

# Sustainable Water Management for the Microelectronics Industry

**WATER TECHNOLOGIES**

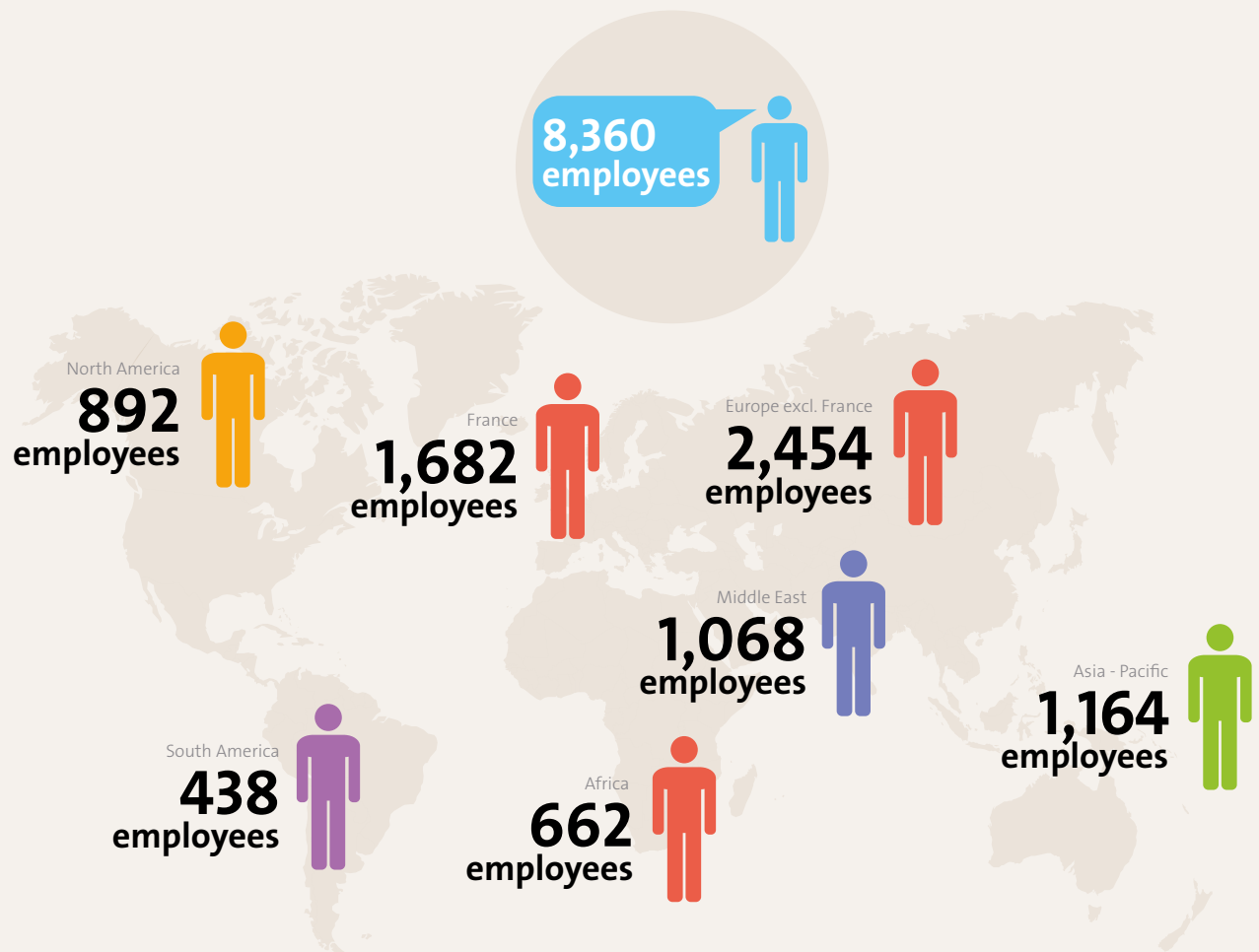
# About Veolia Water Technologies

Veolia Water Technologies specializes in technological solutions, provides the complete range of services required to design, deliver, maintain and upgrade water and wastewater treatment facilities for industrial clients and public authorities.

Our portfolio features everything from online diagnostic solutions to evaporation and crystallization, energy-producing sludge treatment, state-of-the-art desalination, laboratory-grade water and mobile water services.

Our experts deliver the water treatment solutions that improve the quality of people's lives in communities around the world. The performance of these installations depends on the creativity and commitment of our more than 8,360 employees.

Our global expertise is within your reach through extensive local technical support adapted to local regulatory requirements and market needs.



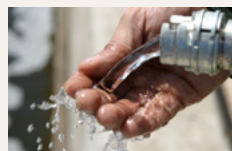
DRINKING WATER



WASTEWATER



SLUDGE



REUSE

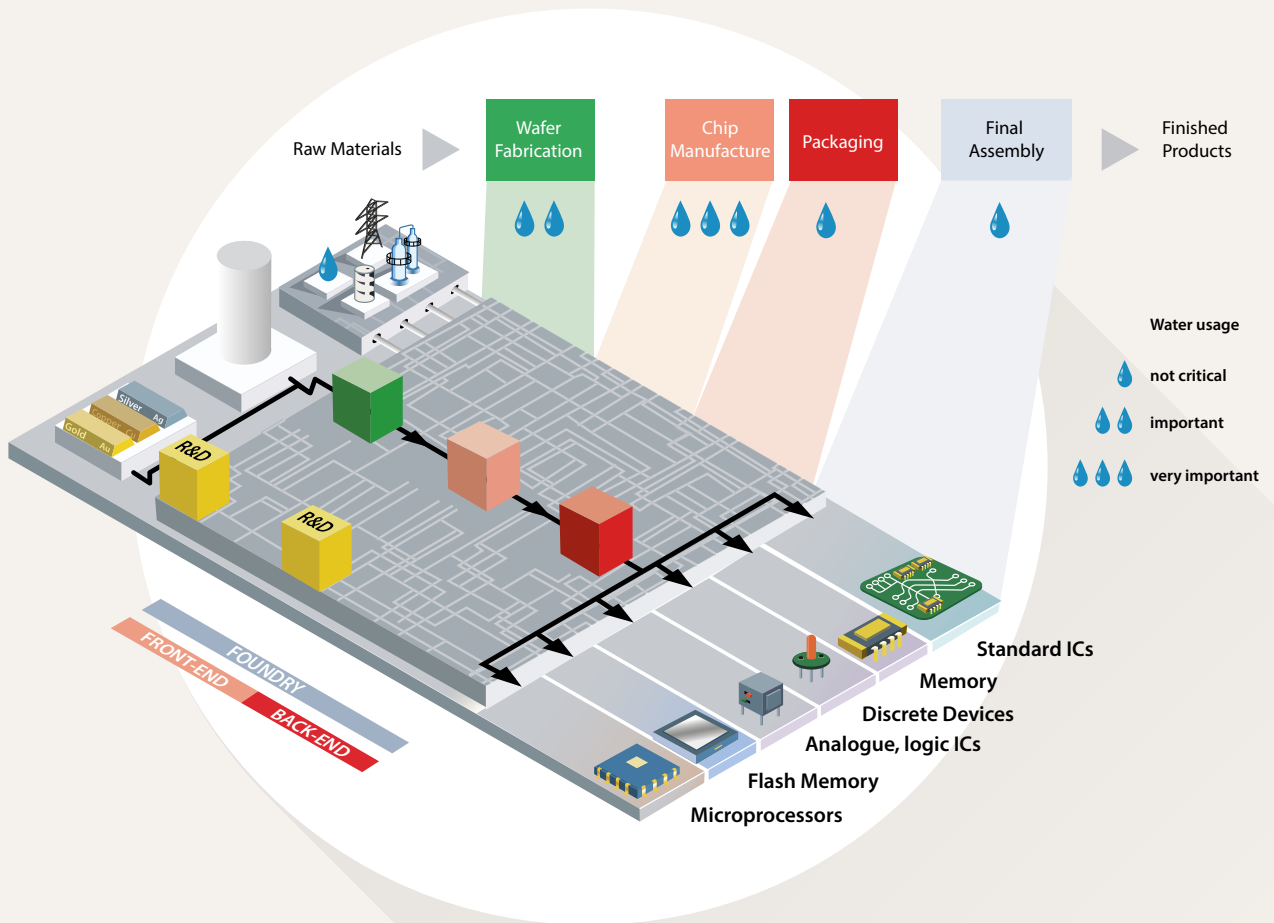


DESALINATION



ODOR

“We share your challenges”



## Water in the Microelectronics Industry

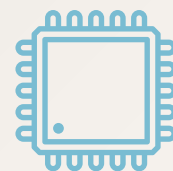
Among many of the industries, microelectronics process has one of the highest water consumption and withdrawal by volume.



Manufacturing a large integrated circuit requires approximately 8,328 litres of water in total, of which 5,678 litres is ultrapure water.



UPW flow rates for a fab plant can range from 500 to 2,000 gpm, and a complete system can cost between 1.0-1.5% of capital costs, or USD 25-40 million.



The semiconductor industry spends approximately \$1 billion on water and wastewater systems and services every year, around half of which is capital equipment purchase.

# “Water solutions tailored to your needs”

## Total Water Management Solutions



- 1**
- Organics removal
  - Biotreatment
  - Continuous microfiltration
  - Selective Ion-exchange
  - Membranes systems
  - Advanced oxidation process

- 2**
- Prefiltration: UF/MF/Media filters
  - Organics removal
  - Two pass RO with brine RO achieving > 90% recovery
  - 2B3T with RO to achieve high recovery rate
  - Continuous deionisation (CEDI, ultra pure and cylindrical series)
  - Degasification using membranes technologies

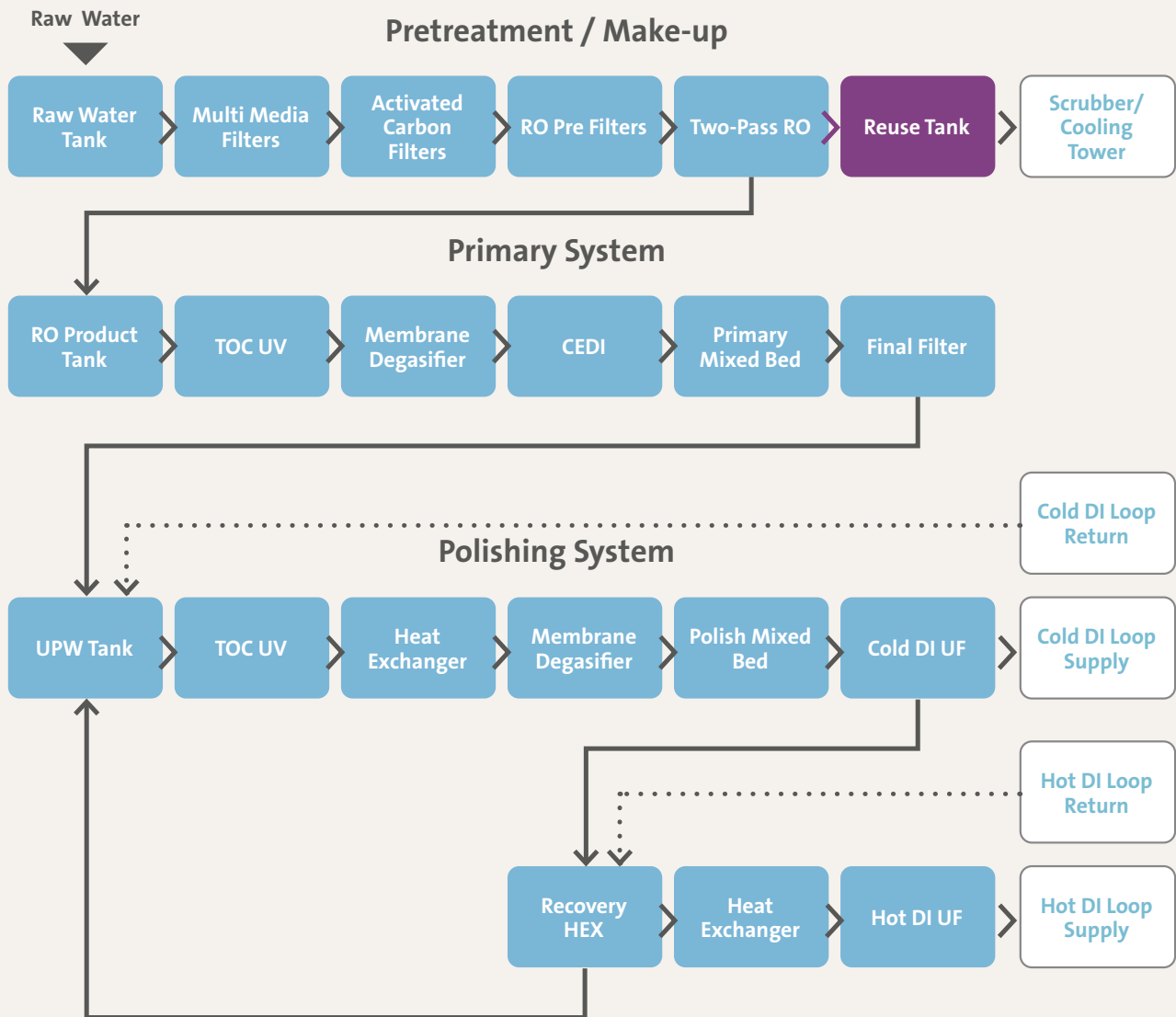
- 3**
- UV oxidation
  - Degasification
  - Low TOC polishing mixed-beds (externally, in-situ or offsite regenerated)
  - Ultrafiltration

- 5**
- pH neutralisation
  - Biological treatment
  - Physico-chemical treatment
  - Micro/ ultrafiltration
  - Sludge treatment

- 6**
- AnoxKaldnes™ MBBR
  - Actiflo®
  - Fenton
  - Ultrafiltration
  - Reverse osmosis
  - Evaporation
  - Crystallisation

- 7**
- Crystallisation
  - Retardation
  - Ion exchange
  - Electrolysis

# Ultrapure Water Treatment Process



## 1 PRE-TREATMENT

Suspended solids and organic carbon are removed through multimedia filter (MMF) and activated carbon filter (ACF) at this stage.

## 2 MAKE-UP SYSTEM

CO<sub>2</sub> is removed in 2 pass RO as carbonates. 2 Pass RO eliminates most ions & some TOC.

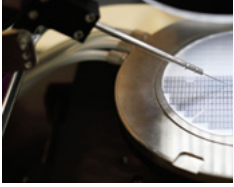
## 3 PRIMARY SYSTEM

The third stage removes ion elements and organic matter and eliminates dissolved oxygen (DO) using membrane degasifier (MDG) and CEDI process.

## 4 POLISHING SYSTEM

Relatively clean water enters through MDG, UV oxidation, mixed bed ion exchange, ultrafiltration, and POU process which further reduces extremely small quantities of total organic carbon (TOC), ions, and particles.

# Solutions Tailored to Your Needs



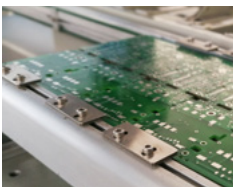
## SEMI-CONDUCTOR

APPLICATION	INORGANIC		TMAH/AMMONIA WW			CU-ETCH		SLUDGE TREATMENT	
OUR SOLUTION	Multiflo / Actiflo / Actiflo Carb	Ion Exchange	UASB/EGSB	MBR / AOMBBR	ANITA Mox	MPPE / Ion Exchange	Multiflo	Dewatering	Sludge thickening



## TFT-LCD

APPLICATION	TMAH/AMMONIA WW		ORGANIC WW		INORGANIC		PHOSPHATE REMOVAL	SLUDGE TREATMENT		
OUR SOLUTION	UASB/EGSB	MBR / AOMBBR	ANITA Mox	Sparthane (upon pilot)	MBR / AOMBBR	Multiflo / Actiflo / Actiflo Carb	Ion Exchange	Chemical Coagulation	Dewatering	Sludge thickening



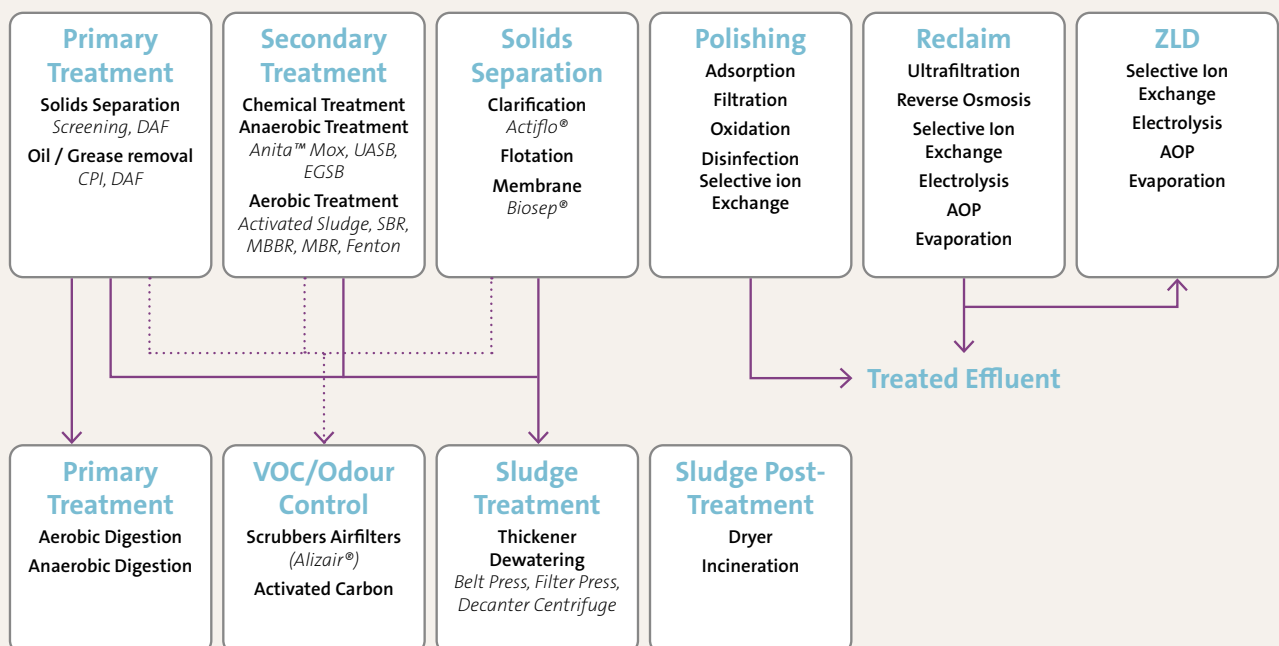
## PCB

APPLICATION	RINSE WASTE WATER		DISSOLVING CU WASTE WATER	CHELATING CU WW	ORGANIC WW	EFFLUENT POLISH
OUR SOLUTION	Multiflo	UF and RO	Electrolysis	Actiflo + Ion Exchange	MBR	Fenton / Actiflo Carb (Hard COD)



# Wastewater Treatment & Reclaim Process

Treatment of wastewater from the microelectronics industry can involve several processes, including



# Proven Technologies



## Actiflo®

- Eliminates up to > 99% turbidity, suspended solids and associated pollutants.
- Extremely small footprint, ideal for retrofitting existing basins for capacity expansion.
- Significant savings in civil costs due to extremely small footprint.
- Unique process stability that handles sudden flow and/or load variations.
- User friendly & minimum maintenance; easy to access

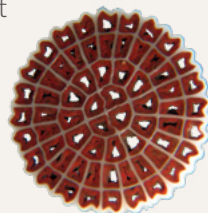
## AnoxKaldnes™ MBBR

- Compact
- Robust
- Simple operation
- Low maintenance
- Enhances nitrification
- High tolerance to TSS influent



## Anita™ Mox

- 660% savings on aeration compared to conventional processes
- No carbon source needed, reducing operating costs and environmental impact
- Compact and flexible process, suited to bring existing plants up to standards
- 90% reduction in sludge production compared to conventional treatment



## Evaled®

- Disposal cost reduction
- Wastewater volume reduction
- Water recycling and reuse
- Valuable components recovery
- High quality outlet
- ZLD (Zero Liquid Discharge)
- Quality certification (ISO 9001/2008) Plug & Play (quick installation)

## OPUS® Technology

- High Water Recovery Rate
- Low Waste Volume
- Reliable Operation with Minimal Downtime
- Effective Control of biofouling
- Effective Control of Scaling due to Calcium Salts, Silica and Metal Precipitates
- High Salt Rejection
- Continuous Clean-In-Place Process
- Low Energy Consumption



## Rapide Strata™

- Regenerates in 30-80 minutes; minimizes down time
- Enhanced bacterial control, improves chemical usage efficiencies
- Continuous water production and increased production capacity
- Skid-mounted, standardized systems for quick installation and start-up



## STANDARDIZATION

Veolia proposes a range of in-house standardized systems including Sirion™ RO and Rapide Strata™ Ion Exchange Deionization. Veolia also works with clients to develop duplicable solutions that can be designed once and deployed across many plants. Such approaches save time, reduce risk and offer cost advantages.



# Reliable Services

## Service Deionization (SDI)

- Low CAPEX
- Strict quality control
- Easy and convenient cylinder exchange
- Small footprint, ideal for confined space.
- No chemicals handling or storage required
- No wastewater or effluent to drain
- Upgradable modular design to meet demanding quality or flow requirements
- Flexible delivery options

## Hydrex™ Chemicals For Cooling Towers

Improves the efficiency and reliability of open, closed and once-through cooling water systems.

This product series includes:

- Scale inhibitors
- Corrosion inhibitors
- Dispersants
- Automated chemical dosing equipment with Hydrex Controller

## Mobile Water Solutions

- Designed for emergency situations (e.g.: process failure)
- 24 hours, 365 days of the year
- Rapid response across territory
- Pure water quality to  $<0.1 \mu\text{S}/\text{cm}$  and  $<20 \text{ ppb}$  Silica
- In-market off-site regeneration stations
- Localised fleet
- Flow rates  $1-400 \text{ m}^3/\text{h}$
- Diverse application base
- Stringent Health & Safety standards
- Technical expertise



## Aquavista™ Digital Water Solutions

- Real-time remote monitoring of equipment data
- Dynamic alarm management
- Event notification, e.g. outstanding maintenance
- Automatic report generation
- Information on service contracts / reports
- Archive of all service and sales orders
- Access to equipment documentation,
- Performance document, calibration certificates,
- O&M manuals, parts lists and training videos, etc.

## Engineering

- South East Asia Engineering Center based in Malaysia
- 3D modeling and AutoCAD capability
- In-house SCADA development and PLC programming

## After Sales Service

- 24/7 and 365 days service coverage
- customized operation and maintenance contract
- Spare parts and consumables (chemicals, activated carbon, etc.)



# Our Global Experience



## One of the world leaders in semiconductors manufacturing *Penang, Malaysia*

- > Design, build & commission Ultrapure Water (UPW) treatment
- > Wafer fabrication application
- > Capacity of 175 m<sup>3</sup>/hr.
- > TOC: <2 ppb ; SiO<sub>2</sub>: < 1 ppb ; DO: < 20 ppb ; Na: < 10 ppt ; Cl: < 20 ppt
- > Primary mixed bed



## Global leader in System-on-Chip (soc) and semiconductor solutions *Singapore*

- > Design, build & commission Ultrapure Water (UPW) treatment
- > Expedited project (4 months from award to water certification)
- > Wafer fabrication
- > Capacity of 160 m<sup>3</sup>/hr.
- > TOC<1ppb; Resistivity to 18.2 mega ohm; Boron<5ppt; Silica<0.5ppb; particle 0.05M<300c/l
- > Continuous De-ionization (CEDI) & UF membrane



## Leading French Manufacturer Silicon-On-Insulator Wafers *Singapore*

- > Engineering, procurement & construction of total water management systems (UPW & WW treatment)
- > 24/7 operation
- > Wafer fabrication
- > UPW Capacity of 128 m<sup>3</sup>/hr; Acid waste neutralization capacity of 154 m<sup>3</sup>/hr
- > TOC<1 ppb; Resistivity to 18.1 mega ohm; Boron<20 ppt; Silica<1 ppb; particle 0.05M<300c/l; Dissolved oxygen < 20 ppb for Grade A water)
- > Continuous De-ionization (CEDI), MMF, ACF



## Showa Denko Hard Disk Trace *Hsinchu, Taiwan*

- > Build, operate & transfer industrial water reclaim system
- > Hard disk production
- > 24/7 operation
- > Capacity of 1,500 m<sup>3</sup>/day
- > 80% effluent quality recovery rate
- > Advanced Oxidation Process (AOP), Multi-media filter (MMF), activated carbon filter (ACF) & reverse osmosis (RO)



## Webel SL Energy Systems Ltd *Kolkata, India*

- > Supply a deionization water treatment system and a wastewater treatment plant
- > Solar photovoltaic cells and modules
- > Neutralization (32 m<sup>3</sup>/hr) & slurry treatment (16 m<sup>3</sup>/hr)
- > Continuous De-ionization (CEDI), MMF, ACF

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# Resourcing the world