

6.5 Water Resource Management

As global climate change becomes more severe, development and allocation of water resources has become a key issue in many countries. It is particularly vital in Taiwan, a highly industrialized and densely populated island with mountainous terrain that does not retain water easily. Development of water resources and balancing ecology with economy has become an important issue for both government and the private sector. TSMC recognizes both that water resources are limited, and that water conservation is one of our highest priorities in resource conservation. TSMC's sole source of water is the Taiwan Water Corporation, and our first principle of water use is reduction, followed by recycling.

6.5.1 Water Reduction and Recycle

Internal Water Saving Status

The primary method of water use reduction is to raise the efficiency of process equipment in using ultra-pure water. TSMC's facilities optimize the water consumption of process equipment and uses wastewater recycling systems to reduce water usage and production of wastewater. TSMC carefully categorizes post-process water by quality to improve water-recycling rates. We use recycled water in the manufacturing process or secondary uses including cooling tower make-up water, wet scrubber make-up water, cleaning water for sludge de-watering filter in wastewater treatment systems, or toilet water, which will not come into human contact. Secondary uses of water are also optimized to reduce make-up water quantity, maximizing water efficiency to reduce water costs and wastewater production.

In 2007, TSMC's average process water recycling rate rose from 60% in 1993 to 80%, while the recycling rates of new fabs are all above 85%, meeting or exceeding standards set by the Science Park Administration, and also exceeding the process water recycling rate for international semiconductor fabs. Our major approaches are:

- Optimization of water usage for process tools, air pollution control wet scrubbers, cooling towers, ultra-pure water systems, and wastewater systems
- Installation of organic/acid water recycling systems, separated collection according to water quality, recycling water to ultra-pure water systems or secondary uses such as cooling towers
- Installation of general and copper-containing CMP wastewater recycling systems, recycling wastewater to ultra-pure water systems or secondary water use
- Installation of wet scrubber water recycling systems to recycle wet scrubber effluent after treatment
- Establishment of rainwater storage system on the roofs to supply plant irrigation systems, toilets, and wet scrubber water use
- Recycling of air condition condensation for cooling tower use
- Use of water saving faucets for employees
- 100% use of recycled water for toilet flushing
- Controlled water use for external wall cleaning and irrigation to avoid unnecessary water use

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TSMC Water Conservation Performance, 2003-2007

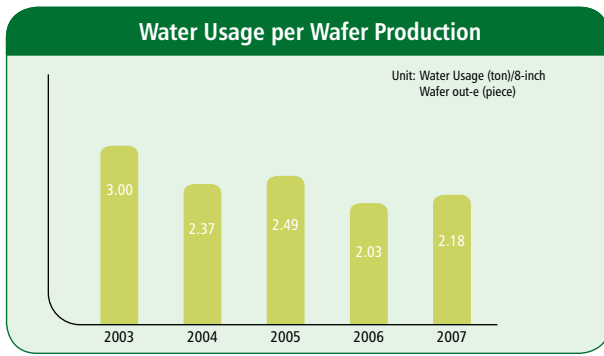
Item	2003	2004	2005	2006	2007
Average process water recycling rate (%) ¹	75.6	76.6	73.4	76.4	80
Water saved (10,000 tons)	991	1,162	1,331	1,628	1,373
Water saved, measured in standard swimming pools ²	3,964	4,649	5,323	6,511	5,493
Water saved, measured in the full capacity of Paoshan Reservoir ³	1.85	2.17	2.49	3.04	2.57

Note:

1. Average process water recycling rate is defined by the Science Park Administration.

2. A standard 50 x 25 x 2m swimming pool contains up to 2,500 tons of water.

3. Paoshan Reservoir is the major reservoir that supplies water to Hsinchu Science Park. The full capacity of Paoshan Reservoir is 5.35 million tons.



External Cooperation for Water Saving Activities

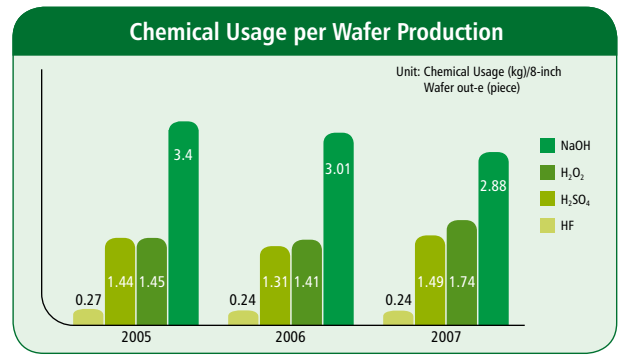
Since water resources are inherently local, TSMC shares its water saving experience with other semiconductor companies through the Association of Science Park Industries to promote water conservation. At the same time, TSMC collaborates with the Science Park Administration to assist small facilities in the Science Park in well water resource management to achieve the Science Park's goals and ensure long-term balance of supply and demand.

6.6 Pollution Prevention

TSMC believes that pollution prevention is one of a corporation's most important responsibilities. TSMC's pollution prevention is based on the ISO14001 environmental management system and uses the "Plan-Do-Check-Act" management model to promote continuous improvement. We believe that conserving raw materials, energy, and resources and reducing waste and pollutants both saves production costs and protects the environment.

TSMC has established comprehensive management and operations procedures for pipe-end treatments such as air and water pollution controls, and ensures these procedures are carried out precisely. TSMC has also installed monitoring systems on the discharging sides of pollution control facilities for on-line monitoring. Facility personnel follow emergency response and reporting procedures to take proper actions if operating conditions diverge from preset limits.

For waste management, TSMC has transitioned from traditional "treatment and disposal" to a concept of effective resource management and implements this concept in daily operations. We manage wastes as resources, categorize and collect waste at the source, raise waste recyclability, and also collaborate with waste treatment and recycling facilities to search for or develop possible recycling measures. With this waste resource management model, TSMC has successfully raised its waste recycling rate each year.



6.6.1 Water Pollution Control

TSMC's ultra-pure water system turns raw water into ultra-pure water mainly used in process tools for cleaning chemical residue on wafer surfaces. To reduce total water usage, TSMC's effluent water from ultra-pure water systems and process tools are graded by purity. The cleanest is reused by in the manufacturing process; the second grade taken from the recycling treatment is employed in secondary uses such as cooling-tower water. Wastewater that cannot be recycled is discharged to treatment facilities for final wastewater treatment.

TSMC adopts a strict front-end wastewater categorization strategy to improve treatment efficiency. Wafer fabs' wastewater can be divided into fluoride, general acid, and various polishing wastewaters. All kinds of wastewater are strictly categorized at process tools, and collected to wastewater treatment facilities through separated piping, carefully operated and maintained by professional teams to comply with the standards of the Science Park Administration (SPA). The water is then discharged to the SPA wastewater treatment plant for further treatment after professional teams ensure the discharge complies with SPA standards. The treated wastewater is discharged to rivers from the SPA's wastewater treatment plants in compliance with river discharge standards.

TSMC operates only after ensuring that the environment is not polluted. Each fab is equipped with effective wastewater treatment systems including complete back-up systems, such as emergency power supplies, to reduce the likelihood of abnormal discharge. Operating status of all of TSMC wastewater treatment systems are monitored 24 hours a day by shift personnel. If operating conditions shift from the preset limits, a warning signal is sent and wastewater discharge is halted. Data gathered for monitoring system effectiveness have been designated an important tracking item to ensure the effluent's quality.

Wastewater Effluent Monitoring Results

All TSMC fabs are equipped with continuous monitoring equipment to monitor and record changes in water quality, such as acidity and fluoride ion concentration, and quantity in order to take appropriate responses when abnormal situations occur. We also conduct off-site sampling and analyze wastewater effluents' quality at least four times a year, which also provides a calibration reference for on-line analyzers, ensuring that TSMC complies with water quality standards.