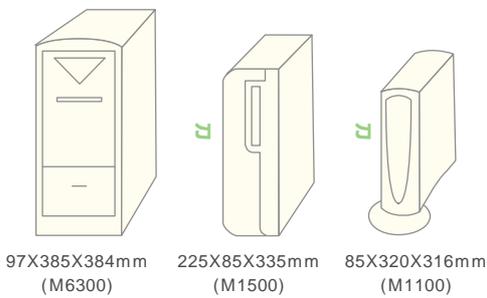
For refrigerators and air conditioners, isobutene and HFC refrigerants are being used as an alternative to previous refrigerants, which caused ozone layer depletion.



Environment-friendly semiconductor chips are used in Samsung Electronics products. These chips are the first lead & halogen-free chips in the world.



**Making Computers More Compact**



formance of the halogen-free multi-layer printed circuit board that we developed for notebook computers surpasses that of comparable products.

**Resource Conservation**

**Monitors**

Samsung monitors are designed to protect the environment by conserving resources - in other words, reducing the number of parts and making the monitor design more compact. For the PN17 series which is a 17" CRT Monitor running at 96kHz, we were able to reduce the number of parts by 29% and weight by 13.7%. With the more compact monitors, loading capacity in delivery/shipping trucks expanded by 63%.

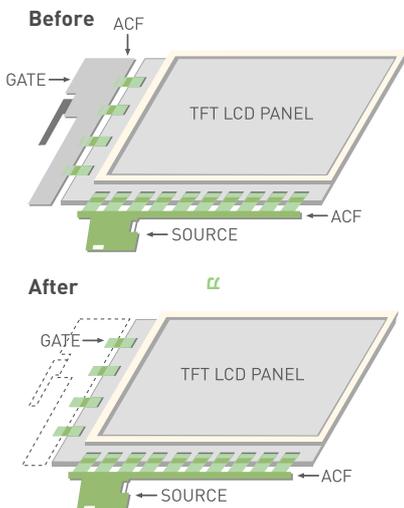
**Computer**

The number of parts used in the DRAKE model was reduced from 729 to 390. In addition, the ratio of shared parts was increased from 70% to 85% and saved resources by making our computers more compact in size.

**Printer**

For Laser printers, toner cartridges were shown to have the most serious environmental impact according to the result of Life Cycle Assessment on laser printers. Consequently, Samsung developed a Toner Save Function, which can save up to 30% of toner use. Moreover, the Power Save Key and Paper Save Function were added to save power and paper. The Paper Save Function allows users to print several pages on one sheet of paper.

**Resource Conservation with New LCD Panel Design**



**LCD Panel**

Samsung altered the design of its LCD panel and adopted COF (Chip On Flex) films to prevent soil degradation from increased industrial waste. Specifically, Samsung removed Gate PCB (Printed Circuit Board) between Source PCB & Gate PCB, and thereby reduced the amount of PCB by 30% and ACF (Anisotropic Conductive Film) by 20%. Such schemes allowed the company to reduce the level of PCB & ACF wastes generated by faulty products or rework.

**Developing Environment-Friendly Packaging**

**Recycling Used Styrofoam**

In order to reuse the Styrofoam used as shock absorbent material, Samsung is doing research in collaboration with the academia on "Reclaiming Used Styrofoam using Physical Methods."

This landmark research is aimed at reusing the Styrofoam as shock absorbent material rather than recycling it into other products. It uses an

unheated compression volume-reducing machine to restore the physical properties of the Styrofoam.

### Reduction in Use of Packaging Materials

A computer simulation identifies the fragile areas of the product to arrive at an optimal shock absorbent structure and thus reduces the amount of Styrofoam used for packaging. The amount of Styrofoam packing for the AS-410 air conditioner was reduced by 18%, from 180g to 148g, by using computer simulation technology.

### Using Environment-Friendly Packaging Materials

Samsung is focusing its effort to replace packaging materials with environment-friendly materials. For example, Samsung's ML-6060 printer was the first in Korea to be packed using **Honey Pad**, a beehive-shaped paper shock absorbent that weighs 10% less than the conventional shape. M5317 computer and NL15MO LCD monitor use **Corrugated Pad**, a shock absorbent material made of paper.

## Recycling Electronics Wastes

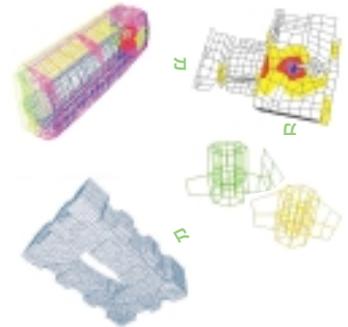
### Extended Producer Responsibility (EPR)

The government and the electronics industry signed a Voluntary Extended Producer Responsibility Agreement in order to deal with the ever-increasing electronics wastes resulting from the widespread use of electronic and high-tech digital products. Accordingly, the consumer, government and companies will share responsibility and accountability in conserving resources and recycling. In September 27, 2000, Samsung launched the **Association of Electronics Environment** (Chairman Sang-Bae Lee, the Vice President of Samsung Electronics) for the purpose of efficient collection and treatment of electronics wastes in Korea. Members of the AEE include the 3 major Korean electronics companies who are working together to establish EPR as a system to sustain environmental health (<http://www.aee.or.kr>).

### Establishment of Electronics Wastes Collection System

Samsung implemented the Electronics Wastes Collection System, a system where the manufacturer collects and disposes of electronic goods at the end of their life cycle free of charge. Currently 27 nationwide storage/collection sites are in operation. The **Green Logistics System** ensures efficient collection and transportation of disposed products, helping to prevent environmental degradation and providing customer convenience.

### Computer Simulated Packaging Design

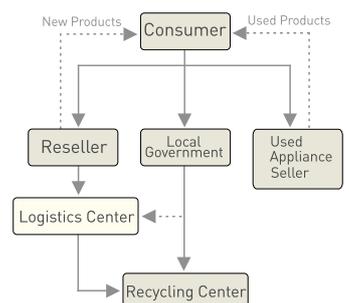


Environment-friendly paper packaging



Voluntary Extended Producer Responsibility was set up to save resources and to enhance recycling processes.

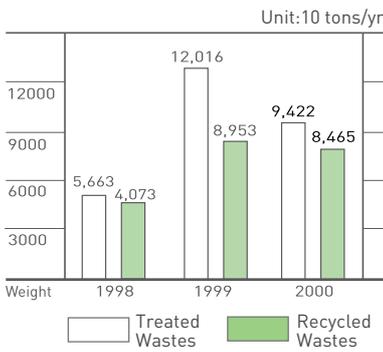
### Collection Process of Electronics Wastes





Asan Recycling Center

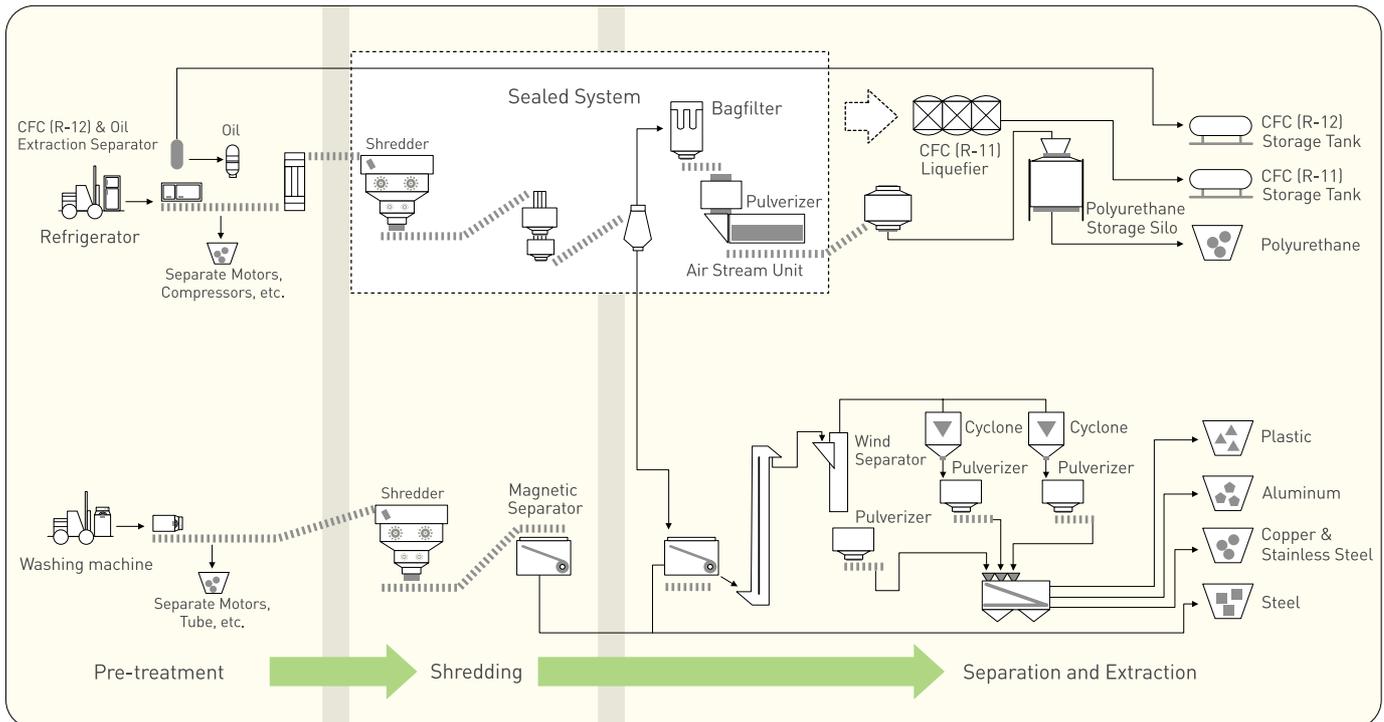
Treatment and Recycling Performance at Recycling Center



**Recycling Center for Electronics Wastes**

In keeping with its announcement of Green Management and commitment to the public, Samsung became the first in the electronics industry to build a Recycling Center in 1998. The purpose of the Recycling Center is to promote a clean and pleasant environment through the safe disassembly and recycling of collected electronics, to help conserve and recycle resources as a responsible member of the society and to be accountable throughout the whole product life cycle. The Recycling Center **disassembles over 300,000 electronics wastes annually** and sorts the materials into steel, copper, aluminum, plastic, polyurethane, CFCs, etc. for recycling. The Center is capable of simultaneously extracting and separating oil and refrigerant (CFC-12) from compressors as well as recovering CFC-11 gas from polyurethane.

**Electronics Wastes Recycling Process Map**





# Greening of Processes

Samsung Electronics faithfully carries out its commitment to make all of its processes environment-friendly through source control activities.



Samsung launched a comprehensive campaign in all of its production lines to conserve energy.

## Energy Conservation

All Samsung plant sites have Energy Sub-committees in each division. The Committees lead the effort to cut energy consumption by 5% annually. In Suwon and Gumi plants, **heat recovered from waste incineration** is used as an energy source for production. At the Onyang plant, an effort is being made to save power, dioxide and material cost by **reducing the Burn-In-Time**, a critical step in chip property testing. Also, as another way of conserving energy, all of our plant sites have installed **heat exchangers** that pre-heat water before it is supplied to boilers.

## Process Improvement

### Reduce Waste using Ultrasonic Puncher

The existing Gimchi refrigerators manually compress and seal the Freon gas, which inevitably leads to minor leakages. To address this problem, our Gwangju plant uses **auto ultrasonic waves to compress, seal and cut the products**. This improves work efficiency and prevents leakages, which in turn reduces the number of product defects. The plant was also able to eliminate two gas welders to improve the safety of the work place and helped reduce the cost of failure by reducing the rate of returned and exchanged products by 20% against total production volume. Furthermore, the Gwangju plant uses **pulverulent body painting quick mastery paint** which reduces painting time to half at 180°C. This cut the LNG cost in half, from 1,959,000 won to 1,788,000 won.

### Improving in Packaging Materials

The existing HDD products used to be packed with shock absorbent cushions on all 6 sides - something the consumers were left to dispose. In order to reduce this burden on consumers, the Gumi plant now packs cushions on only 2 sides of the box and saves cost as well by reducing 3 tons of waste per annum.

### Automatic Testing of Printer Boards

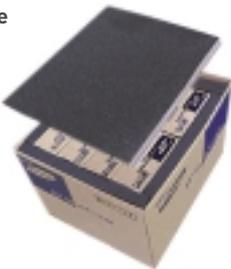
Samsung automated the printer board testing process, which was done manually in the past. In doing so, the company was able to save resources such as paper, ink and toner. In addition, by adopting a clean technology to minimize wastes, Samsung benefits from an annual cost reduction of 430 million won.

## Protecting Water Resources

Our Onyang plant was able to reduce up to 86,860 tons of wastewater and annual water consumption by reclaiming 238 tons of wastewater produced

### Improvement in Packaging Material

Before



After



Samsung changed its cushion packing method from 6-sided to 2-sided, which saves cost, and reduces waste.

daily by wafer sawing in the  $\mu$ BGA production process. The plant collects wastewater and puts it through a CMF (Continuous Micro Filter) then reuses the filtered water to produce de-ionized water.

At the Gumi plant, ultra pure water that was used to clean HDD parts is reclaimed, undergoes 2nd and 3rd water quality testing and is used in other production processes. This saves the plant 150 tons of water a day. The Giheung plant also began operating a **fluoric acid waste water treatment system** and saved 447 million won, whereas the Suwon plant used a free filter and water circulation pump to collect wastewater from its rotary compressor production line and reused it as cleaning water in the scrubber. To improve problems in disposing the preliminary cleaning water of the etching process, our Cheonan plant started introduced a **De-ionized Water Reclaim System** to reclaim the cleaning water and reuse it as de-ionized water.

## Minimizing Hazardous Substance

The Cheonan plant discovered that IPA (isophthalic acid), a substance that causes potential harm to the human body was discharged from the static control box that became uncovered during the POL process. In order to solve the problem, the plant installed an **exhaust duct in the static control box**. Applying RPSC-2STEP to remove PFC (Per Fluoro carbon) from the PASS 'N process also substantially **reduced NF3 (Nitrogen trifluoride) cleaning time**.

### Technological Development in PFC Emission Reduction

The World Semiconductor Council (WSC) made a resolution to reduce PFC, a global warming gas (GWG), by 10% until 2010. Accordingly, Samsung has launched a **joint research project between academia, industry and research centers** to develop domestic technology that will make the Korean semiconductor industry more competitive while meeting the emission targets set forth by the WSC. The joint research project is to be completed by August 2000 with a research fund of 3 billion won to develop PFC treatment technologies and alternative gases.

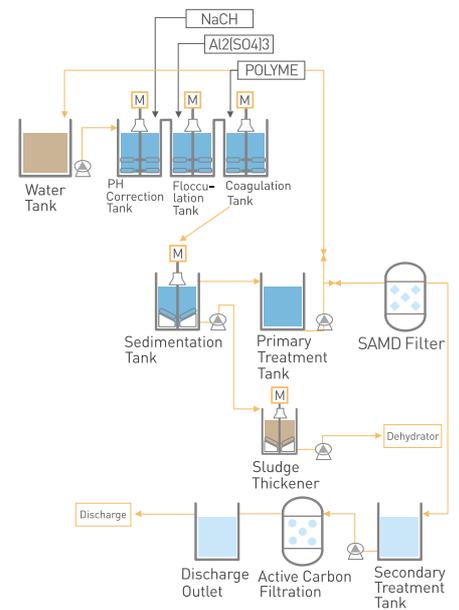
### Low Voltage Liquid Crystal Recycling Technology

In order to prevent product default in TFT-LCD panels, 35% of low voltage liquid crystal is additionally injected. The liquid crystal excess collected from this process is reclaimed and reused using the **Low Voltage Liquid Crystal Recycling Technology**. This method substantially reduces the cost of material through reuse and also alleviates material supply demand. As a result, the Giheung plant and Cheonan plant saves 1,170 million won and 3.3 billion won a year, respectively, in material cost.



Samsung leads water resource protection by recycling industrial wastewater.

### The Wastewater Treatment System



Samsung strives to improve all production processes to become more environment-friendly.



# Greening of Workplaces

We at Samsung aim at building accident-free, illness-free and pollution-free workplaces through the prevention of environmental and safety accidents. That is why our internal control standards are even more stringent than the domestic laws require and are observed with a 24-hour monitoring system. Samsung Electronics managers and employees work with the Employees' Council to organize "Environment and Safety Inspection Days" and create a healthy and clean work environment.



## Building Green Workplaces

### Suwon Plant

The Suwon plant is leading the effort by continuously seeking ways to minimize environmental pollutants. Accordingly, the plant recently replaced its incinerator's wet scrubbers based on water, electrostatic precipitators and centrifugal force dust collectors to a **2-stage filtration dry dust collector**. This was extremely effective in removing harmful dioxin and minimizing air pollutants.

The plant also adopted a **Bio-Reactor System** to remove odors from surplus sludge produced from the biochemical processing facility during wastewater treatment. **The three-times wastewater treatment facility** is installed in the final discharge outlet to minimize water pollutants and improve the quality of discharged water. We successfully lowered the level of all pollutants to below the 10% of the legally permissible level.

### Giheung Plant

Another form of our commitment to build a green workplace is the Green Park. With the creation of the **Green Park**, which was aimed at promoting waste recycling, we were able to aggregate and integrate the scattered waste management facilities. In the Green Park, waste materials are contained indoors to prevent environmental contamination.

Moreover, the **R&C Bank**, a scheme to recycle unused or repaired parts & equipment, is contributing to the reduction of industrial wastes and cost-savings by avoiding duplicated purchases.

Such environmental initiatives in the plant have been sought continuously and consistently since the implementation of "On-site Waste Reduction Scheme" in 1997. Although the semiconductor chip and LDC, the main production items of the plant, consume relatively more chemicals, equipment and raw materials than other industries, the company was able to reduce the raw material use by altering feeds and improving the production processes. Increasing recycled items and identifying new suppliers helped the plant to successfully reduce raw material per unit of product, from 9.9 kg/unit in 1997 to 8.0 kg/unit in 1998 and to 7.4 kg/unit in 1999 (approximately reducing 2,000 tons/yr). The recycling rate in the plant also went up by 2% (approximately 1,200 tons/yr). The Gyeong-In Environmental Agency selected the Giheung plant as **the Best Waste Reduction plant** in July 2000.

### Gumi Plant

The Gumi plant operates a scrubber to reduce hydrogen chlorides produced during the optic fiber production process. In addition 870CMM-capacity **wet scrubber** is installed to treat hydrogen chlorides in times of increased production or breakdown of the primary scrubber. The



Installed a third water treatment facility in the final discharge outlet to minimize pollutants.



Green Park helps to effectively manage wastes and to increase recycling.



In order to reduce chloride gas, scrubbers have been installed and operated for optical materials such as Sol-Gel.

**Recycled Wastes for Cement Material**

Plants	Recycling
Suwon	137 ton/month
Giheung	1,500 ton/month
Cheonan	600 ton/month
Onyang	141 ton/month
<b>Total</b>	<b>26,892 ton/yr</b>



Waste vinyl is recycled and effectively managed using a recycling compressor.

plant also built and installed a 6-stage tower for the purpose of removing of highly concentrated HCl that is generated in the production process of optical materials such as Sol-Gel. The equipment enables the plant to control and maintain HCl level below 20% of the permitted level.

**Cheonan Plant**

Although acid gas is neutralized in the acid scrubber, emission gases still contain NOx that produce a slight odor. As a solution, the Cheonan plant uses NaOCl in the neutralization process to reduce the NOx content in the emission. Moreover, the wastewater treatment facility produced strong odors during the treatment processes including the concentration tank, aeration tank, sedimentation tank, etc. In response, the plant installed a deodorizing facility to reduce the level of odor in the treatment process. Furthermore, the waste vinyl in the plant is no longer is outsourced for processing, but recycled and minimized in volume using a recycling compressor.

**Onyang Plant**

The Onyang plant, a major semiconductor manufacturer, focuses on developing Green Packages. In addition, waste materials are recycled into cement to save cost and to protect the environment. Accordingly, 141 tons of sludge and EMC Cull are recycled and used for cement production. Wastewater is also recycled through CMF (Continuous Micro Filter) to reduce water consumption and wastewater discharge.

**Gwangju Plant**

The Gwangju plant manufactures refrigerators, vacuum cleaners, and compressors. As a way of source reduction, the plant uses LNG from the initial stage of production. In 1996, the plant built an underground sewage treatment facility and an aboveground pond and park to become a clean, and environment-friendly plant. Furthermore, pipes were installed to supply water from the pond to be reused for processes and toilets. These environment-friendly initiatives in the Gwangju plant have become a benchmark for the local community and students.

**Building a Safe Workplace**

**Ergonomically Engineered Working Environment**

The Suwon plant carried out detailed assessment of factors related with equipment, device, color and working environment to promote employee comfort, safety and productivity in hope to build a safer, healthier workplace.

For instance, the standing chair, developed for the first time in Korea,

allows employees to lean on it at all times to reduce fatigue and enhance work efficiency. Furthermore, various measures are taken to enhance safety of the workers such as the Tact Time Analysis by individuals and processes for the purpose of effectively distributing workloads. Samsung also provides wrist support and back support bands to reduce body fatigue, as well as tools that are ergonomically engineered to suit the size of individual workers hands.

### Integrated Disaster Control Center

The Integrated Disaster Control Center constantly oversees and monitors the environment and safety issues at each plant site to prevent the possibility of fires, explosions, floods and other potential disasters and controls damage in the event of an accident. The center is equipped with CCTV and ultra-sensitive detectors to ensure safety from fire, gas leaks, and chemical leaks. Moreover, the center operates an **Emergency Calling System** to comprehensively maintain safety in the workplace.

### First Aid Agents

**First Aid Agents** are trained to safeguard the lives of employees in the event of disasters or accidents. These in-house specialists receive professional training from the Korea Red Cross to enhance their expertise. In addition a one-day training program is provided to voluntary firemen in the workplace to train evacuation process and use of vertical ladder, rope descend, and other rescue equipment. In May 2000, the Suwon plant conducted a comprehensive emergency training exercise jointly with the local fire department to strengthen its control & command system and to effectively manage emergencies.

### Samsung 3119 Rescue Team

The Samsung 3119 Rescue Team was launched in October 1995, to protect the lives and safety of Samsung employees and to assist the nation and local communities in times of disaster. The team is also **the first private rescue team to be recognized by the government** and will continue to serve as a "guardian angel" that ensures safety in the workplace as well as the community.

## Building a Healthy Workplace

### Awarded HACCP Certificate

The Giheung plant was **the first in Korea to be awarded the HACCP (Hazard Analysis Critical Control Point)** from the Korea Food & Drug Administration (KFDA) for meeting sanitation and safety standards as a cafeteria. HACCP is a process of defining risk factors in all of the food preparation stages,



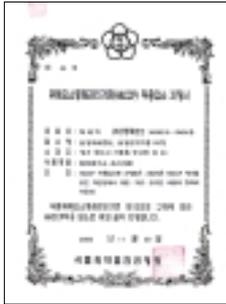
The standing chair is used to alleviate fatigue and to enhance efficiency of workers.



Samsung trains in-house FAA specialists to effectively prepare for any emergency.



The Samsung 3119 Rescue Team not only protects the environment within the plants but contributes to the society and community as well.



The Giheung plant's cafeteria was awarded the HACCP certificate from the Korea Food & Drug Administration.



The In-house Health Care Center promotes a healthier working environment by providing medical and fitness facilities.

including ingredient production, cooking, processing, preservation, distribution and consumption.

HACCP is a scientific sanitation program that prioritizes and focuses on effective management of food processing to ensure food safety. Since 1995, when legal provisions were established, HACCP regulated and defined standards for the business location, facilities, cooking equipment, anti-vermin facilities, sterilizing equipment, waste storage facilities. It is applied to livestock, fisheries and dairy products.

### On-site Medical Facilities

Each plant operates an on-site infirmary equipped with **medical facilities** and staffed by medical professionals to provide basic health care services to its employees.

The infirmaries provide prescription drugs and medical treatment to all the employees as well as individualized guidelines for preventing occupational diseases, storage and usage information of emergency medicines and counseling service on adulthood diseases. The infirmaries also provide a health-counseling service from outside doctors, including Chinese herbal medicine doctors, and physical checkups. It also operates the **Wellness Clinic**; a fitness club equipped with 28 types of exercise equipment, which is open 24 hours a day.

### Lumbago Exercise Training

Depending on the working environment of each plant, individualized exercise programs are developed and practiced for a healthier and more efficient workplace. In Samsung Electronics' case, we developed a lumbago exercise to alleviate pain in the lower back coming from the workplace. As a result, the number of workers affected by lumbago was reduced substantially.



# Greening of Communities

Samsung Electronics is engaged in a variety of support activities to improve the safety and environment for local communities, which include our business partners. Although we have taken the initiative, we hope to encourage participation and to ultimately build an inclusive community-wide Green Partnership.



The campaign to save fireflies is part of Samsung Electronics' effort to preserve nature.



Conserving the integrity of the environment requires a concerted effort by companies, communities and civic groups.  
Photo: Green Running Festival



Transparency is fundamental to a company's coexistence with the society.  
Photo: Samsung Electronics' facilities are open to public scrutiny in the Green Tour

## Commitment to Environmental Integrity

Samsung Electronics has launched various initiatives to prevent environmental destruction and to preserve nature, with continued efforts to promote public awareness regarding the importance of environmental protection.

### Adopt-a-Mountain, Adopt-a-River Clean up Program

Each of the Samsung Electronics plant sites nationwide has chosen one mountain and one river to care for in an attempt to realize the principle of Green Management and to fulfill its responsibility to society. This "Adopt-a-Mountain, Adopt-a-River Clean up Program" is aimed at restoring the damaged natural environment and caring for it. Local governments and community residents also participate in our initiative for the Greening of Communities.

### Saving Fireflies

Since 1999, Samsung Electronics has been conducting research and promoting public awareness on the habitat of fireflies, one of the index insects of a clean environment. We released melanin snails at Mt. Gwang-gyo in the City of Suwon to feed fireflies as part of our endeavor to save them and their habitat.

### Cleaning Up the Environment

Our commitment to a clean environment goes beyond the plant sites. We believe the communities we operate in suffer the same fate as ours and therefore are directly involved in various activities to keep the communities clean. Such activities are carried out not only on the World Water Day and the Environment Day but also on a continual basis by voluntary participation of all the employees. Moreover, the support of community residents is making our activities more effective.

### Samsung's "Green Running Festival"

On the occasion of Environment Day, we organized a "Green Running Festival" to promote the public's interest in environmental preservation and reaffirm our commitment to the environment. Samsung Electronics employees, community residents, suppliers and public officials participated in the event.

### Designated as a "Green Tour Course"

In 1998, The Environmental Office of the Youngsan River designated Samsung Electronics' plant as a "Green Tour Course." The company's manufacturing and wastewater treatment facilities are open ten or more times a year for public officials, students and local residents. These Green Tours transparency in our efforts dealing with environmental issues.

### "Sister School" Programs

Each plant site has established a **sisterhood relationship** with a neighborhood school, conducting various programs to induce the participation of the community residents in protecting the environment. The programs include environment and awareness essay contests, poster contests, environment and safety catchphrase contests, recycling exhibitions and provisions of scholarships.

## Partnerships with Green Businesses and Support for Environment and Safety

Samsung Electronics is spearheading the efforts for the **Greening of Communities by forming Sister Company Partnerships** with other businesses. We provide technical training as well as transfer advanced technologies. We also exchange information with the local fire departments and conduct **environment and safety inspections on our suppliers** at least twice a year. We provide them with our expertise and advice and help them improve their capacity for managing environment and safety.

## Nature-friendly Eco-pond

In the Green Park at our Giheung plant, we created a pond with a size of 30,000-pyong(approx. 9000m<sup>2</sup>). The purpose of the pond is to obtain basic data needed to develop advanced wastewater treatment technology and to monitor of how the treated effluents affect bio-diversity. A **Nature-friendly Eco-pond** is a body of water where cleaned and treated wastewater is discharged and naturally purified one more time by the pond's plants.

The pond is composed of a water tank and vegetable sewage disposal tank. Wastewater flows from the water tank to the vegetable sewage disposal tank, where emerged plants with excellent water purifying ability eliminate nitrogen, phosphorus and BOD in the water. These plants and organisms inhabiting the pond form a food chain to maintaining the ecological balance in the pond. These plants and microorganisms that are depending on each other creates a synergy effect and further strengthens the purifying capability of the pond.

At present, a total of six emerged plants and hygrophytes including *Typha Angustata*, *Zizania Latifolia*, and *Eleocharis kuroguwai* populate the pond and surrounding areas. Insects such as dragonflies, grasshoppers and beetles also inhabit the pond. Samsung Electronics also has other programs centering on the pond, such as a program inviting local elementary school students and residents to come experience the mini-ecosystem and learn about the how plants can natural purify wastewater.



Samsung Electronics promotes public awareness of environment and safety through various programs.  
Photo: Students from "sister schools" visiting a Samsung Electronics plants



Samsung Electronics supports suppliers through various partnership programs.



A Nature-friendly Eco-pond was created for research and development of next generation wastewater treatment technology.

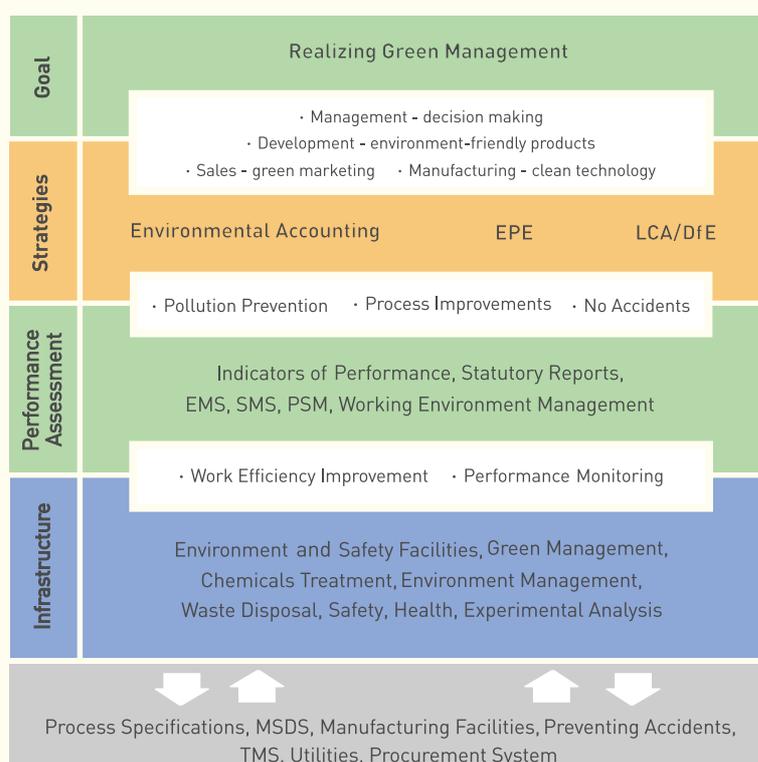
# Vision for Green Management

Since May 1996 when "Samsung's Green Management" was launched, Samsung Electronics has reported a number of achievements in preventing environment, health and safety related accidents as well as in enhancing competitiveness through cutting cost and improving energy efficiency. Even under difficult economic conditions since 1999, Samsung Electronics continued to expand its Green Management system and pursued the goal of realizing an accident-free, illness-free and pollution-free workplace. At the same time, we have constantly engaged in protecting the environment we operate in and supporting our suppliers. We also introduced clean production technologies as a way to make our products more environment-friendly.

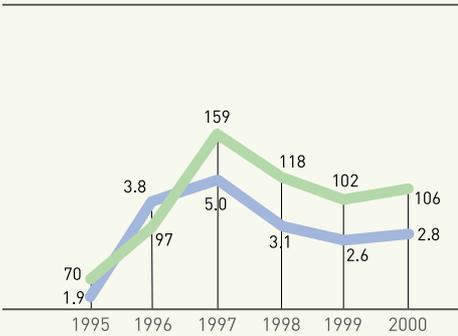
At present, all of our six plant sites in Korea are ISO 14001 certified. We are expanding the scope of Green Management to include our overseas plant sites as well, starting with the one in Malaysia that earned ISO 14001 certification in 1999. In addition, Samsung's display device business unit earned the European Environmental Labelling and the digital printing business unit earned the Korean Environmental Labelling. Such achievements represent Samsung Electronics' efforts to provide our customers with environment-friendly products.

Samsung Electronics plans to conduct Environmental Performance Evaluation (EPE) on other areas such as corporate organization and system, and apply it on work sites. LCA will be adopted as a basis of green product development and green marketing. By sharing our experience in Green Management with our suppliers and the communities, we will build a foundation to prosper together.

With the pursuit of Green Management, Samsung Electronics will continue to create new values as a digital leader in the 21st century.



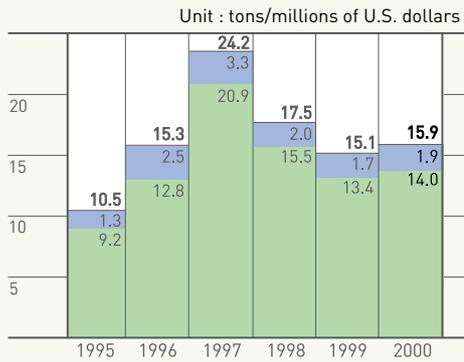
# Indicators of Performance



**Energy Consumption**

Recognizing that energy conservation contributes to not only corporate profits but also to national competitiveness, Samsung Electronics actively participates in government programs to conserve energy. At the same time, we also take proprietary actions to reduce energy at our plants. As a result of the Greening of Processes, Products and Management, we have seen a dramatic fall in energy consumption. In 2000, energy consumption increase has been minimal despite operation capacity buildups at our plant sites.

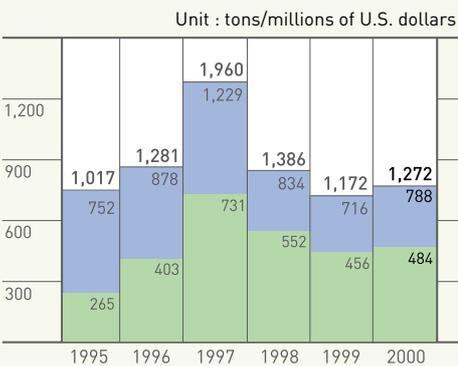
Electricity (millions wh/millions of U.S. dollars)      LNG (thousands m³/millions of U.S. dollars)



**CO2 Emission**

Along with atmospheric water vapor, CO<sub>2</sub> is one of the major greenhouse gases that cause a rise in Earth's temperature. The greenhouse effect is a serious threat to the environment as it alters Earth's normal weather patterns. In response to this global problem, Samsung Electronics actively conducts research and other measures to abatement CO<sub>2</sub> emissions at its plant sites.

CO<sub>2</sub> emissions of electricity      CO<sub>2</sub> emissions of LNG



**Water Consumption**

In line with the Greening of Processes, all Samsung Electronics plant sites are reducing the amount of industrial water used for production. In 2000, 484 tons/millions of U.S. dollars of industrial wastewater was reclaimed and reused. Moreover, the fact that this achievement took place despite the increase in total production volume reflects Samsung Electronics' strong commitment towards conservation of water resources.

Recycled water      Industrial water

### Toxic Chemicals

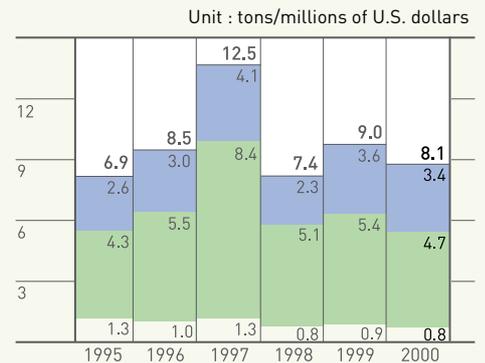
In order to gradually reduce the toxic chemicals used in production and wastewater treatment, we reduced the number of processes where these chemicals are used and computerized the toxic chemical feed system. Although the absolute amount of toxic chemical use rose in 2000 over that of 1999, it was due to increased production. Chemicals use volume as compared to production volume has actually been decreasing.



### Industrial Waste Treatment and Recycling

Samsung Electronics has been constantly developing creative ways to reduce industrial waste and promote recycling. Our "Green Park" and Recycling Center, the R&C Band, as well as recycling industrial waste into raw material for cement are some of our many creative ideas that have been implemented. As a result, we have substantially reduced the amount of industrial waste even while our total production volume increased.

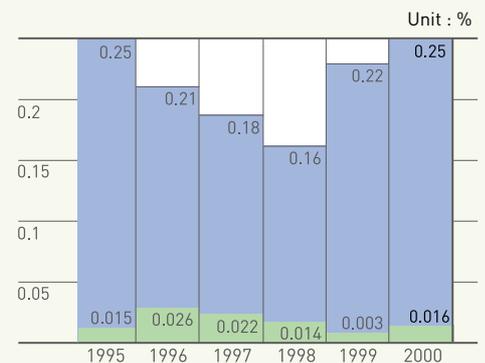
Incineration on site
  Controlled destruction & landfill
  Recycling

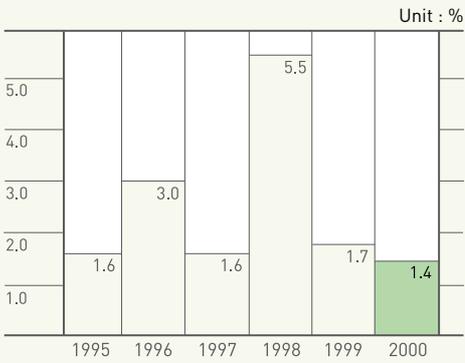


### Industrial Accident Rate

Thanks to stringent internal safety policies and a 24-hour monitoring system, Samsung Electronics set a record in December 2000 of operating 60 consecutive free of any industrial accidents and received the No Claim Bonus from our insurers. Samsung Electronics' accident rate is significantly lower than the industry average, establishing Samsung Electronics' plants as "safe and accident-free workplaces."

Accident rate at Samsung Electronics
  Accident rate at Korean electronics industry (average)

$$\frac{\text{No. of people in accidents}}{\text{Total No. of employees}} \times 100$$




**Environment and Safety Investment Ratio**

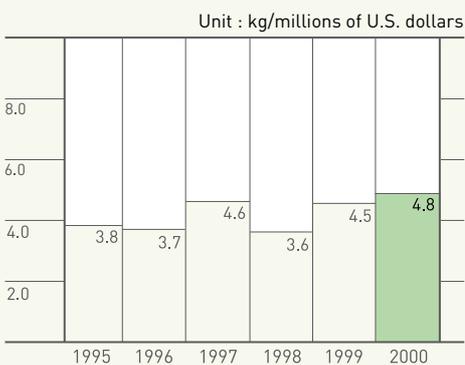
In pursuit of world class quality, Samsung Electronics is making capital investments to further improve product quality. At the same time, we are making every effort to reduce the amount of the pollutants generated during product manufacturing by upgrading processes and investing in environment and safety facilities.

$$\frac{\text{Environment and safety investment}}{\text{Facilities investment}} \times 100$$



**COD**

COD (Chemical Oxygen Demand) is the amount of oxidizers that need to be supplied into urban or industrial wastewater to effectively oxidize the organic compounds. Samsung Electronics takes active measures in a variety of areas to control wastewater and limit its amount of COD.



**SS Discharge**

Suspended solids, or SS, are small particles smaller than 2mm in diameter stay suspended in water. They do not dissolve in water and causes water pollution. Samsung Electronics is operating a Tele-Metering System (TMS) and a Bio-Reactor system, so as to reduce SS as well as effectively treat industrial waste water.

---

### SOx Emission

Sulfur oxide compounds or SOx are released when materials containing sulfur are burned, when metals are melted or refined, during the production of sulfur dioxide as well as oil refining and manufacturing of chemical fertilizers. SOx can cause bronchitis and pneumonia, and in some cases, lead to respiratory disorders. In an attempt to reduce SOx emission, Samsung Electronics is switching to clean fuels such as LNG.

---



---

### NOx Emission

Nitrous oxide compounds or NOx include nitrogen monoxide and nitrogen dioxide, which are air pollutants released during combustion of oil or coal. Mining, power generation and automobile exhaust fumes are the main sources of these gases. Samsung Electronics has been investing in research and facilities to minimize the emission of NOx and put in place a thorough neutralization process to reduce NOx concentration.

---

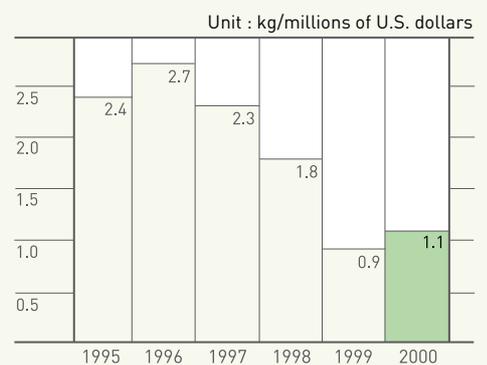


---

### Dust Emission

Small particles in the atmosphere are referred to as dust. Since it is one of the main air pollutants, dust sources are required to be equipped with scrubbers. Samsung Electronics has installed state-of-the-art scrubbers to control dust emissions while minimizing the amount of dust produced at the source in the manufacturing process.

---



## Certificates and Awards

### **Suwon Complex**

1996.6  
Grand Prize for Green  
Management (Maeil Business  
Newspaper and Ministry of  
Environment)

1999.11  
KOSHA 2000 Program  
Certification

2000.6  
Industry Safety Health New  
Technology Improvement  
Gold Medal in Corporate  
Competition

2000.11  
ISO 14001 & OHSAS 18001  
Simultaneously Certified

2001.7  
Presidential Award for  
Outstanding Corporate Industrial  
Safety Achievement

### **Giheung Plant**

1999.12  
Semiconductor Division ISO  
14001 and OHSAS 18001  
(BS8800/Safety Certification)

2000.7  
Presidential Award for  
Outstanding Corporate  
2000.10  
Industrial Safety Achievement  
Officially Listed in Guinness  
Book of World Records for  
Accident-free Record

2000.11  
NSC Award (Presidential  
Special Award)

### **Onyang Plant**

1999.12  
Semiconductor Division Certified  
ISO 14001 and OHSAS 18001  
(BS8800/Safety Certification)

2000.4  
UNEP Korean Committee  
Chairman's Award

2000.5  
Clean Water Award

2000.12  
Grand Prize for Safety  
Management

### **Cheonan Plant**

1999.11  
Outstanding In-house Fire  
Fighting Team (Governor of  
Chungnam Province)

2000.6  
Semiconductor Division Certified  
ISO 14001 and OHSAS 18001  
(BS8800/Safety Certification)

2000.11  
TPM Most Outstanding  
Workplace Award

2001.1  
Set World Record for 5  
Consecutive Accident-free  
Periods  
(9.6 million man hours)

### **Gumi Plant**

2000.6  
Grand Prize for Green  
Management (Maeil Business  
Newspaper and Ministry of  
Environment)

2000.6  
KOSHA 2000 Program  
Certification

### **Gwangju Plant**

1999.11  
KOSHA 2000 Program  
Certification

1999.11  
Outstanding In-house Fire  
Fighting Team (Ministry of  
Government Administration  
and Home Affairs)

2000.10  
Declaration of Nature Protection  
Day - Minister of Environment  
Award for Group  
(Ministry of Environment)

2000.11  
Best Practice Award for  
Workplace Health  
Promotion (Ministry of Labor)



