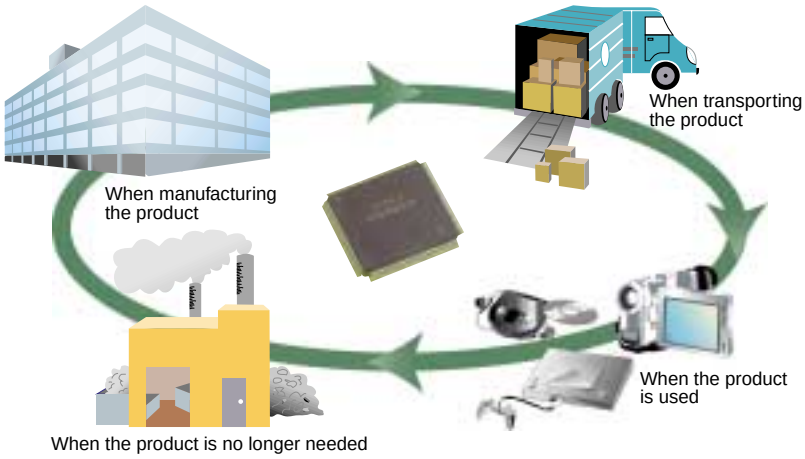
Sony Semiconductor's Environmental Efforts
– Towards a Circulatory Society

In October 2000 Sony, as part of it's efforts towards creating a sustainable society, formulated its "Mid-Term Environmental Vision", which aims at doubling the environmental efficiency of the Sony Group as a whole by 2010. The Sony Semiconductor Group is also engaged in a variety of environmental activities based on that Mid-Term Environmental Vision. This article introduces several of these efforts that are underway at Sony Semiconductor.

Environmental Concerns Throughout the Product Life Cycle

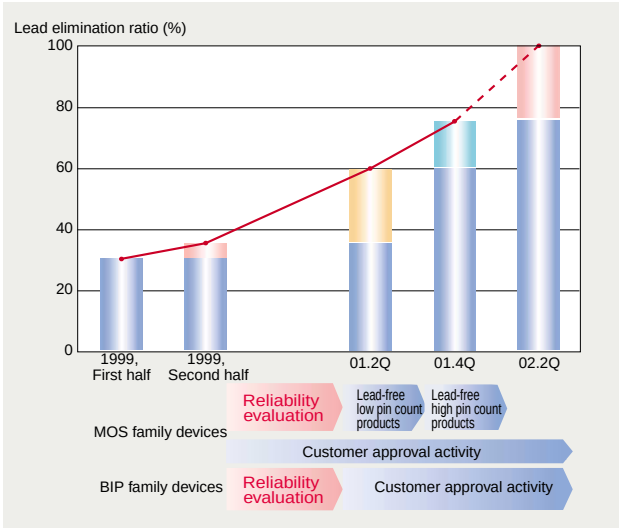
Sony Semiconductor is analyzing the overall life cycle of its products, and working to protect the environment in a variety of ways at different points in the product life cycle.



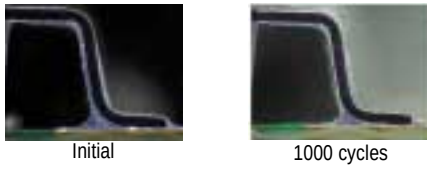
Environmental Considerations Applied to Products

Efforts to Switch to Lead-Free Solder in Semiconductor Products

If the lead included in many types of solder were not processed appropriately and discharged, it could be dissolved by acid rain and pollute the groundwater. In Japan as well as Europe, Sony is working aggressively to increase the collection rate for electric and electronic equipment and to discard that equipment only after it has been processed to an appropriate state to reduce the influence on the environment of this equipment. Furthermore, Sony is accelerating its efforts towards abolishing the use of lead-containing solder in the manufacturing process and abolishing the use of lead-containing solder on component leads and contacts.
Conventionally, electrodes of semiconductor product have been plated with lead-containing solder to attach them to the printed circuit board. As part of Sony's environmental efforts, Sony has started work on making these components lead free.
By replacing the plating material previously used for external contacts with a plating material whose main component is tin and that contains no lead, Sony has eliminated lead from 70% of its products. As of March 2002, Sony had made it technologically possible to remove lead from 100% of its products, and is now working towards lead-free manufacturing of all its products.



■ **Trends in the Elimination of Lead**

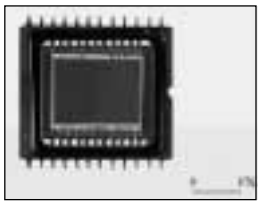


■ **Cross-Sectional Views of Sn-Bi Plating (Lead-free solder)**

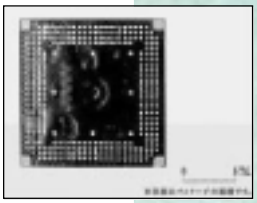
Lower Resource Usage and Lower Power in Semiconductor Products

At Sony Semiconductor, Sony is adopting new methods in their efforts at reducing resource usage and power consumption. In CCD devices, Sony has, by applying unique processes and circuit technologies, achieved both miniaturization of the sensor area and increased sensitivity, enabling the miniaturization of end products that use CCDs. This will contribute to reducing the amount of materials used and to reducing resource consumption overall during end product manufacturing.

In System LSIs, Sony has succeeded in including both memory elements and logic circuits on the same silicon substrate, thus achieving both high performance and low power consumption. Furthermore, Sony has reduced operating voltages to as low as 1.5 V. For example, the Sony IP7 network Handicam product, which uses these technologies, has an operating power consumption of a mere 3.5 W. When using an NP-FF70, it can record continuously for up to 2 hours and 50 minutes.

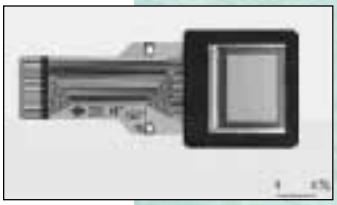


Type 2/3 5.07 M-pixel color CCD imaging device



System LSI (MPEG2 video codec)
This photograph shows the back of the package

Low-power CDMA analog baseband IC for mobile communication applications



LCD for color viewfinder

Reuse and Recycling of Semiconductor Packing and Containers

To reduce the amount of waste generated in reuse of packing materials related to semiconductor product, Sony is working towards the reuse of packing materials and the recycling of damaged materials. In particular, Sony Semiconductor has created its own domestic (Japan) collection system.

Sony led the semiconductor industry by initiating efforts at reusing packing materials in 1991, and still continues its reuse and recycling activities at a high level.

Sony plans to expand its efforts in this area throughout 2002 and further increase its reuse ratio.

Sony Semiconductor Reuse and Recycling Efforts

1991 - Proposed the reuse of semiconductor packing materials.

1992 - Began study and evaluation of collection methods and the quality of reusable materials in conjunction with packing materials manufacturers and customers.

1993 - Started reuse of hard trays and magazines.

1994 - Established company-wide reuse and recycle directions, and promoted and implemented increases in the number of reused items.

1997 - Implemented CCD and LCD soft tray reuse for the first time in the semiconductor industry.

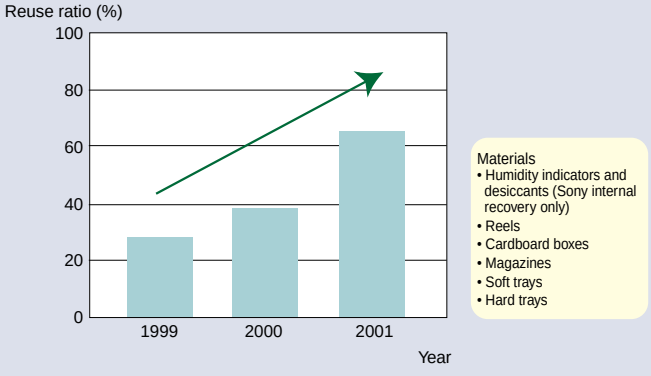
1998 - Started reuse of both cardboard boxes and cushion materials.
Added Sony logos to hard and soft trays and magazines.

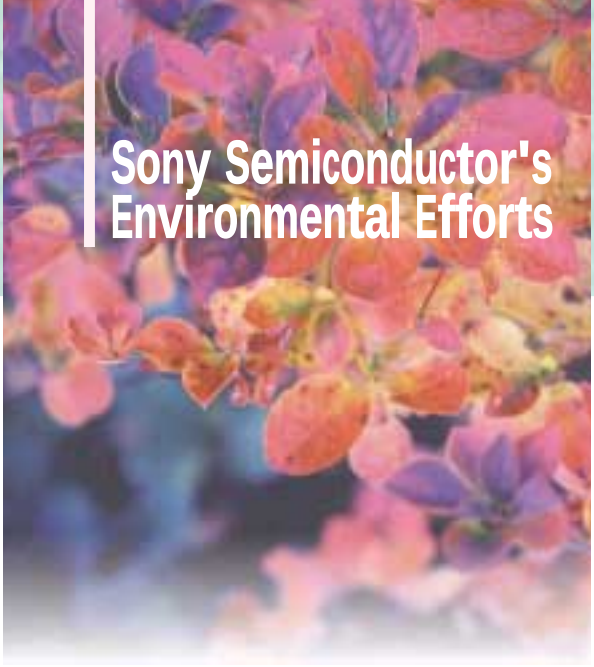
2000 - Started reuse of desiccants and humidity indicators.
Expanded hard tray recovery route in markets outside Japan.

2001 - Made presentations at events and environmental product conferences, and promoted increases in reuse rates.
Created a direct recovery organization (for economic effects) between SCT*1 and Sony EMCS*2 (Kisarazu TEC, Koda TEC, and Minokamo TEC).

*1 SCT:Sony Semiconductor Thailand
*2 EMCS:Engineering Manufacturing and Customer Services

Sony Semiconductor Packing Materials Reuse Achievements





Sony Semiconductor's Environmental Efforts

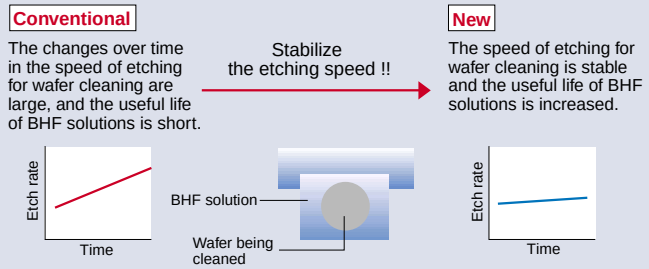
Environmental Considerations during Manufacturing

■ Sony is developing technologies that reduce the environmental load of semiconductor manufacturing processes.

1 Extending the life of buffered hydrofluoric acid (BHF) solutions

Sony invented a simple composition control method for the buffered hydrofluoric acid used in large quantities in semiconductor manufacturing, and extended the life of these chemicals in wafer cleaning by a factor of 10. This allowed Sony to significantly reduce the amount of sludge generated in treatment of waste fluorine-based chemicals.

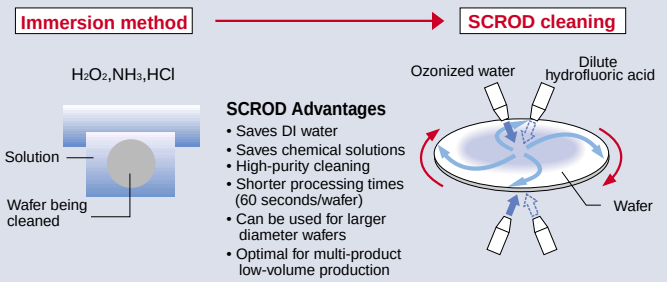
Extending the Life of Buffered Hydrofluoric Acid (BHF)



2 Single-wafer spin cleaning with repetitive use of ozonized water and dilute HF ("SCROD")

Sony developed the "SCROD" repeated single-wafer cleaning technique, which enables the amount of chemicals and DI water used to be reduced by a factor of 25.

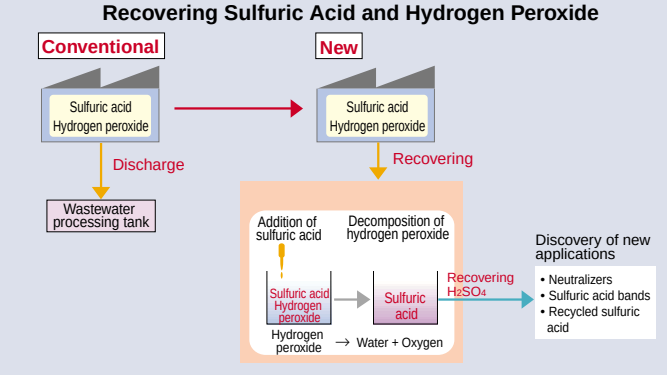
Single-Wafer Spin Cleaning with Repetitive Use of Ozonized Water and Dilute HF ("SCROD")



3 Recovering sulfuric acid and hydrogen peroxide

Sony has developed technology for reclaiming sulfuric acid and hydrogen peroxide which was previously simply discharged, as regards sulfuric acid which is the chemical used the most in semiconductor manufacturing process. Sony is also developing new applications for reclaimed sulfuric acid.

Recovering Sulfuric Acid and Hydrogen Peroxide



Making further progress towards the highest level of zero emissions operation at the Kumamoto Technology Center, a leading edge semiconductor manufacturing site

Sony Group has the goal of achieving zero emissions, which means eliminating materials that, in the production or development processes, cannot be reused and are finally discarded. To achieve this, Sony is promoting recycling (resource recovery), reuse, and the elimination of waste. In semiconductor manufacturing, the processing of wastewater from the manufacturing process is a key issue for achieving zero emissions.

While supporting leading edge semiconductor manufacturing processes such as 300 mm wafer manufacturing, the Kumamoto Technology Center is implementing resource recovery from used cleaning solution and other chemicals. This facility has achieved the highest level of zero emissions operation. It is also moving forward with energy savings techniques intimately connected to the local area, such as the use of locally supplied natural gas and the adoption of solar generators.

By the end of March 2001, five Sony semiconductor sites, Kokubu, Nagasaki, Oita, Atsugi, and Shiroishi, had achieved zero emissions, defined as a 99% resource recovery rate.

Kumamoto Technology Center

Communicating Sony's Environmental Activities

Environment-Related Advertising

"What Sony semiconductor products have done for the environment. And what they will do."

Advertisement taken out in the October 11, 2001 Nihon Keizai Shinbun

Monthly Environmental Activities

–– Sony declares June to be Environment Month, and sponsors activities at many locations.––

• Environment Summit

Top management and environmental officers from both domestic (Japan) locations and international sites meet to discus strategies and tactics.

• Lectures on the Environment

Professor Yukio Yanagisawa of the University of Tokyo lectured on mechanisms of global warming in 2001.

• Regional Meetings

Sony held meetings to which local officials, residents, and grade school students were invited. (Sony Atsugi TEC, Sony Semiconductor Kyushu)

• Regional Volunteer Activities

Sony Atsugi TEC and Sony Semiconductor Kyushu sponsored local volunteer activities, such as flower planting.