Kurita Global Technology Center

2019-2020

Kurita Global Technology Center
Kurita Water Industries Ltd.

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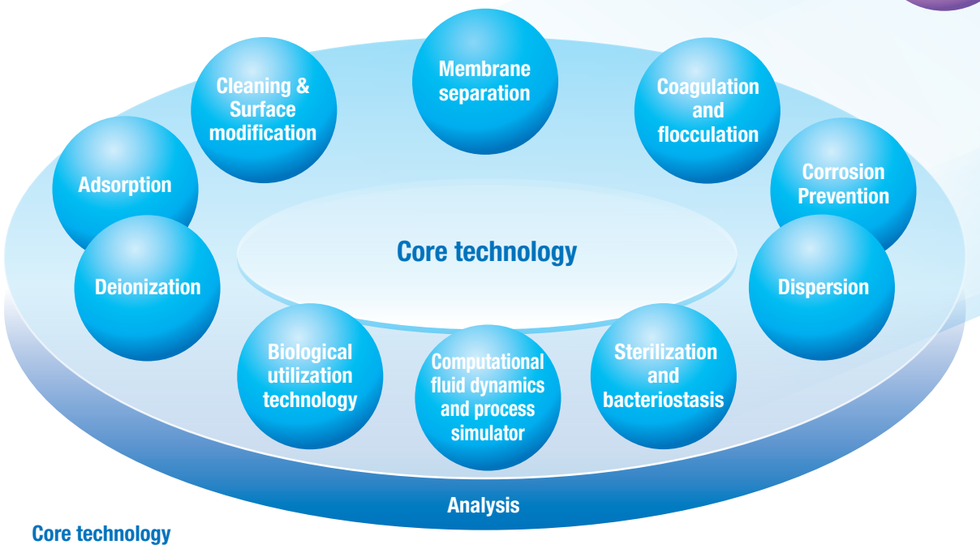
All the product names in this brochure are valid only in Japan.

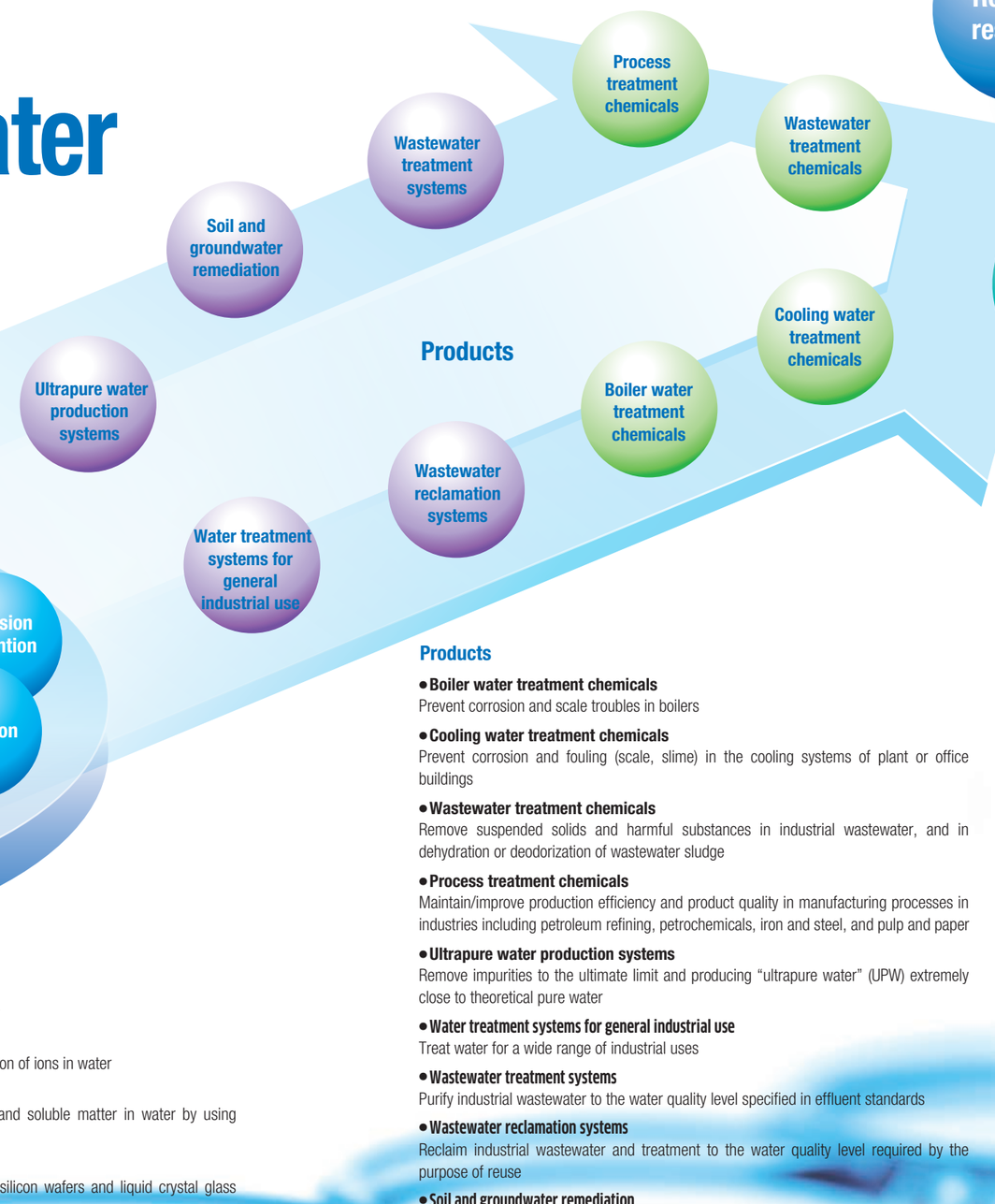
Studying the Properties of Water

Kurita has contributed to realizing a sustainable society as "A creator of unique value for water and environment," which is our corporate vision, while continuing to refine the water-related technologies that have been cultivated over many years of operation. Kurita develops technologies for providing comprehensive solutions from the perspectives of enhancing the functions of water, reducing the impact on the environment, improving productivity and recycling resources, and it can be achieved by promoting open innovation and utilizing advanced technologies such as IoT and AI to create new value that contributes to our customers and society.



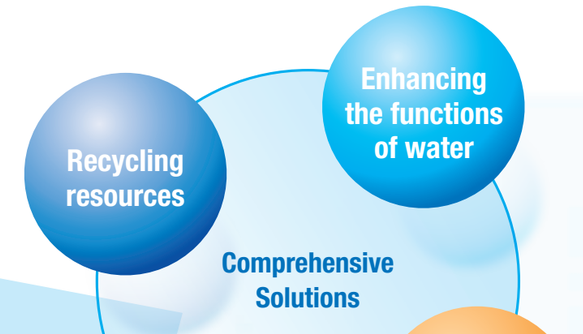
Core technology

- **Corrosion prevention**
Prevent corrosion of piping and heat exchangers
- **Dispersion**
Disperse contaminants such as hard components contained in water to prevent fouling on piping and heat exchangers
- **Coagulation and flocculation**
Enhance coagulation/flocculation of fine contaminants and impurities in water to an easily-treated size
- **Sterilization and bacteriostasis**
Prevent biofouling of heat exchangers and separation membranes by preventing proliferation of microorganisms in water
- **Biological utilization technology**
Decompose organic substances in wastewater by using microorganisms, and energy-producing technologies utilizing biological metabolism
- **Adsorption**
Adsorb and remove ions and impurities in water
- **Deionization**
Remove by ion exchange or electro-deionization of ions in water
- **Membrane separation**
Remove suspended solids, micro particles and soluble matter in water by using separation membranes and filter materials
- **Cleaning & Surface modification**
Clean/reform the surface of semiconductor silicon wafers and liquid crystal glass panels
- **Computational fluid dynamics and process simulator**
Technologies for analyzing and simulating water flows and treatment mechanisms in water treatment systems

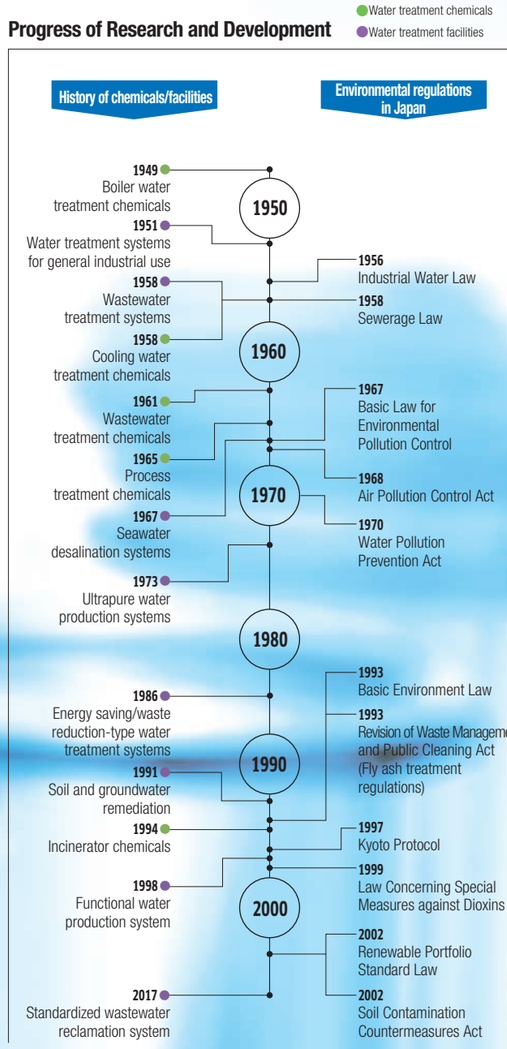


Products

- **Boiler water treatment chemicals**
Prevent corrosion and scale troubles in boilers
- **Cooling water treatment chemicals**
Prevent corrosion and fouling (scale, slime) in the cooling systems of plant or office buildings
- **Wastewater treatment chemicals**
Remove suspended solids and harmful substances in industrial wastewater, and in dehydration or deodorization of wastewater sludge
- **Process treatment chemicals**
Maintain/improve production efficiency and product quality in manufacturing processes in industries including petroleum refining, petrochemicals, iron and steel, and pulp and paper
- **Ultrapure water production systems**
Remove impurities to the ultimate limit and producing “ultrapure water” (UPW) extremely close to theoretical pure water
- **Water treatment systems for general industrial use**
Treat water for a wide range of industrial uses
- **Wastewater treatment systems**
Purify industrial wastewater to the water quality level specified in effluent standards
- **Wastewater reclamation systems**
Reclaim industrial wastewater and treatment to the water quality level required by the purpose of reuse
- **Soil and groundwater remediation**
Remediate for soil and groundwater contaminated by toxic substances



Progress of Research and Development

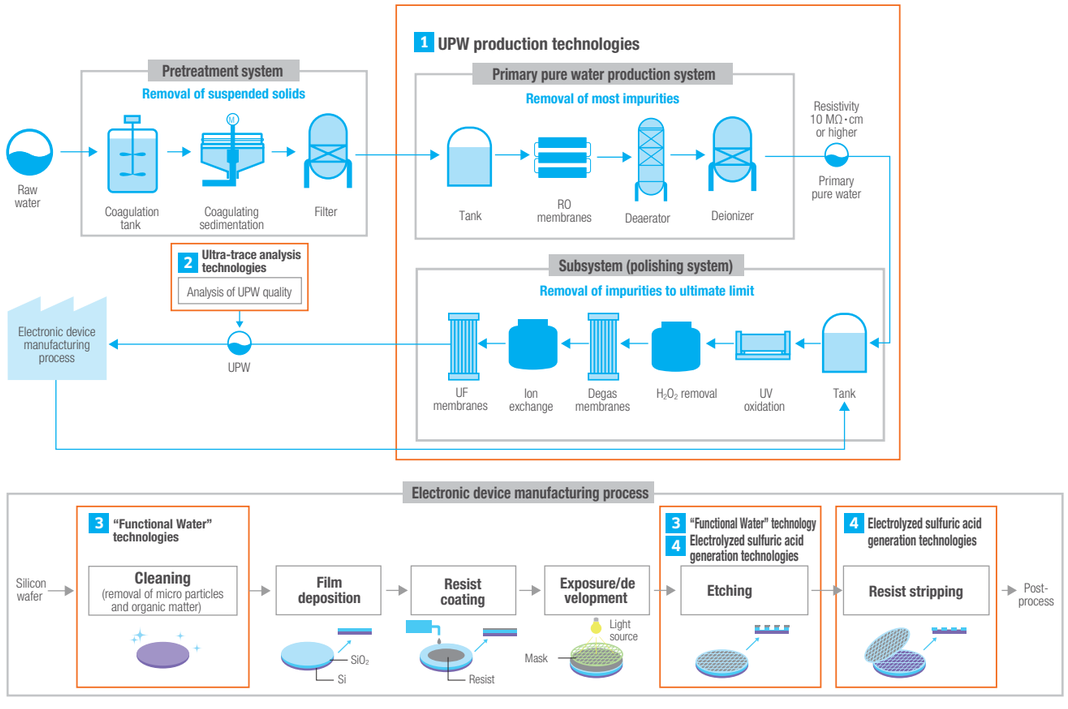


Enhancing the Functions of Water

Studying the various possibilities of water

Kurita is exploring the various possibilities of water in order to create "valuable water" with maximized functions.

【Ultrapure water (UPW) production systems and electronic device manufacturing process】



Ultra Purification of Water

1 Ultrapure water production technologies

Demand for higher purity in ultrapure water (UPW) is increasing in leading-edge industries such as semiconductor manufacturing in order to meet the needs of ever-higher integration.
Kurita is developing the world's highest level of UPW production technologies by using state-of-the-art separation, removal and purification technologies, including membrane separation, ion exchange and oxidation technologies.


UPW production system


Double bed type ion exchange tower

2 Ultra-trace analysis technologies

Analytical technologies for measuring ultra-trace levels of impurities in UPW are indispensable in the development of UPW production technologies. In addition, it is vital to measure the level of impact that impurities in UPW have on semiconductor devices.Kurita is therefore developing technologies for analyzing the surfaces of wafers and other substrate in clean rooms that are on a par with those of semiconductor fabs, in addition to water quality analysis technologies.


Ultra-trace analysis system

Adding new functions to water

3 "Functional Water" cleaning tecnologies

The pH level, concentration of dissolved gases, and other properties of UPW is changed by dosing it with trace amounts of gases or other additives. This improves UPW's ability to remove micro particles on wafers and permits control of the surface texture of materials used for wafers and semiconductors. Kurita is developing these and other technologies to add new functions to UPW.


"Functional Water" production system

4 Electrolyzed sulfuric acid generation technologies

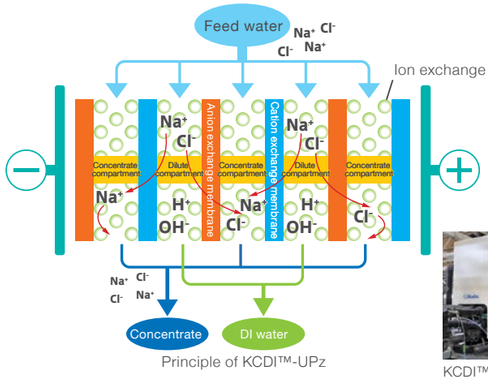
Kurita is developing an electrolyzed sulfuric acid generator for resist stripping and metal etching processes for manufacturing electronic devices. This technology, which generates a strong oxidant "peroxosulfuric acid" by electrolyzing sulfuric acid, also reduces chemical waste because the peroxosulfuric acid returns to the form of sulfuric acid after use and can be regenerated by circulating use.


Electrolyzed sulfuric acid generator "GREEN SULFACEED KD™"

TOPICS

High-boron-rejection-type continuous deionization system : KCDI™-UPz

The KCDI™-UPz is a water purification device that boasts substantial space-saving. This unit continually recycles resin without the use of chemicals by electrically separating ions absorbed by an ion exchange resin. Boron, which is the most difficult substance to remove using an ion exchange resin, is removed to a maximum degree, and meets the increasing demands from the semiconductor industry for water with a higher level of purity. The used chemicals and generated wastewater in connection with the production of pure water can also be reduced, helping customers reduce the environmental impact of their plants.



Principle of KCDI™-UPz

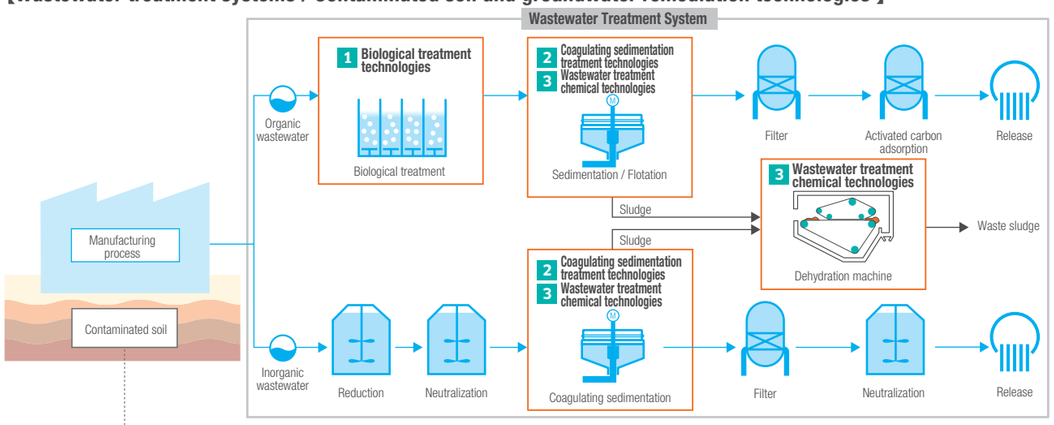

KCDI™-UPz module

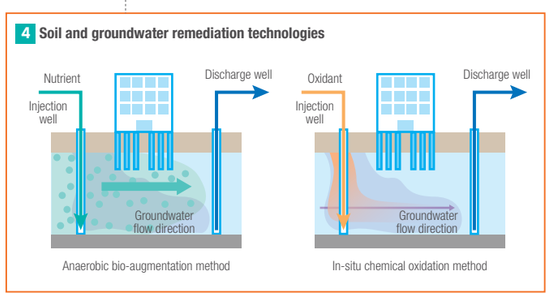
Reducing Environmental Impact

Creating Harmony between Nature and Mankind

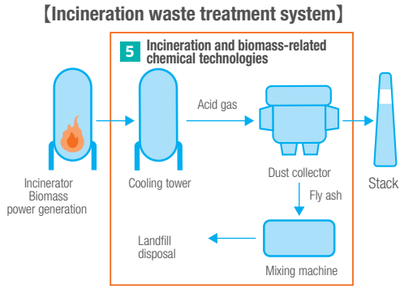
Kurita is continuing to develop state-of-the-art environmental protection technologies in order to create an environment in which nature and mankind exist in harmony.

【Wastewater treatment systems / Contaminated soil and groundwater remediation technologies 】





【Incineration waste treatment system】

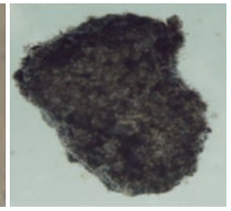


Water Purification

1 Biological treatment technologies

Biological treatment technologies utilize microorganisms to treat wastewater which contains organic substances. Kurita is developing compact, high efficiency treatment systems and energy saving, low sludge treatment systems using microorganism-immobilizing carriers and separation membranes.

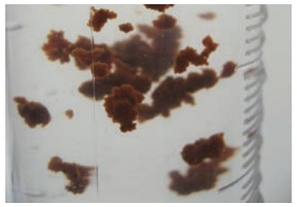
Rotifer (sludge-eating animalcule) used in sludge volume reduction process



Carrier used in Kurita Anaerobic System – BS-TK
Carrier-type anaerobic treatment process

2 Coagulating sedimentation treatment technologies

Coagulating sedimentation technology is used to separate and remove suspended solids contained in wastewater. Kurita is developing a high speed sedimentation floc and optimized the device structure so as to realize high efficiency, space saving coagulating sedimentation systems.



High speed coagulating sedimentation system SEDIMAX™SP
(Left: SEDIMAX™SP, right: formed coagulation flocs)

3 Wastewater treatment chemical technologies

Kurita is developing chemicals which enhance the coagulation and sedimentation of suspended solids in wastewater. Kurita is also developing dehydrating agents to reduce the amount of waste sludge, sludge odor control chemicals and others. Kurita is also developing chemicals that separate excess paint from the circulating water in the automobile painting process and thus improve the circulating use rate of the water.

Separation into solid and liquid by flocculant (coagulation agent)

Treatment of Toxic Substances

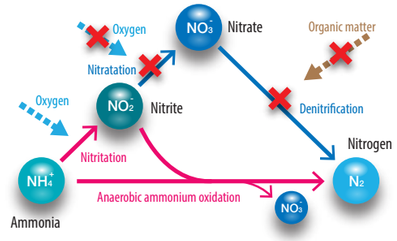
5 Incineration and biomass-related chemical technologies

Toxic flue gases and dioxins are generated when fuel is burned or waste is incinerated, and the fly ash captured by dust collectors contains hazardous heavy metals. Kurita is developing chemicals and chemical dosing control technologies for treatment of these harmful substances.

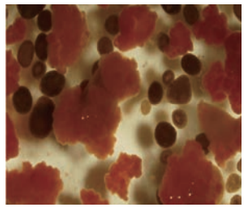
TOPICS

High Efficiency Nitrogen Removal System using ANAMMOX Bacteria

Kurita has established practical utilization of the ANAMMOX bacteria, which can convert ammonia and nitrite directly into nitrogen gas. Since this system does not require a power-consuming oxygen supply for nitrate formation or methanol addition for denitrification, the operating cost for nitrogen removal is greatly reduced. This system also features low excess sludge generation. Furthermore, our pelletizing (granulation) technology for ANAMMOX bacteria can achieve a high concentration of active bacteria, thus achieving a high volumetric loading rate.



Reaction path in denitrification using ANAMMOX Bacteria



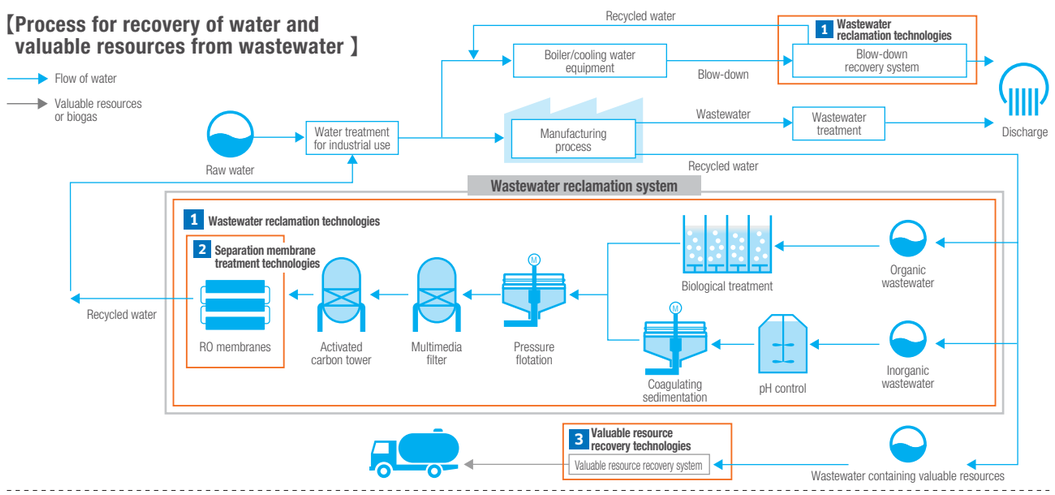
Enlarged view of ANAMMOX bacteria pellets, diameter: approx. 2mm

Recycling Resources

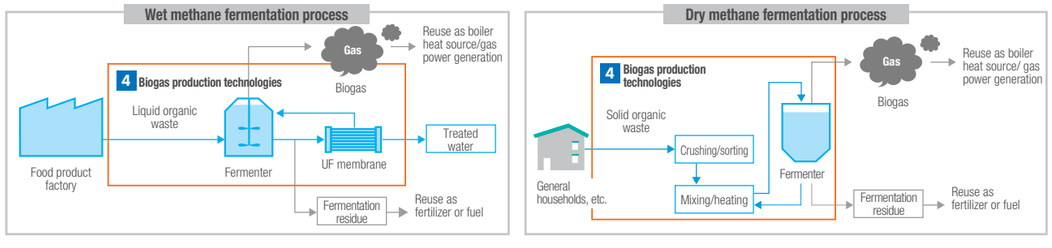
Making Better Use of Limited Resources

Kurita is committed to the development of technologies that contribute to a "sustainable society," such as water recovery, valuable resources recovery and renewable energy recovery technologies.

【Process for recovery of water and valuable resources from wastewater 】



【Processes for recovery of energy from wastes】



Recycling Water

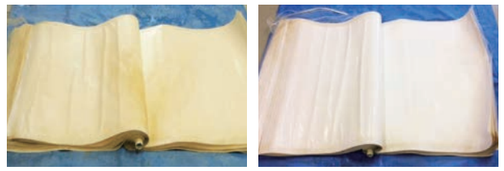
1 Wastewater reclamation technologies

Securing the water source as a basis of every industry is a globally shared need. Taking full advantage of the water treatment technologies cultivated by Kurita over many years, Kurita is committed to developing state-of-the-art wastewater reclamation technologies that enable recovery of water resources by purifying water to a suitable quality for the purpose of reuse.

Cooling water blow-down recovery system

2 Separation membrane treatment technologies

RO (reverse osmosis) membranes are used in water treatment for industrial use, production of ultrapure water, water reclamation, seawater desalination and numerous other applications. Kurita is developing chemical products to prevent fouling and remove contaminants that reduce the filtration performance of these RO membranes. Kurita is also developing technologies to prevent deterioration of the membrane surface by washing and to restore membrane performance.

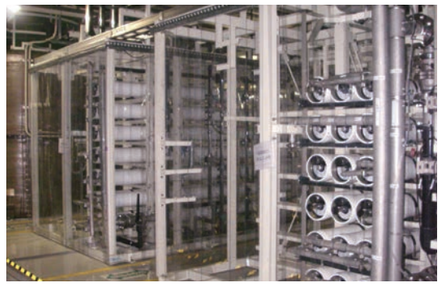


Slime peeling effect of RO membrane biofilm control agent
(left: before washing, right: after washing)

Recycling Resources

3 Valuable resources recovery technologies

Phosphorus and fluorine are used in large quantities in the electronics industry. Since resource depletion and rising prices are serious concerns, Kurita is developing technologies for efficient recovery and recycling of these valuable resources from wastewater.



Phosphoric acid (H_3PO_4) recovery system

Energy Recovery

4 Biogas production technologies

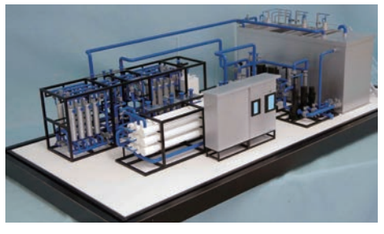
As renewable energy technologies, Kurita is developing methane fermentation systems for efficient production of biogas from organic wastewater, sludge and organic wastes.

Dry methane fermentation system

TOPICS

Standardized wastewater reclamation system "CORR™System"

In countries and regions with scarce water resources, securing water, which is essential for industrial development, is an urgent task. With conventional wastewater reclamation systems, the cost of reclamation was high because they are massive facilities that require many water treatment processes. This was the bottleneck for the proliferation of these systems. This system from Kurita has a simple structure, which consists mainly of membrane separation units.
Combined with unique water treatment chemicals from Kurita, the system permits low-cost, stable reclamation of water from raw water with diverse properties.



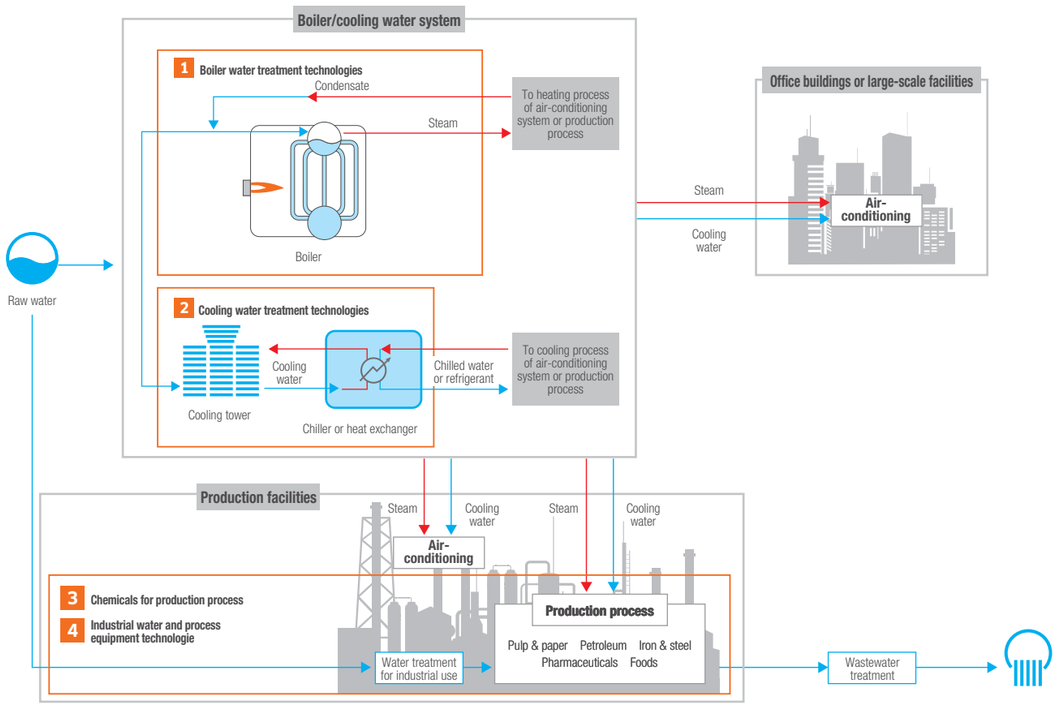
External view of "CORR™System"

Improving Industrial Productivity

Improving the Performance of Production Facilities

To prevent trouble in air-conditioning systems and production lines, Kurita is developing technologies that contribute to stable operation and improved productivity.

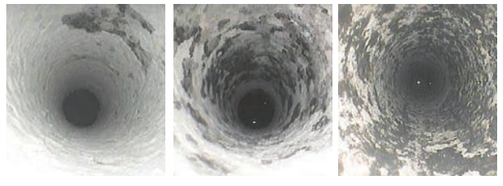
[Boiler/cooling water systems and production processes]



Energy and Water Saving

1 Boiler water treatment technologies

Kurita is developing chemicals that prevent corrosion and scale trouble in boilers, and contribute to their safe operation and energy/water saving. In addition to improving the performance of boiler chemicals, Kurita is also developing chemicals that meet high safety standards and chemicals with low environmental impacts.



Scale prevention/removal effect in boiler by highly-functional material "DReeM Polymer™"
(left: before use, middle: after 4 months, right: after 7 months)

2 Cooling water treatment technologies

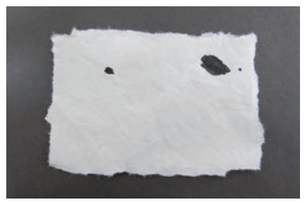
Kurita is developing chemicals that prevent corrosion, scale and biofouling (slime) trouble in the cooling water systems of factories and large buildings, and contribute to their safe operation and energy/water saving. Kurita is also developing a technology that prevents the proliferation of pathogenic bacteria such as *Legionella pneumophila* in cooling water.

Cooling tower water spray plate before/after treatment with bacteria elimination agent for *Legionella pneumophila*
(left: before treatment, right: after treatment)

Improvement of Production Processes/Stable Operation

3 Chemicals for production processes

Kurita is developing chemicals that prevent trouble in manufacturing processes in the petroleum refining, petrochemical, iron and steel, pulp and paper and other industries, and contribute to maintenance and improved production efficiency or product quality. For example, in the pulp and paper field, Kurita is developing chemicals that prevent deposits generated in the manufacturing process from adhering to the paper.



Paper with adhering deposits generated in paper manufacturing process

4 Industrial water and process equipment technologies

Kurita is developing technologies for producing water with the quality required in various manufacturing processes, and process equipment such as large-scale chromatography devices, which are used in separation and refining in the raw pharmaceutical production process.

Improving Construction Efficiency

5 Chemical technologies for civil engineering and construction

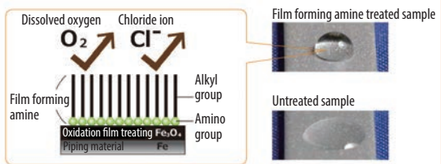
Kurita is developing chemicals for applications such as treatment of construction sludge and reduction of sprayed concrete dust, and mud conditioning agents for tunnel projects, which are large-scale infrastructure construction projects.

Underground shield tunnel

TOPICS

Film forming amine technology "CETAMINE™"

Water-repellent layer formed by film forming amine



Film forming amine, an ingredient of "CETAMINE™", adsorbs onto the metal surface of boiler piping, etc. and water-repellent layer, which keeps dissolved oxygen, chloride ion, and other substances in the water from coming into direct contact with the metal surface, thereby preventing corrosion.
We have already commercialized a series of chemicals with the water-repellent layer formed by "CETAMINE™" is attracting attention from power plants worldwide because it produces effect in intermediate and high pressure systems as well.
They have already been delivered to more than 1,000 customers worldwide, mainly in Europe, and the number of users still has been growing all over the world.

Advanced Management

More Effective Use of Water and Energy

Utilizing IT and sensing technologies, Kurita is developing advanced management technologies that contribute to the optimization of water and energy use, and to stable operation of whole facilities.

Kurita's Centralized Monitoring/IoT System

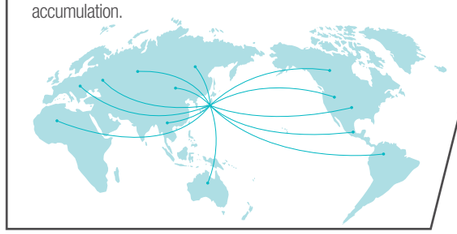
1 Measurement by proprietary sensors

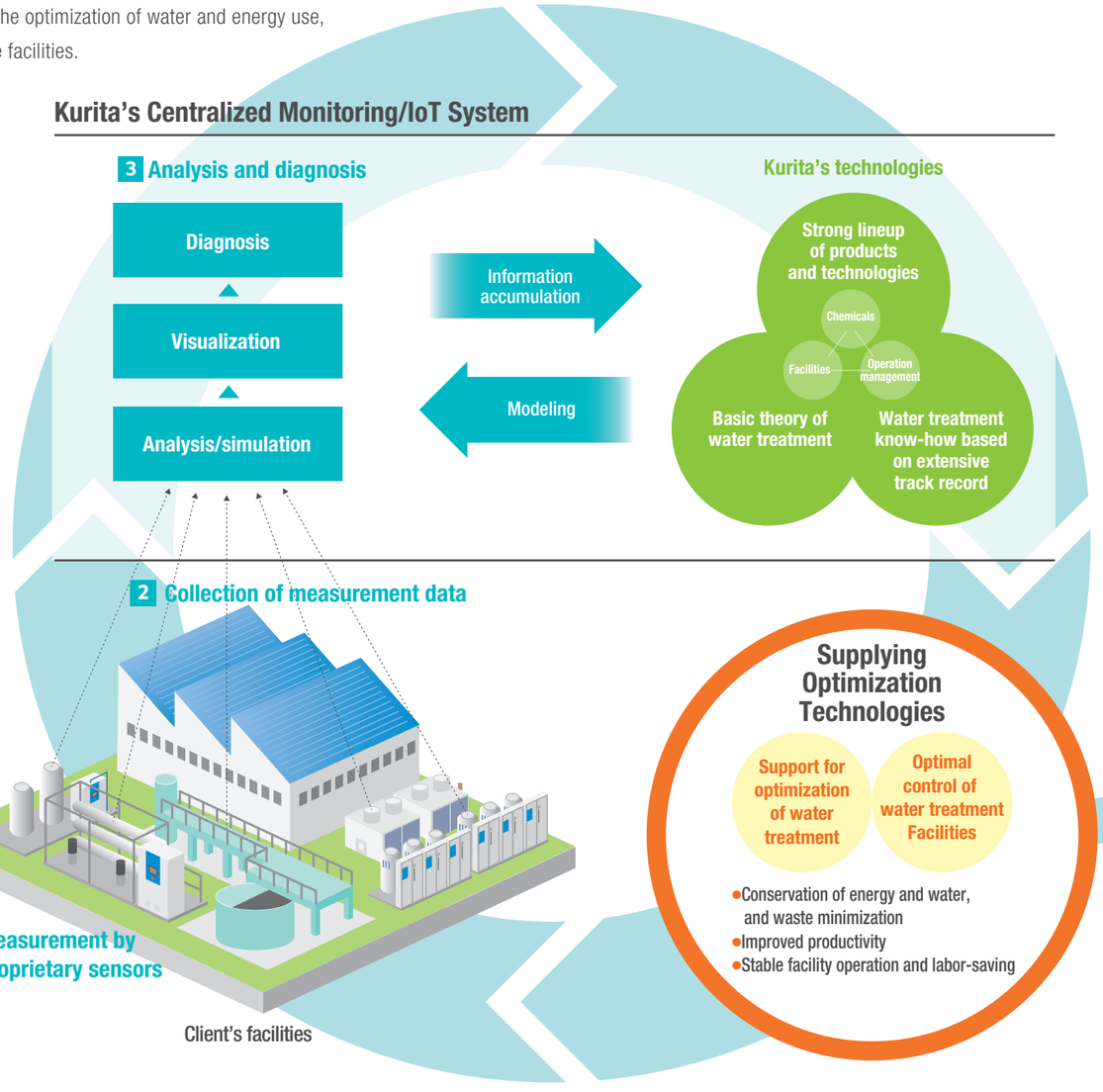
In order to "visualize" the condition and effects of water treatment, we are developing proprietary sensors that enable to measure the concentration of water treatment chemicals, corrosion or fouling status, coagulation condition of wastewater, etc.

Water treatment management system "S.sensing™"

2 Collection of measurement data

Kurita's new global data collection terminal can easily collect a wide range of data from sensors installed at water treatment facilities worldwide. This continuous IT development allows efficient data collection and accumulation.





3 Analysis and diagnosis

Water treatment fundamentals, our wealth of treatment technologies and know-how based on vast, long-term water treatment records are captured as computer models, and then form the basis for development of high level IT-based analysis and diagnosis support systems.
Facility operation records and water quality data can be fully utilized for analysis, diagnosis and optimization of facilities to prevent water trouble, minimize water consumption, and realize energy saving and waste reduction.

Dedicated website for sharing measurement data and results of analysis/diagnosis with the client

Challenge for new water fields

Water for space

Together with JAXA (Japan Aerospace Exploration Agency), Kurita is carrying out joint R&D on a "water recycling system" for collection of water generated in the International Space Station and recycling as drinkable water. Our aim is to realize a water recycling system which enables stable, long-term use in gravity-free outer space by applying our water treatment technologies for industrial water.

Earth-based demonstration system

International Space Station

Ballast water treatment system: KURITA BWMS™

Ships take on ballast water for stability while sailing, but then discharge it when they call at a port and pick up cargo. Since this can result in trans-border movement of plankton and other organisms in the ballast water, the influence on the marine environment has become an international concern. To address this problem, Kurita has developed the KURITA BWMS™ chemical-injection-type ballast water management system utilizing the equipment, chemical and analytical technologies that have been developed in our water treatment business onshore and offshore.

On-board test system

R&D Centers/ Facilities

Delivering More Valuable Technologies

Kurita is committed to developing products and technologies that respond to global water treatment needs through collaboration between Kurita Global Technology Center in Japan, and our overseas laboratories in Germany and Singapore.

History of R&D Centers

1951

Establishment of Boiler Water Laboratory
(Nishinomiya, Hyogo Pref.)

1962

Establishment of Multidiscipline Laboratory
(Yokohama, Kanagawa Pref.)

1985

Relocation of Multidiscipline Laboratory
(Atsugi, Kanagawa Pref.)

1996
Establishment of Water treatment Units Development Center
(Yoshida-cho, Shizuoka Pref.)

1998
Establishment of Kurita Global Technology Center
(Nogi-machi, Tochigi Pref.)

2005
Consolidation of domestic laboratories into Kurita Global Technology Center
(Nogi-machi, Tochigi Pref.)

2015
Establishment of R&D bases in Europe

2018
Establishment of Kurita R&D Asia Pte. Ltd.

1950 — 1960 — 1970 — 1980 — 1990 — 2000 — 2010

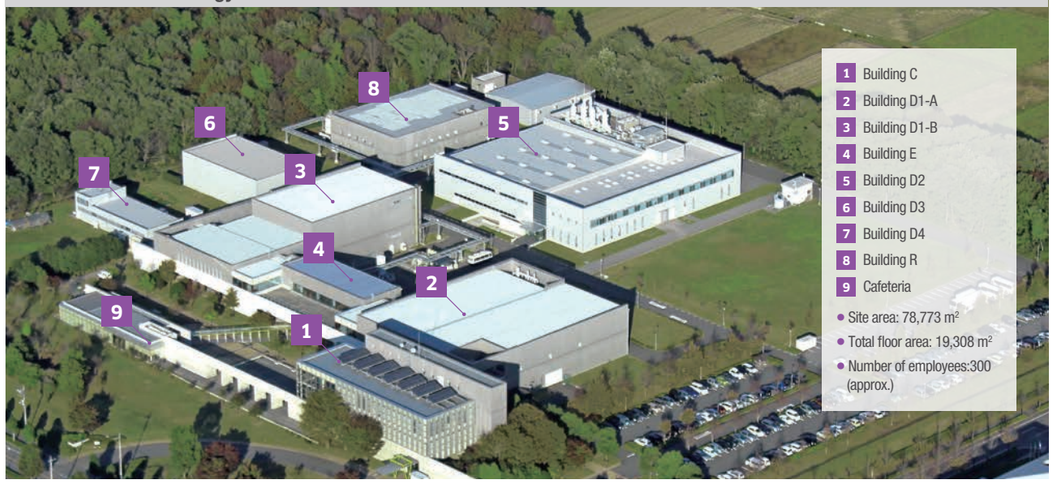
R&D Centers

Laboratories for water treatment chemicals / Germany
Kurita has two laboratories in Germany. These laboratories are mainly involved in development of water treatment chemicals for the European market.

Kurita Global Technology Center / Japan
As Kurita's flagship R&D center for "comprehensive solution technologies for water and the environment," Kurita Global Technology Center is engaged in a full range of activities from fundamental research to products development.

Kurita R&D Asia/Singapore
This base is involved in development of technology for seawater desalination and water reclamation.products development.

Kurita Global Technology Center / Introduction of Facilities



Building C

As a dedicated building for communications with customers and between employees, the Communications Building has a large lecture hall and various types of meeting rooms, etc.

Building D1-A

This laboratory building is used in the development of ultrapure water technologies and analysis of ultrapure water. It is equipped with a large-scale cleanroom for ultra-trace analysis and electronic component cleaning tests, and a large capacity UPW production line, combining demonstration of UPW production technologies and a UPW supply system.

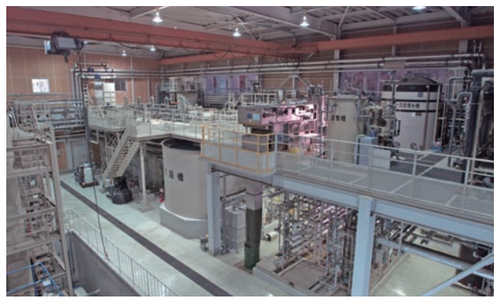
Building D1-B

This laboratory building has a large-scale plant laboratory with a height of 16 m and floor space of 1,000 m², and features equipment for demonstration of the performance of water treatment chemicals for cooling water and boilers. it is possible to conduct pilot tests, etc. by using large-scale test equipment which simulates the client's actual equipment.

Building D2

This laboratory building has an open lab-type laboratory room with 60 experimental tables, which are used jointly by engineers engaged in the R&D of water treatment chemicals and facilities, and also has analysis rooms equipped with modern analytical instruments for performing water quality and material surface analysis, genetic analysis, etc.

Building R



This is a water treatment facility that purifies wastewater discharged by the Center to a level which can be reused as service water for experiments and water for domestic use. Because water is treated using a combination of Kurita's water treatment systems and water treatment chemicals, the Recycling Building is also a "showroom" for Kurita's wastewater treatment technologies.

CLOSE UP

Wastewater recycling system

The experimental wastewater and domestic wastewater discharged by the Center are sorted by water quality characteristics and collected. The water is then purified to satisfy effluent standards by performing the optimum treatment using our own water treatment systems and chemicals, such as biological treatment, coagulating sedimentation, and activated carbon. Water is further purified by membrane treatment to a quality that can be used in water for experiments or for other purposes, and is then recycled in the Center.