



SCREEN water management initiatives

Innovation for a Sustainable World

SCREEN Semiconductor Solutions Co., Ltd.

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Agenda

- **Introduction**
 - About SCREEN
 - Kyoto spirits for sustainability
 - SCREEN's sustainability activities for water usage
- **Total solution for water conservation**
 - Digital twin technology "WMA" produced by FTD
 - Current situation at SCREEN's site
 - Future plan

SCREEN Group Business & Organization

SCREEN Holdings



Headquarter

Tenjinkita-machi 1-1, Teranouchi-agaru 4-chome,
Horikawa-dori, Kamigyo-ku, Kyoto 602-8585

Headquartered in Kyoto where the
“Kyoto Protocol” was founded,
sustainable society/industry is at the
core spirit of SCREEN.

Business Operating Company

SCREEN Semiconductor Solutions

SCREEN Graphic Solutions

SCREEN Fintech Solutions

SCREEN PE Solutions

SCREEN Advanced System Solutions

Functional Support Company

SCREEN IP Solutions

Subsidiaries
of Holdings
Company

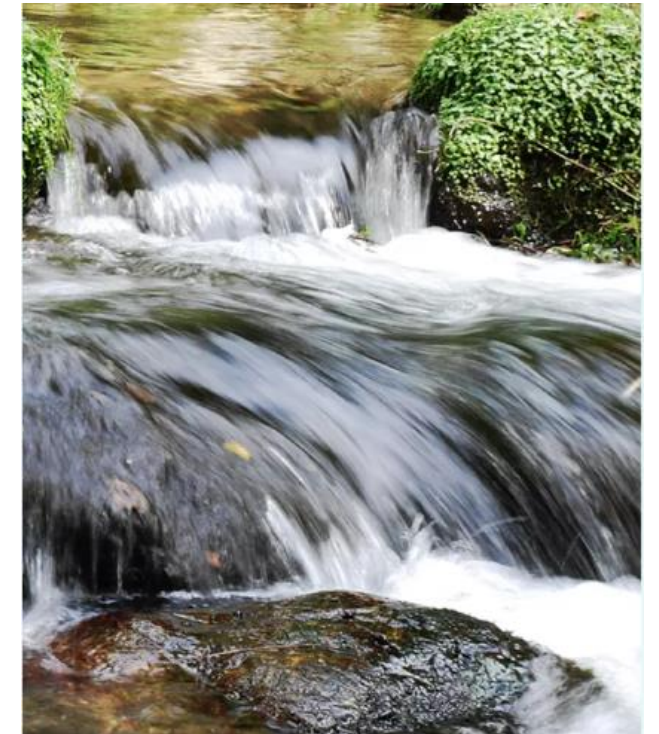
Subsidiaries
of the
Business
Operating
Company

Kyoto Spirit for Sustainability: Beliefs about water

There is a belief that water purifies and cleanses away sins and impurities. At Kamigamo, no matter which direction you enter the grounds, you must cross a river before reaching the main hall.

Source: <https://www.kamigamojinja.jp/en/grounds/>

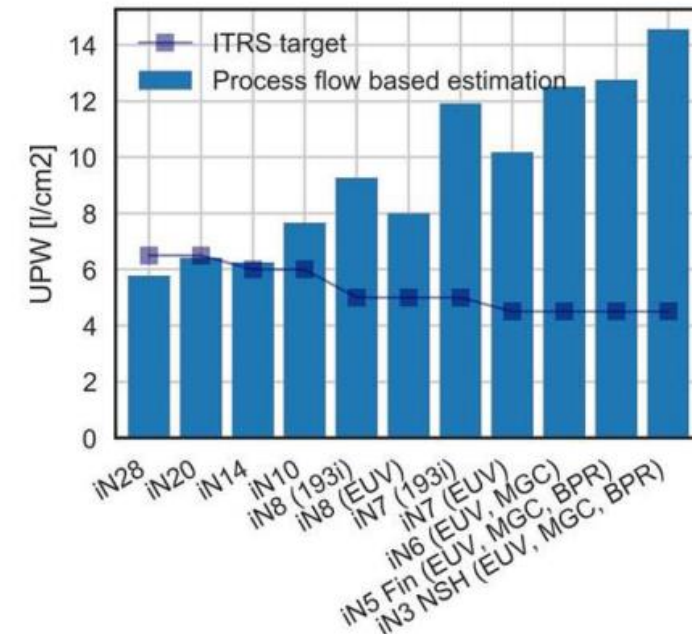
Shingu Jinja Shrine, located in the campus of Kamigamo Shrine, is dedicated to a dragon deity called Takaokami no Kami. The deity is believed to answer prayers about rainfall, field irrigation, flood prevention, safe travel by water, good health, and rejuvenation. The shrine is located on the northeast side of Kamigamo Jinja grounds, next to the main shrine area. The first mention of a shrine building on this site appears in Kamigamo Jinja records from 1048.



Source: <https://www.kamigamojinja.jp/en/grounds/>

Usage trend of ultrapure water (UPW)

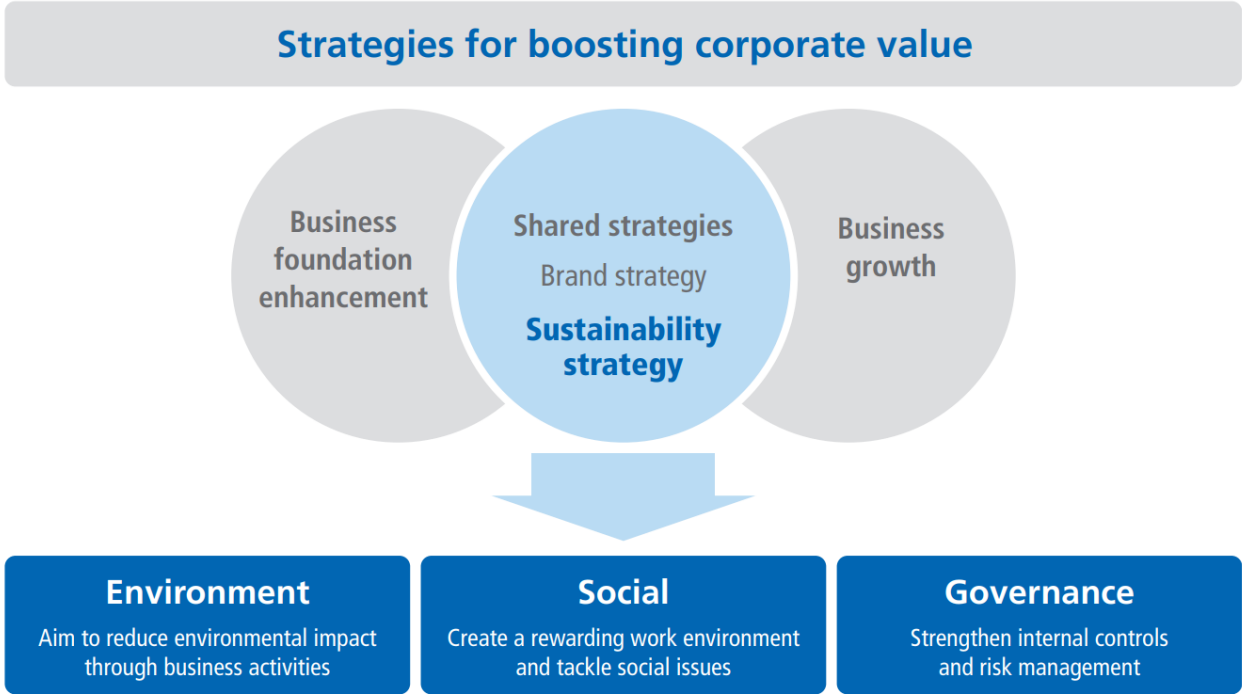
- These days, Semiconductor manufacturing is highly water-intensive, with an average facility using up to 40 million liters of UPW per day.
- In the semiconductor cleaning systems that we develop and manufacture, the increase of processes from further device scaling has raised the use of UPW.
- In response to these situations, managing water use is essential to mitigate environmental impact, ensure sustainability, and maintain operational continuity amid increasing global water scarcity.



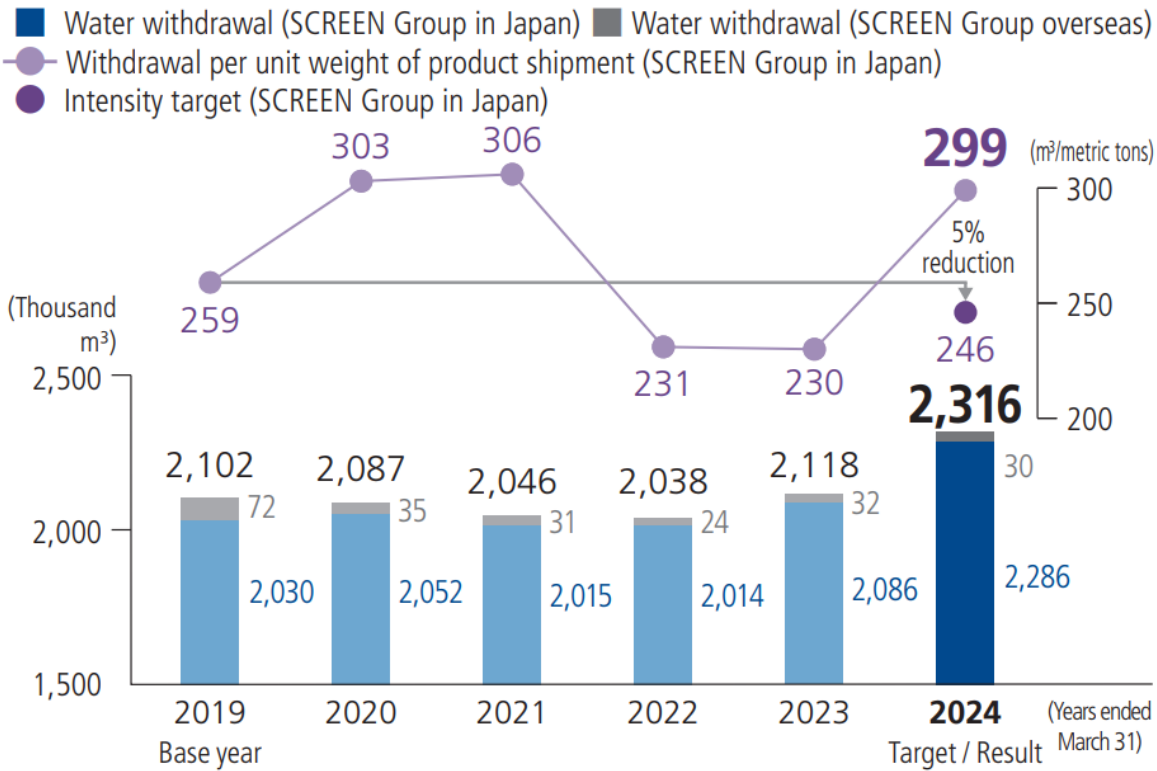
Total Ultra Pure Water(UPW) usage in liters per cm² for full process flows from iN28 to iN3 for 300mm wafer equivalent. ITRS guidelines shown as reference.

Sustainability Strategy and Water Conservation

SCREEN has addressed sustainability activities for many years.
We are expanding this initiative to our products as well.



Water withdrawal



SEMI Standard and Water Management Strategies

SEMI F98 - Guide for Water Reuse in Semiconductor Industry

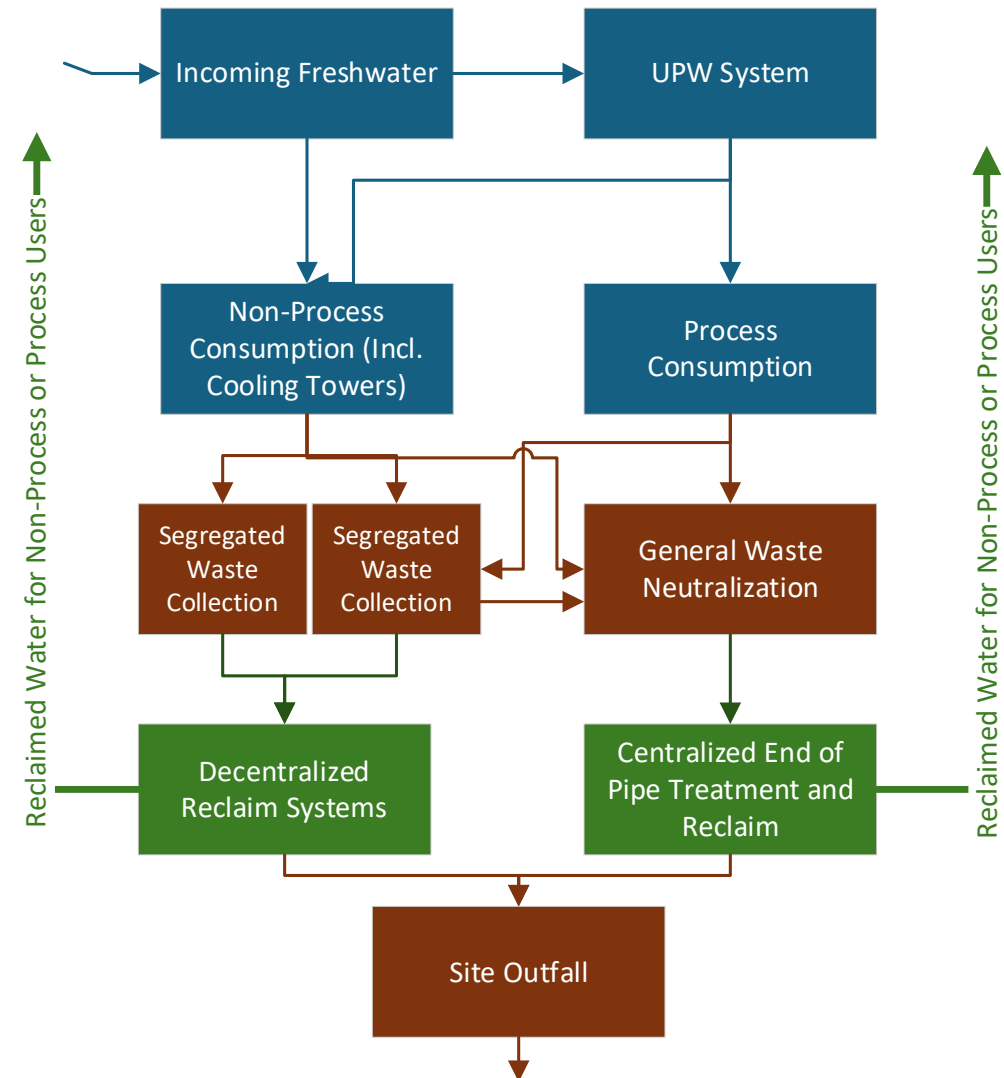
This Guide provides definitions and recommendations for design of industrial water treatment systems that reuse water in a semiconductor manufacturing facility. It also provided recommended Key Performance Indicators (KPIs) for water conservation accounting.

GENERAL STRATEGIES FOR WATER CONSERVATION BASED ON SEMI F98

Strategy 1 - Centralized: End-of-Pipe reclamation, where the main fab effluent stream is collected and treated by a centralized reclamation plant and subsequently reused.

Strategy 2 - Decentralized: Segregation-based approach, where segregation of wastewater is provided at the manufacturing tool level. Each stream is then treated separately and subsequently reused.

Strategy 3 - Hybrid: Hybrid is a mix of centralized and segregation-based approaches. In this approach, some streams are treated separately along with an end of pipe system to support reclamation.



Digital twin and data collection for water conservation

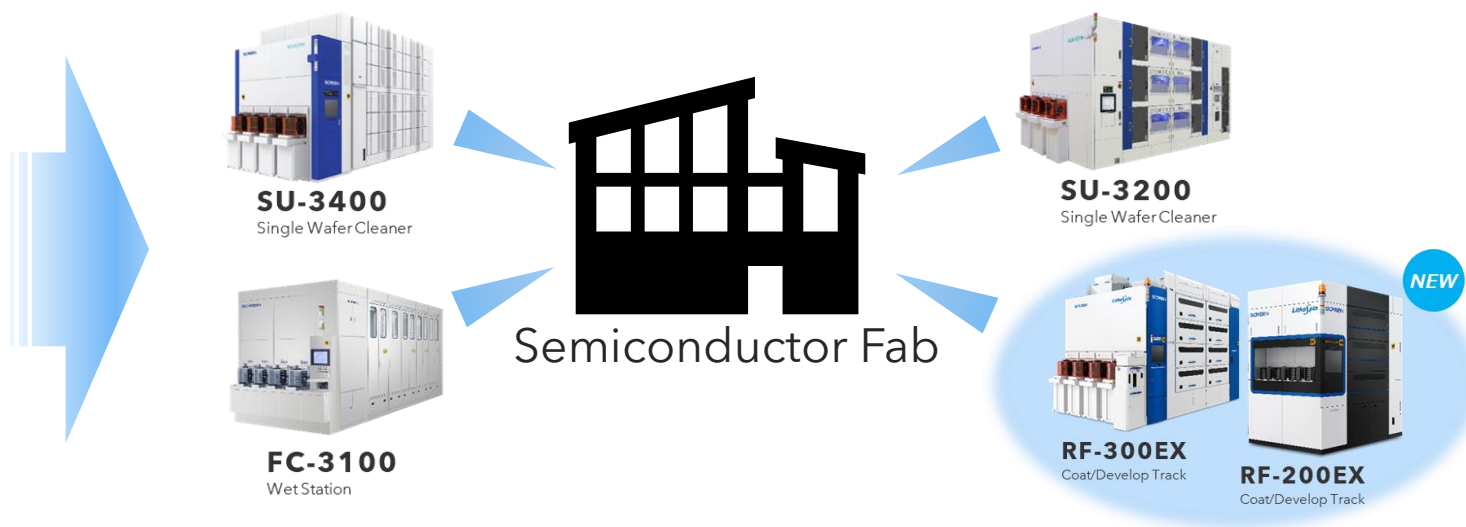
Recently we have reduced water usage in our products.

We have already started to develop the Fab total solution to reduce/reuse/reclaim materials.

Equipment itself



Fab total solution



For the total solution, we need numerous data from real fabs and develop the digital twin, in order to optimize the manufacturing environment and predict the further proposals based on the data.

Collaboration with FTD Solutions

Digitization using the Water Management Application (WMA®)



- WMA® platform produces digital twins of industrial facilities that drive water conservation via actionable insights, enabling:
 - Data-driven decision-making for optimized configuration and operation of site water systems
 - Validated water conservation accounting and performance tracking aligned with industry standards
 - Automated reports to support both innovation and sustainability reporting

WMA Water Management Application

The WMA (Water Management Application) is a secure web-based platform that uses a visual representation of water systems to automatically calculate flowrates and chemistry for every stream and system based on critical inputs.

The WMA enables industrial, commercial, and institutional users to conserve water, remain within environmental compliance limits, improve infrastructure performance, better manage operations, and reduce costs.

The screenshot displays a detailed digital twin of a water system. It includes a central network of pipes and tanks with various data points. On the left, there are panels for 'Simplified Lab Data Upload', 'Over 100 Chemistry Parameters' (listing elements like Aluminum, Antimony, Arsenic, Barium, Beryllium), 'Compliance Point Alarms', and 'Scaling Alarms'. On the right, there are panels for 'Units', 'Streamlined Quality Control', 'Automatic Calculation of Reclaim', 'Auto Report Generation', and 'Reporting'. A 'Report List' panel shows a table with columns for 'Parameters', 'Summary', and 'Status'. A 'Site Water Management summary report' is also visible, titled 'Case 4: City Water Quality Worsens / Case 4.A - Summer'.

<https://www.ftdsolutions.net/wma>

Collaboration with FTD Solutions

Solution Steps

Hikone site
(R&D and Manufacturing)



WMA®

1st Step (Complete)

Current Assessment
&
Baseline Modelling

WMA®

2nd Step (Future Goal)



Site Strategy

Implementation

Continuous
Evaluation



✓ Suboptimization for each tool

- ✓ Exploring issues
- ✓ Requirement for data collection
- ✓ Proposals for improvements

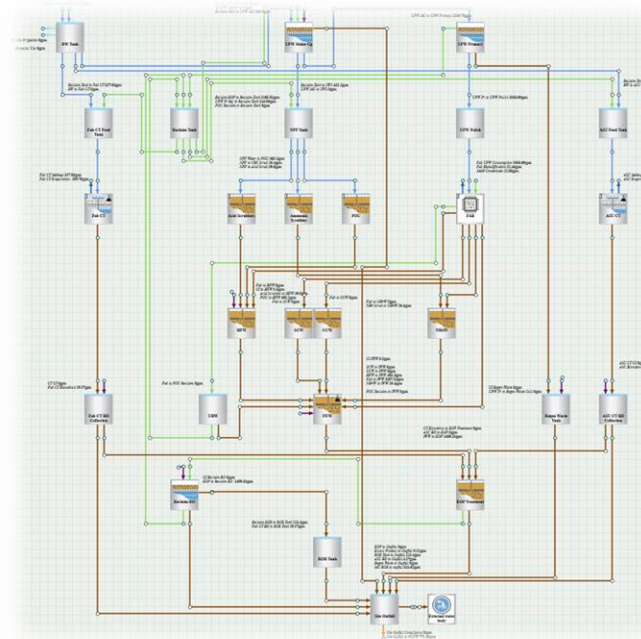
✓ Suboptimization for each tool
✓ **Total-optimization**

Collaboration with FTD Solutions

SCREEN's Hikone site

R&D area located at Hikone site has been studied via WMA®.

1. **Modeling & Assessment**



- ✓ Visualizing
 - piping
 - connection
 - equipment
- ✓ Data collection points
- ✓ Water/chemicals flow

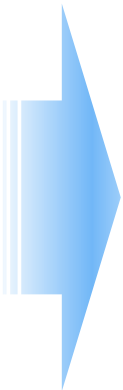
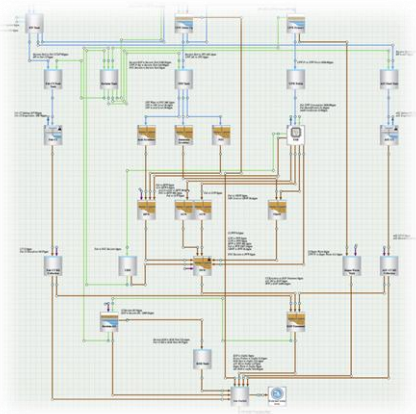
✓ Result of WMA modeling

- ✓ Provided site-wide flow and chemistry balance of a complex site
- ✓ Revealed findings that support future water conservation efforts at the site
- ✓ Enables strategy development in the next phase

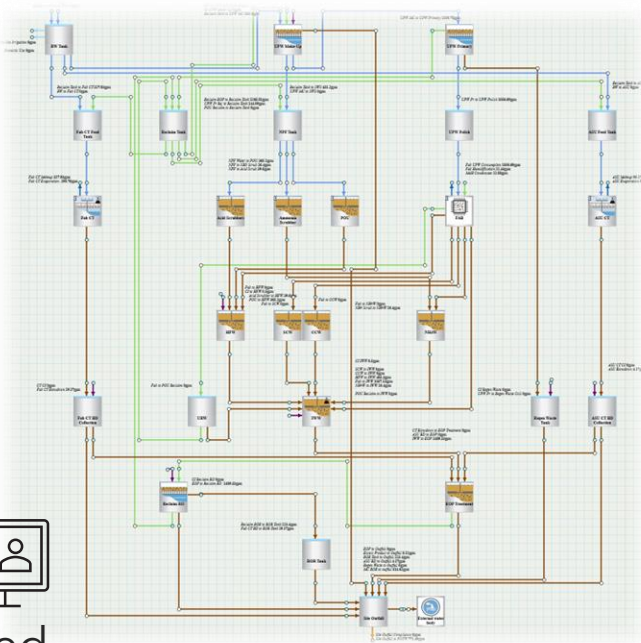
Collaboration with FTD Solutions

SCREEN's Hikone site

1. Modeling & Assessment




Automated
report




Sensors


Real-time
Monitoring

2. "Innovative fab design" Predicted by digital twin

Next step

Future Plan

Based on first initiatives, we have the following plans.

- Part 1 : Strategy Development

- Develop options for the site water management strategy based on SEMI F98
- WMA Model Version Development to support the site water management strategy

- Part 2 : Water Sustainability Program

- Develop water management standard
- Modeling efforts to enable sustainability performance tracking and reporting

- Part 3 : Tool Data Integration Into WMA - Proof Of Concept

- Demonstrate the effect of the different SCREEN tool configurations on a representative semiconductor site

Innovation for a Sustainable World

