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WATER REUSE PROMOTION CENTER

Outline of WRPC



President, WRPC to the Kazuo Yamamoto to the University of Tokyo Interim President of Asian Institute of Technology

Message

Besides being indispensable for human life, water is a fundamental substance for our social and economic activities.

Securing of water resources has, however, become a serious issue worldwide.

To cope with the shortage of water, the Water Reuse Promotion Center, or WRPC, has made every effort to develop and spread new technologies in the fields of reuse of industrial/municipal water and desalination of sea water.

The results of our development have been put to practical use effectively both in Japan and abroad.

WRPC intends to work towards further development, and to transfer its advanced technologies to countries suffering from the shortage of water and to contribute to the protection of the global water environment.



Our Business

- (1) Research and Development of Water Treatment Technologies
- (2) Survey on Water Treatment Technologies
- (3) Dissemination of Water Treatment Technologies
- (4) Training on Water Treatment Technologies
- (5) Exchange/Cooperation with relevant organizations in Japan and abroad
- (6) In addition to the above, businesses necessary to achieve the purpose of this Foundation.

Establishment May 10, 1973

Transformation March 1, 2010 (change to a General Incorporated Foundation)

Fundamental Property Fundamental Property 100 million Yen (as of March 31, 2023)

Organization



Certified Persons

- 1. 9 Doctors of Engineering
- 2. 9 Professional Engineers
- 3. 6 Pollution Control Managers
- 4. 14 Other Certified Persons

Concept of Water Treatment System



Major technical developments to date

1973	1980	1990	2000	2010	2020
•May 197	'3: Establishment o	f Foundation Water	Reuse Promotion Cen	ter OMar. 201	0: Change to General Incorporated Foundation
(Seawater • '74-Pres	Desalination Tech sent: Development of 0'79: Start 800 m ² 77-'85: Basic design o 0'8:	nologies) energy saving desalir 3/d RO desalination pi of Okinawa Seawater 5: Pilot test of pervapo 9/91-'93: B 9/94	ation (RO, LNG freeze, So lot test Desalination Center (40,0 oration process asic survey of Fukuoka De L-'98: Feasibility study of @'03-'03	olar, etc.) 000 m³/d) esalination Center (50 Kagawa Seawater De 7: Pilot test of high sa '06-'12: Joint project	2,000 m ³ /d) esalination alinity seawater desalination in Qatar t for developing NF/RO/MED Hybrid System • '17-'20: Survey on the current situation of Fukuoka Desalination Center • '21~'22:Technical advisory service for seawater desalination facility
(Sewage re ●'73: Pilot t	euse and water qua test of sewage reuse •'79: Technologic •'8:	ality improvement) al development of me 5-'90: <aqua-renaissa •'89~'91: Deve</aqua-renaissa 	mbrane process for sewa nce '90 project> Pilot tes lopment of water circulat • '97-'01: Cooperation	age reuse st of small sized sewa ion system in Space program of water re 0'09-'10: Tech	age reuse process Station isource usage, the Philippines inological development of low-cost sewage reuse process •'16-Present: Development of energy saving MBR technology •'17-'21: Effective sewage treatment in rainy weather
(Industrial •'73: Pilot t •'74: Teo	wastewater reuse) test of wastewater re chnological developm •'80: Water tre	use in petrochemical nent of steel factory w atment test for cleani 92	and pulp industries astewater reuse ng water quality in each ii t: Technological developr o"01-'05: Pilot	ndustry nent for anaerobic ar test of wastewater reus •'10-'12: Te	nd methane fermentation of rice polishing wastewater e of textile dyeing and food factories by use of MBR & RO, Thailand schnological development of produced water treatment • '18-'21: Joint program of water conservation for refinery, UAE
(Other)	●'80-Present: Ra	ationalization of water	usage	●'10-Present: ●'14-	Technical support program for water reuse, domestic and overseas Present: International standardization project for water reuse

Introduction of Projects

Seawater Desalination

Desalination is to produce fresh water such as potable water by removing salt from seawater or brine water using mainly distillation or membrane (reverse osmosis) technologies. Desalination plants in the world had been constructed before the year 1900, and cumulative total production from 1980 is 121 million m^3/d (2022). Installation records show that the reverse osmosis process accounts for approx. 60% while the distillation process makes up approx. 30%. Here at WRPC, we have participated in basic design for a desalination plant



Fukuoka Desalination Center (Mamizu-Pia) (photo credit: Fukuoka District Waterworks Agency)

Wastewater Treatment and Reuse

Wastewater reuse is to recycle treated wastewater contaminated by usage. As water is one of limited natural resources, it is important to reuse and recycle water for sustainable social development. There are a variety of wastewater for reuse and recycling such as factory wastewater, building wastewater, municipal sewage, and oilfield produced water. Here at WRPC, we are investigating optimum techniques for wastewater reuse and recycling by applying various methods including the membrane process to meet the required quality at recycled points.

International Standardization

Establishing relevant international standards to augment water reuse and strengthen international competitiveness of Japanese water reuse technologies has progressed through public-private partnership. In the technical committee of water reuse started in 2013 in the ISO (International Organization for Standardization), we WRPC engaged in establishment of standards for guidelines for water reuse technologies. In the committee, we propose new standards from the aspect of environmental performance, economy and technical characteristics by industry-academiagovernment cooperation. As of September 2022, new 30 standards have been published by the technical committee of water reuse.

In order to share the results of our activities, seminars through industry-government-academia collaboration have been held.









Participants in International Conference of Technical Committee of Water Reuse

Rationalization of Water Usage

The "rationalization of water usage" refers to not only the effective use of water, but also reduction of wastewater. That results in reduction of environmental burdens through water saving, energy saving and wastewater reduction. Major technologies for attaining this purpose include cascade use, circular use, recycling and the use of water-saving devices. In order to rationalize water usage with these technologies, it is necessary to first have an accurate understanding of the actual water usage situation and then apply the most appropriate rationalization methods suited to this usage. Here at WRPC, we have surveyed the actual water usage situation at more than 2,000 domestic and foreign factories across a variety of industries and are engaged in examining the rationalization of water use for these factories.

Evaluation with incorporating the concept of LCA (Life Cycle Assessment) is also conducted.

Technical Dissemination Activities

1) Overseas Technical Cooperation & Exchange Program We are engaged in providing technical support to countries suffering water shortage or water environment deterioration, by dispatching experts and/or cooperating in research. We are also engaged in an international exchange program under which key government officials and experts from foreign countries are invited to undertake technical training for Japan's water production and reuse technologies. In addition, we have held technical seminars in foreign countries to introduce and promote Japan's advanced technologies also with online.



Overseas Seminar (Embassy of Japan in Serbia)

2) Dissemination of Water Production and Reuse Technologies in Japan

WRPC holds annual seminars, lectures and symposiums in Japan about water production and reuse technologies. Through these events and other opportunities, we communicate details about the status of water resources in Japan, new water production and reuse projects and experiment based technological progress with the aim of sharing knowledge about water production and reuse with related sectors and the general public, and providing new insights into water production and reuse projects.

We also disclose a database of our activities throughout website.



Symposium for Water Production and Reuse

Consulting Service

Based on the accumulation of developing technologies and diverse human resources, WRPC has conducted many consulting services, for such as seawater desalination, wastewater reuse, environmental improvement, and market research both in Japan and overseas.

Typical Examples of Technology Development

Overseas Technical Cooperation and Development in Seawater Desalination Technology

We are promoting human resources development through project implementation planning, verification tests and research cooperation in the Middle East, South America and Africa as overseas activities regarding water desalination. Recent examples are research cooperation with Sultan Qaboos University in Oman and with QEWC (Qatar Electricity & Water Co).

•Development of the NF/RO/MED Tri-hybrid method efficient seawater desalination technology

With the cooperation with SWCC (Saline Water Conversion Corp.) in Saudi Arabia and Sasakura Engineering Co., Ltd., a hybrid desalination system has been developed to cope with a substantial increase in water production, by removing scale forming components in seawater using the NF membrane and raising distillation temperature in the MED (Multi Effect Distillation) desalination process.



Opening Ceremony for Research Cooperation Project in Qatar



Opening Ceremony for Tri-hybrid Desalination Pilot Plant in Saudi Arabia



Pilot Plant for Tri-hybrid Desalination in Saudi Arabia

Research Cooperation with Private Enterprises and Academia

We WRPC are conducting joint research and development with private enterprises and academia. Especially in Water Plaza in Kita-kyushu city, joint research has been conducted for various projects from 2014. *Furthermore, in 2022, WRPC has contracted with Kitakyushu City to operate and manage the facility, as well as develop energy-saving membrane separation activated sludge equipment.

In addition, on the facility, there is a testbed that enables the development of advanced water treatment systems by utilizing of sewage and seawater. WRPC are looking forward to use of various organizations.

Facility	Project name		Year								WRPC has managed on research development in this facility.		
Classification		'14	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	
MBR (500~ 1,000m3/d)	Verification test for energy saving MBR									\leftarrow			
	International standardization for water reuse using MBR (Sponsored by METI)												
	Development of energy saving biological treatment with intermittent aeration (Joint research with private enterprises and university)												
	Development of MBR technology with carrier addition (Joint research with private enterprises and universities)					-							
	Verification test for energy saving MBR (Joint research with private enterprise)												
Testbed	Effective sewage treatment system in rainy weather (Joint research with private enterprises and university sponsored by MLIT)												
	Development of sewage treatment technology with low cost and low energy consumption (Joint research with universities)												
	Performance evaluation test of reused RO membrane (RO Pilot Plant) (Joint research with university)												
				122 (-Million						- AL	

Water Plaza Kita-kyushu (provided by Kita-kyushu city)

MBR Plant

Testbed

Activities Relating to Government Organizations

1) Development of Application of large pore membrane and biological treatment to Effective Sewage Treatment System in Rainy Weather

The project includes high accuracy estimation of influent flow and quality at the time of rain by using of ICT (Information and Communication Technology) on observation technology.

The objective was to develop a system for treating infiltrated water during rainy weather that efficiently treats water by using of large-pore membranes while maximizing the treatment capacity of existing sewage facilities.

This activity is entrusted as a feasibility study for the Innovative Sewerage Technology Demonstration Project (B-DASH Project), sponsored by MLIT (Ministry of Land, Infrastructure and Transportation) in 2020 to 2021.

Technology Evaluation System

This activity is to evaluate advanced technologies and introduce them into the area of water reuse and production through the technology evaluation committee composed of academic knowledge. In seawater

Recent Major Research Projects

2) Verification Test for Local and Temporary measures against a water bloom in the Moat of Imperial Palace in Tokyo.

This test is to verify the effectiveness of natural coagulants locally and temporarily to remove a water bloom which may increase during Tokyo Olympic Games in Summer. This work is a contract business from the Ministry of the Environment in 2018.



Scattering of natural coagulants over the moat of Imperial Palace (Chidori-ga-fuchi)

desalination, energy recovery system, pretreatment membrane for highly contaminated water, and TOC (Total Organic Carbon) meter for high salty water are evaluated and developed through this committee.

- Development of a practical scale FO membrane module for ultra-energy-saving sewage treatment (2021-2022), City of Kitakyushu
- Advisory service for seawater desalination project (South East Asia) (2021-2022), Private enterprise
- Market research on indoor circulation type aquaculture business (2021), Private enterprise
- Research on usable amount of nitrogen compounds derived from industrial activities (2020-2021), Private enterprise
- Technical Cooperation Program for the Water Environmental Conservation of the ADNOC Refinery (UAE) (2018-2021), JCCP
- Valuable metal recovery technology in oilfield produced water (2018-2021), JOGMEC
- Survey of current Seawater Desalination Facilities (2017-2020), Fukuoka District Waterworks Agency
- Establishment of international standards for water usage in international industrial sectors (2016 to present)
- International standardization for water reuse (2014 to present), METI and Private enterprise
- Joint Venture of Formation Water Treatment Technology in Refineries in Southern Regions of Iraq (2010 to present), JCCP
- Examination and instruction for rationalization of groundwater usage (2000 to present), Ishikawa prefecture
- Development of Energy Saving Technology for the MBR Equipment (2016-2018), Kita-kyushu city
- Investigation of new evaluation criteria for efficient usage of water (2016 2018), JKA
- Support work for the PPP business survey for worldwide sewage treatment (2016), Private enterprise
- Survey of Current Seawater Desalination Equipment and Future Trends(2016), JSTRA
- Study on Treatment Technology of Water-soluble organic substance in Produced water (2014-2015), JOGMEC
- Training project on seawater desalination for Kuwait Ministry of Electricity and Water (KEW)(2013, 2016, 2018), JCCME
- Survey for rationalization of water usage for various industries (2013-2015), JKA
- Development of UF membrane pretreatment technology for Seawater RO desalination (2012-2013), JKA
- Procurement assistance for a desalination plant for Bangladesh (2010-2011), JICS and a private enterprise
- Technical assistance for a desalination plant in Tunisia (2010-2011), private enterprise

JCCP: Japan Cooperation Center for Petroleum and Sustainable Energy

JOGMEC: Japan Oil, Gas and Metals National Corporation

METI: Ministry of Economy, Trade and Industry, Japan

JKA: Japan Keirin Autorace foundation

JSTRA: Japan Ship Technology Research Association

JCCME: Japan Cooperation Center for the Middle East JICS: Japan International Cooperation System

Members of Water Reuse Promotion Center

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Government members

Local Government

Fukushima Prefecture Ibaraki Prefectural Government Chiba Prefecture Saitama Prefecture Tokyo Metropolitan Government Kanagawa Prefectural Government Toyama Prefecture Aichi Prefectural Government Osaka Prefectural Government Hyogo Prefecture **Mie Prefecture** Kagawa Prefectural Government Ehime Prefectural Government Okayama Prefectural Government Yamaguchi Prefecture Fukuoka Prefecture **Oita Prefectural Government Okinawa** Prefecture Kawasaki City City of Yokohama City of Nagoya City of Osaka Amagasaki City Kobe City Matsuyama City City of Kitakyushu Fukuoka City Nagasaki City

Major Industrial Water Consumers Group

Japan Petrochemical Industry Association Petroleum Association of Japan Japan Industrial Water Association The Japan Society of Industrial Machinery Manufacturers Japan Automobile Manufacturers Association, Inc. The Japan Iron and Steel Federation Japan Fertilizer & Ammonia Producers Association The Association of Filtration and Purification Industry

Corporate members

Water Industries

Ace Water Treatment Co., LTD. Asahi Kasei Corp. Asahi Kasei Home Products Corporation AGC Engineering Co., Ltd. Awa Paper & Technological Company, Inc. Chiyoda Corporation DMW CORPORATION F. C. C. Co., Ltd. Fracta Leap Inc. **FUSO** Corporation Hitachi, Ltd. Hitachi Zosen Corporation Kobelco Eco-Solutions Co., Ltd. KUBOTA Corporation Kurita Water Industries Ltd. Kyowakiden Industry Co., Ltd. Lumilite Japan Co., LTD. Maezawa Industries, Inc. MEIDENSHA CORPORATION METAWATER Co., Ltd. Mitsubishi Chemical Agua Solutions Co., Ltd. Mitsubishi Chemical Corporation Mitsubishi Electric Corporation MIURA CO.,LTD NAGAOKA INTERNATIONAL CORPORATION NIHON SUIKO SEKKEI CO., Ltd. NIPPON SHOKUBAI CO., LTD. Nitto Denko Corporation ORGANO CORPORATION Sanki Engineering Co., Ltd. Sasakura Engineering Co., Ltd. Shin-Ei Chemical Industry Co., Ltd. SOUGOUMIZU INSTITUTE, LTD. Sumitomo Electric Industries, Ltd. Swing Corporation Tokyo Water Co., Ltd. Toray Industries, Inc. TOYOBO CO., LTD. Toyo Engineering Corporation TSUKISHIMA KIKAI CO., LTD. WOTA CORP. ZEOLITE CO., LTD.

Bank and Financial Organizations Aozora Bank, Ltd.

Nonlife Insurance Aioi Nissay Dowa Insurance Co., Ltd.



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