

Innovation and Advancement in Water and Wastewater Treatment



Huvis Water
Huvis Water Corporation

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Huvis Water

Advanced Technical Leader, Huvis Water Always Gives You Happiness

Huvis Water Corporation takes pride in its role as a pioneer in the field of municipal and industrial water and wastewater treatment since its establishment in 1959. Equipped with its organizational experience and technical knowhow accumulated through decades of unabated dedication, Huvis Water has achieved countless technological breakthroughs and successfully managed all phases of challenging major projects.

Huvis Water is capable of carrying out water or wastewater treatment projects on the Turnkey or the Build-Own-Operate-and-Transfer (BOOT) model, which covers all phases of the project including design, purchase, manufacture, installation, supervision, and operation and maintenance. Huvis Water channels all its efforts and resources into developing the water and wastewater treatment technologies that are capable of meeting today's more expanded and more rigorous requirements.

Not contenting itself with its present technological expertise or status in the industry, Huvis Water has determined to continue its investment not only in R&D but also in fostering excellence in the human resource, aspiring to lead the water and wastewater treatment technologies.



Ultrapure water System

Seawater Electro-Hypochlorination System



Membrane Filter

Condensate Polishing System

Operation & Maintenance Services



Seawater Desalination System



Wastewater Treatment System



Raw Water Pretreatment System



Wastewater Reclamation and Reuse System



Drinking Water Treatment



Research & Development

Membrane Deionization



Chemical Feed System

Steam Generator Chemical Cleaning



Dissolved Oxygen Removal System

With its long experience and outstanding technological expertise, Huvis Water delivers a variety of municipal & industrial water treatment plants designed to meet the customer requirements. Huvis Water takes pride in its continuous investment not only in R&D, with the aim of developing leading technologies in the global water treatment markets, but also in recruiting and nurturing highly qualified experts. Huvis Water and its cutting-edge technological expertise are expanding out of the domestic market into the global arena. Huvis Water firmly promises to be the future of global water treatment technology.

Ultrapure water System

Huvis Water delivers not only the conventional ion exchanger system that utilizes ion exchange resins but also the MRM system that applies most up-to-date membrane technologies. Huvis Water's demineralization systems have been supplied to the power generation, electronics, automobile, chemicals, and other industries and Proven to maintain their highly reliable performance for (a long time) more than guaranteed period of time. Particularly, the state-of-the-art MRM system, which employs the membrane filter system, the reverse osmosis system and high-efficiency membrane-deionization system, is capable of continuous and stable production of ultrapure water.



Condensate Polishing System



The condensate polishing system maintains steam generator (SG) reliability, allows operation even with condenser leakage, supplies protection of turbine from deposition and corrosion, and reduces start-up time after a plant trip or refueling. Overall plant economy and efficiency are greatly improved by the condensate polishing system.

Huvis Water has supplied lots of condensate polishing systems according to custom requirements for the last 50 years. Our system is easily constructed to fit into all variations of footprints specified by our clients.



Seawater Electro-Hypochlorination System

The Seawater Electro-Hypochlorination System is meant to control the effects of marine growth and slime in industrial plants (such as the intake structures, piping, condenser and cooling water heat exchangers in a power plant) because marine growth would rapidly reduce heat transfer capacity and increase pressure losses in the seawater piping, even potentially blocking flow, forcing extensive component replacement.

Huvis Water's Seawater Electro-Hypochlorination System economically and safely produces the sodium hypochlorite (NaOCl) used in Industrial plants, particularly nuclear power plants, thermal power plants, combined cycle power plants, desalination plants and LNG receiving terminals, etc.



Seawater Desalination System

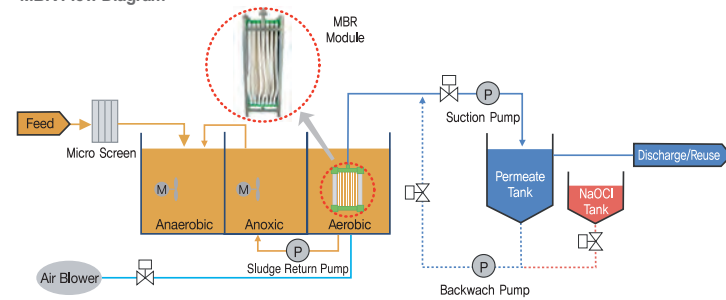
Seawater desalination is the technology that can produce the potable water and industrial water from seawater. Supported by recent technological development, the reverse osmosis (RO) process is receiving the primary focus among various seawater desalination processes. Huvis Water provides an effective desalination plant solution based on its wide knowledge, know-how and experience in RO process over the last decades.



Wastewater Treatment System

Huvis Water has provided optimum systems with diverse combination of unit processes such as a coagulation-clarification/floatation, biological treatment, media filtration, adsorption, membrane filtration, oxidation, reduction and sludge treatment taking into account wastewater quality and surroundings. Huvis Water keeps up with changes in technology and gives every effort to satisfy customers by presenting the best solutions with proven state-of-the-art technology.

MBR Flow Diagram



Steam Generator Chemical Cleaning

Chemical cleaning has been established as an effective mean of removing deposits from the secondary sides of PWR steam generators.

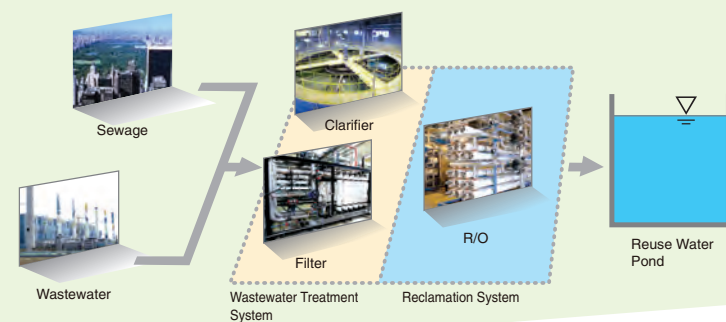
Steam generator tube corrosion and loss of performance remain a significant problem in PWR operation. Secondary side chemical cleaning has been used to remove accumulated corrosion products and mitigate corrosion problems and performance loss.



Wastewater Reclamation and Reuse System



The increase in population, industrial expansion, and climatic change have caused the gradual depletion of usable water. Consequently, it is required to reclaim the terminal discharge from the industrial wastewater treatment or the sewage treatment facilities. Huvis Water's state-of-the-art membrane application technology and its long experience municipal make it possible to deliver a system that can reclaim the terminal discharge into the industrially or domestically usable water.



Membrane Deionization(MDI®)



Huvis Water supplies MDI modules, an environmentally safe ultrapure water preparation system developed in-house. MDI is a unique electro-deionization(EDI) module capable of preparing ultrapure water in a continuous and stable fashion by means of the ion exchange membrane, ion exchange resin, and direct current power source. Unlike the other brands of EDI modules, Huvis Water's MDI modules have the cell stacks inserted in a cylindrical pressure vessel, thereby preventing any water leakage. Further, Huvis Water's MDI modules are capable of carrying out high pressure, high temperature operation. Finally, their output volume vs. electricity consumption ratio guarantees cost-effectiveness. Currently, Huvis Water's MDI modules are preparing a reliable supply of ultrapure water for the power generation, electronics, automobile, and other industrial establishments.

Raw Water Pretreatment System

The raw water pretreatment system is designed to eliminate organisms, turbidity, and other particles suspended in the raw water. The system consists of filtration system alone or filtration system combined with coagulation and clarification system based on the composition and quality of the raw water. The filtration methods applied in the process are media filtration and membrane filtration

Huvis Water supplies meticulously selected and composed systems that optimally meet the levels of water quality required throughout the entire treatment process.



Dissolved Oxygen Removal System

VDT, CORS, MORS

The dissolved oxygen removal system is used to remove O₂ which dissolved in the water and is capable of producing make-up demineralized water with parts-per-billion levels of dissolved oxygen. The system is a final polishing stage of the water treatment processes to produce high purity condensate makeup water.

Our degassing products are as follows;

- Vacuum Degassing Tower (VDT) : Using a conventional tower
- Catalytic Oxygen Removal System (CORS) : Using catalytic resins
- Membrane Oxygen Removal System (MORS) : Using membranes



Chemical Feed System



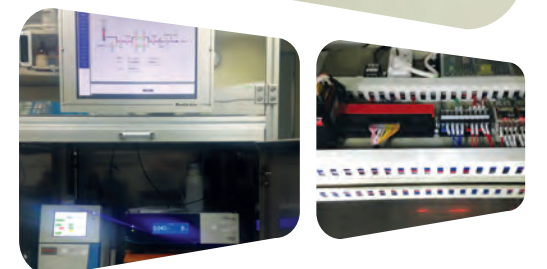
Huvis Water has developed an optimal chemical feed system in order to ensure the perfect operation and maintenance of its own systems such as power generation and chemicals production. The chemical feed system performs the tasks of scale control, oxygen scavenging, and pH control, all of which require a precision operation. Huvis Water's chemical feed system, developed on the basis of its many years of experience and know-how, promises a meticulously organized system operation.

Boron Monitoring System[BMS]

Boron Monitoring System(BMS) based on capillary tube Ion-Chromatography is possible to measure boron in real-time the range from trace levels ppb to ppm levels in aqueous solution of mixed cations and anions within 15 minutes.

BMS can accurately detect the tube leakage in advance, when tube leakages of heat exchangers like the steam generator in nuclear power plants occurred. Besides, BMS can be very useful in demineralizer plant, because boron normally come out earlier than the silica in case of the saturation of the ion exchange resin, and it also has been expected to be reliable and effective method in water treatment plants, because boron ion in the drinking water could have an impact on some genetic problems at over certain amounts.

This measurement technology using capillary tube can reduce one hundredth of the waste solution in comparison with the conventional Ion-Chromatography, because it needs a very small amount of sample. BMS is not only applicable to nuclear power plants, demineralizer plants and drinking water plants, but to a monitoring process of seawater desalination, hot spring water and mine waste water.



Membrane Filter

Recent advancement in the membrane filtration technology has generalized the application of the UF/MF hollow fiber membrane modules to water treatment systems. Huvis Water supplies a variety of UF/MF modules developed and manufactured on its in-house technology. After a long, dedicated research, Huvis Water now produces high-performance membranes and supplies filter modules of various capacities to meet the customers' needs.





Research & Development

To meet customer's requirements in water and wastewater treatment, Huvis Water R&D center makes constant efforts to develop economical and state-of-the-art processes and technologies applicable in industrial & municipal sectors, such as raw water pretreatment, ultrapure water, condensate polishing, sea water desalination, wastewater treatment, and wastewater reclamation and reuse. Through aggressive and continuous R&D investment and development of superior human resources, the R&D center has become the future core growth engine of Huvis Water Corporation.

Huvis Water R&D center is focusing on development of new technologies that not only make a minimum impact on our environment but also provide our customers with more reliable, safe, efficient & profitable products.

- Development of advanced pretreatment systems.
- Seawater desalination technology with low energy consumption.
- Resource recovery technology.
- Renewable energy technology.



Operation & Maintenance



Huvis Water produces and supplies top-quality water with our rich experience and know-how acquired over 50 years of doing business. We contribute to the reliability of facilities through real-time system diagnosis based on online data acquisition and reporting.

As a final verifier and manager of facility performance, we provide our management services through strict standards, identify problems and recommend improvement plans.

Our total water solution includes facilities operation, maintenance, technical support, technical consultation, and improvement and diagnosis of facilities.



Huvis Water in the world

From planning & engineering to operation & maintenance services.

Huvis Water wants to be a top company and challenges leading companies around the world. Huvis Water is paving the way to the twenty-first century and is always at your service.





Huvis Water confidently equipped with its long experience and accumulated technological expertise, supplies optimized Ultrapure water Systems. Particularly, its a on MRM system, a breakthrough after a long, dedicated research activities, is an environmentally friendly system that uses the membrane application process, and is capable of generating the optimal ultrapure water from the water of various qualities. Huvis Water has been making and will continue to make an unabated effort for the most satisfactory delivery of the rigorous customer specifications.

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Ultrapure Water System

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Ultrapure water System Huvis Water currently supplies a couple of Ultrapure water Systems, that is, the conventional ion exchanger and the MRM system, depending on the customer requirements and the operational environment of the site. Equipped with its decades of experiences and state-of-the-art technologies, Huvis Water is more than competent to design and construct the most cost-effective and optimal system that faithfully delivers the customer demands.

Applications

- Demineralized water in power plants
- Cleaning water in semiconductors
- Demineralized processing water in the chemical industries
- Pure water for the pharmaceutical, food & beverage industries
- All places in need of Ultrapure water

Ultrapure Water System

MRM® System Huvis Water's MRM is an innovative ultrapure water production system that makes use of the membrane process. The MRM consists of three distinct membrane processes in order, that is, Ultrafiltration/Microfiltration(UF/MF) for the pretreatment process, Reverse Osmosis(RO) for the desalination process, and Membrane Deionization(MDI) for polishing water. The MRM system guarantees an economical and reliable supply of ultrapure water.

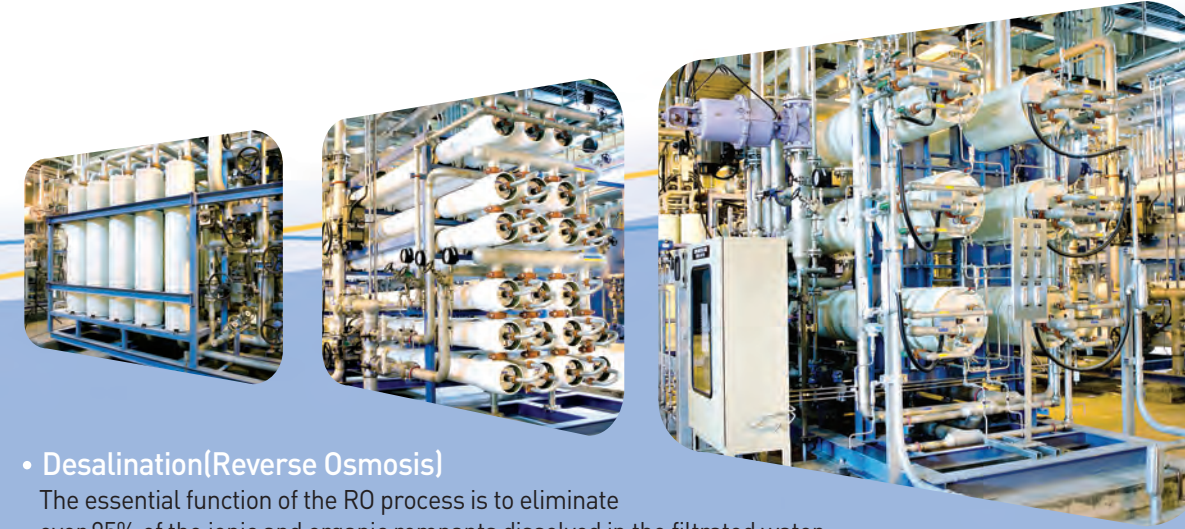
MRM® Advantages

- **Cost-effectiveness**
Lower operation and maintenance cost
- **Easy installation**
User-specific, site-specific system configuration and installation fully or partially shop assembled on skids or containers to minimize site work.
- **Reliable supply of consistent-quality water**
No interruption for resin regeneration and consistent and predictable product water quality.
- **Minimal space requirement**
Due to its compact design and shop assembly on skids or containers, installation area is minimized .

MRM® System Configuration

• Pretreatment (UF/MF Hollow Fiber Membrane)

The pretreatment of raw water using UF/MF membrane can effectively filter out organics and other particles suspended in RO feed water, ensuring a smooth operation of the RO process. Huvis Water supplies the optimal industrial-scale UF/MF modules that cater to the level of water quality specified by the customer and the operation conditions at the site.



• Desalination(Reverse Osmosis)

The essential function of the RO process is to eliminate over 95% of the ionic and organic remnants dissolved in the filtrated water. Using its long experience in the field of the RO process design and operation, Huvis Water supplies the optimal RO systems designed and constructed to generate ultrapure water.

• Polishing (Membrane Deionization, MDI®)

The MDI system is an environmentally safe device designed to produce a continuous and reliable supply of ultrapure water. The MDI module, which operates on direct current, is composed of the ion exchange membranes, ion exchange resins, and electrodes. The function of the module is to clean up the minute traces of ionic elements remaining in the RO product water and ensure the production of ultrapure water. Huvis Water delivers the MDI systems to various industrial sites including power generation, electronic, and chemical industries, with the help of its in-house technical know-how developed and accumulated through the past few decades of research and plant operation.

• CO₂ removal system

The carbon dioxide dissolved in the filtrated water, if left untreated, can be the cause for a compromised quality of water. Therefore, to guarantee the maximum level of water purity, the installation of the CO₂ removal system is strongly recommended. Huvis Water supplies the conventional type of forced draft degasifier as well as the membrane CO₂ removal system, which has a higher efficiency than the former. Huvis Water delivers the optimum-efficiency CO₂ removal systems, taking full advantage of its long experience in the industry.



Ultrapure water System by Ion Exchanger

Huvis Water's long experience and technical know-how in the water treatment industry enables it to supply the most cost-effective systems optimally tailored to the customer specifications. The Ultrapure water Systems supplied by Huvis Water can be divided into two distinct types: the conventional type of the internal regeneration method; and, the packed bed type of the external backwashing method.



• Facility configuration

- SC + (DG) + SB + MBP
 - SC + (DG) + WB + MBP
 - SC + (DG) + WB + SB + MBP
 - WC + SC + (DG) + WB + SB + MBP
- WC : Weakly acidic cation exchange resin tower
 - SC : Strongly acidic cation exchange resin tower
 - WB : Weakly basic anion exchange resin tower
 - SB : Strongly basic anion exchange resin tower
 - DG : Forced draft Degasifier
 - MBP : Mixed bed polisher



Seawater Desalination System

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Methods of desalination include thermal evaporation, distillation and reverse osmosis(RO) technologies. Supported by recent technological developments, economical and easy to use, reverse osmosis technology is receiving the primary focus.

Huvis Water has wide knowledge, know-how and experience in membrane technologies over the last few decades. RO can be applied to many industrial & municipal areas including seawater desalination, demineralization and sewage and wastewater reuse facilities. Based on this technological capability, Huvis Water has entered the seawater desalination market and has provided seawater desalination systems both locally and internationally.

- **The best suited pretreatment solutions**

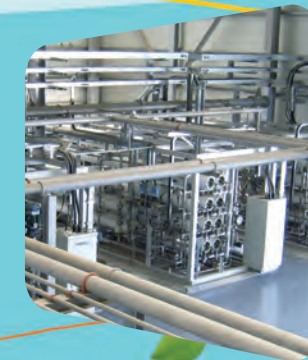
The RO operation is sensitive to raw water conditions and the importance of the pretreatment facility is emphasized accordingly. Huvis Water designs and supplies the most appropriate pre-treatment facilities for the raw water conditions.

- **Optimization of RO system design**

Huvis Water designs the optimal RO facility

- Recovery rate review
- Selection of the most suitable membrane
- Design of the most cost effective energy saving system with combination of high pressure pumps and energy recovery devices(ERD).
- Application of variable frequency drivers (VFD) for minimization of power consumption
- Pilot test service

Seawater Desalination System



We Offer the Optimal Solutions

- **Post-treatment facility**

A suitable post-treatment facility for the customer requirements is provided.

- **Environmental impact review**

Huvis Water selects the most eco-friendly system taking into account the surrounding environment when selecting the method for RO system brine discharge.

Movable RO System

Huvis Water provides a movable RO seawater desalination system mounted in a container without limit of location or capacity.

- Skid-mounted or containerized desalination system.
- Solutions for isolated areas and temporary needs.
- Easy operation and remote monitoring system.

Remote Monitoring



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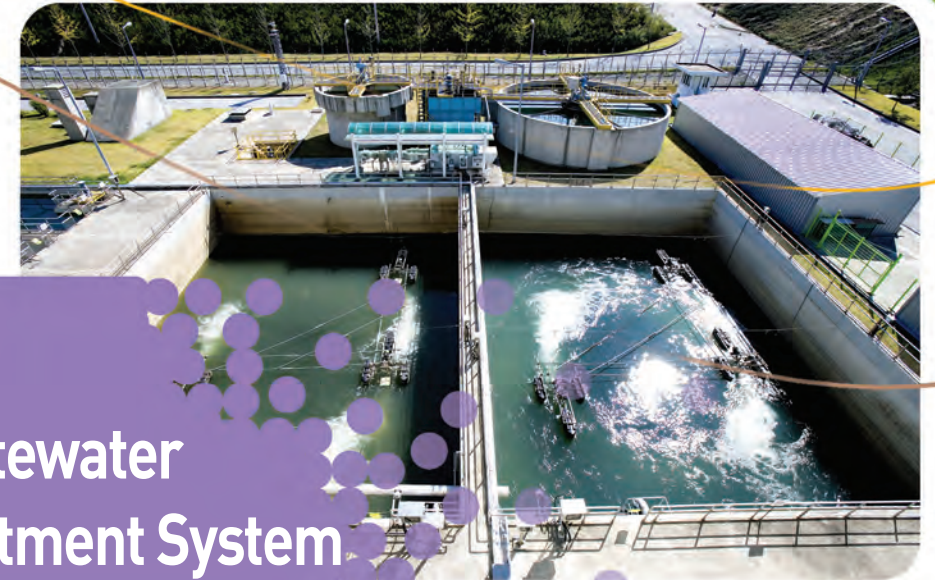
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Wastewater Treatment System



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Huvis Water provides optimum systems with diverse combination of unit processes such as a coagulation-clarification/floatation, biological treatment, media filtration, adsorption, membrane filtration, oxidation, reduction and sludge treatment taking into account wastewater quality and surroundings.

Huvis Water keeps up with changes in technology and gives every effort to satisfy customers by presenting the best solutions with proven state-of-the-art technology.

Choose one suitable for your requirement

Submersible MBR Process

- Simple, compact, expandable, designed as a block assembly. Aesthetically pleasing appearance after assembly.
- Minimal air loss and excellent cleaning performance with air nozzle installation inside the lower portion of the element

Outside-Circulation Pressurized MBR Process

- Easy to set up due to a compact housing equipped with air diffusers
- Clean operating environment using a housing and easier access
- Easy periodic and intermittent backwashing, and cleaning
- Advantageous for a small area or sites with extension difficulties

Wastewater Treatment System



MBR Process... Perfecting techniques challenging convention

Membrane biological reactor(MBR) guarantees extraordinary water processing quality by applying separation membranes such as precision filtration membranes or ultra-filtration membranes in the aeration tank instead of the settling tank during activated sludge processing. The MBR process can be applied to various biological treatment processes as well as to the conventional activated sludge process such as the nitrogen and phosphorus advanced treatment process.

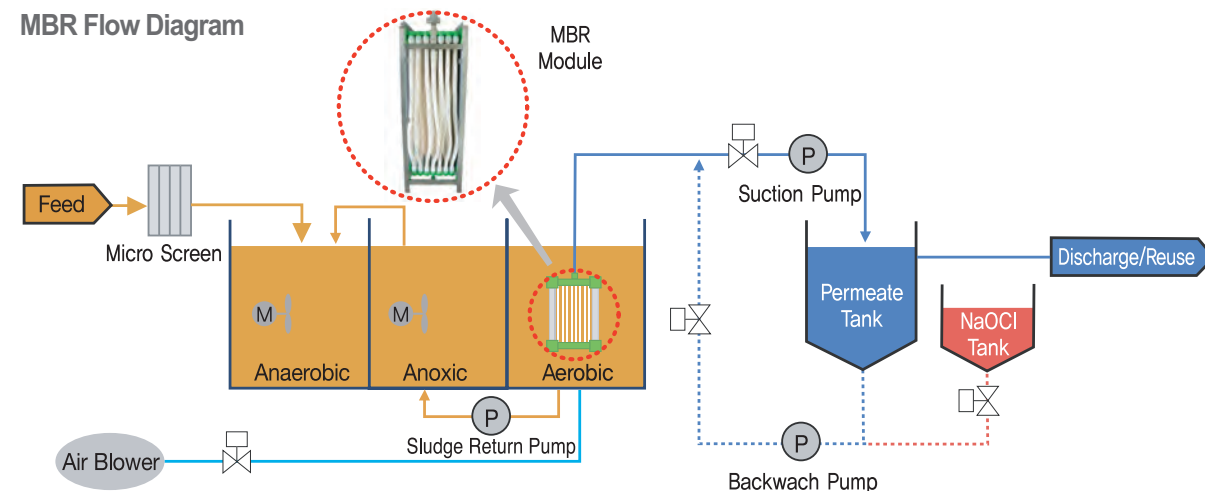
Every day, up to 1 NTU of clean water is discharged and the effluent can be reused after simple post-treatment such as disinfection.

Benefits of the MBR process

- High treated water quality
- Minimal foot-print required
- High efficiency and minimal sludge through high concentration MLSS of 8000~15000mg/l
- Easy, fully automatic operation
- Easy to retrofit



MBR Flow Diagram



Applications

MBR process can be applied to various industrial & municipal wastewater and sewage treatment.



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Wastewater Reclamation and Reuse System



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Wastewater Reclamation and Reuse System The increase in population, expansion of industries, and climatic change-all have contributed to the gradual depletion of usable water. Consequently, it is required to reclaim the terminal discharge from the industrial and municipal wastewater treatment or the sewage treatment facilities.

Huvis Water's wastewater reclamation and reuse system employs the most up-to-date membrane technology to reclaim the terminal discharge into high-quality industrial and household water, with the dual aims of helping to alleviate the global water shortage and to reduce the pollution rate of the environments, natural or man-made.

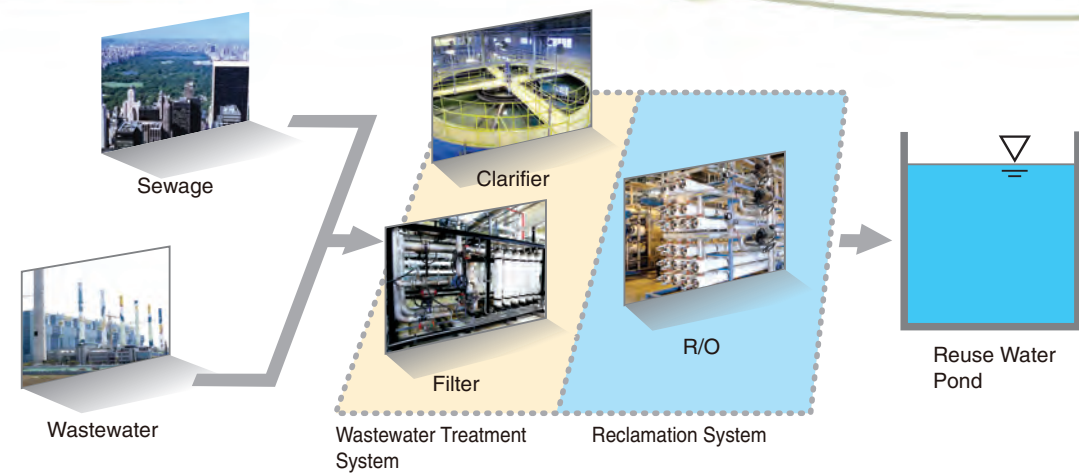
Especially, the construction of a system with no wastewater discharge is possible when the reclaimed water is used as the industrial process water. Huvis Water supplies an optimal system designed to cater to the customer's quality and quantity specifications.

Applications

- Recycling the discharge from industrial wastewater treatment plants
- Recycling the discharge from sewage treatment plants
- Installation of other systems to respond to customers' requests



Wastewater Reclamation and Reuse System



Features

Huvis Water's wastewater reclamation and reuse system consists of two components: the Ultrafiltration/Microfiltration(UF/MF) membrane system and the Reverse Osmosis(RO) system.

- Continuous and homogeneous product water quality
- Remarkable reduction in cleaning chemicals
- No need for additional wastewater treatment equipment
- High treatment efficiency
- Easy repair and operation
- Easy transportation, exchange, and installation

Facility Configuration

• Pretreatment

The UF/MF membrane system produces high quality water by filtering out particles and solids suspended in wastewater. It is applied to pretreatment systems for wastewater reclamation and reuse systems.

• Reverse Osmosis (RO)

The RO system eliminates the high-concentration of TDS and dissolved organics remaining in water, thereby generating high-quality water.

Huvis Water's optimal design takes into meticulous consideration appropriate chemical injections to enhance the durability and performance of the entire system as well as the stability control of the operational components.



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Ultrafiltration Membranes



Huvis Water

Hollow Fiber Membrane

Recent advancement in the membrane filtration technology has generalized the application of the UF/MF membrane modules to water treatment system. Huviswater has developed specific technologies, know-how and insights into the pre-treatment for using UF membranes. Specially formulated hydrophillic polyethersulfone(PES) material, uniquely designed asymmetric profile with sponge-like structure and an optimised process ensure high permeate flux and quality. Low fouling property of the membrane can also reduce operating cost and plant downtime. You will enjoy a low capital and installation cost with a large membrane area per unit volume at a small footprint.

After a long, dedicated research, Huviswater now produces high-quality membranes and supplies modules of various capacities to meet the customers' needs.

Huvis Water membrane is used to treat ground water, surface water, waste water, and seawaters as either primary treatment or as pretreatment to RO membranes.

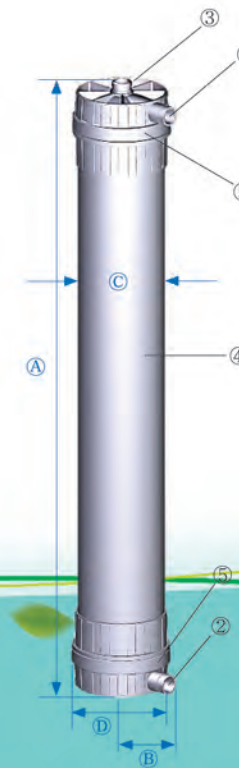
Ultrafiltration Membranes



- Replacement of flocculators and filters
- Pretreatment of RO system
- Pretreatment of seawater desalination
- Pretreatment of industrial water
 - Pretreatment of power plant boiler and cooling tower
 - Pretreatment of process water in the semiconductor industry
- Wastewater recycling system



Module Specifications (HS-50, HS-60)



Item	① Feed (TOP)	② Feed (BOTTOM)	③ Permeate	④ Body Case	⑤ Coupling
Material	PSf or ABS	PSf or ABS	ABS	ABS	STS 304

Module Part No.	① Length(mm)	② Length(mm)	③ Diameter(mm)	④ Diameter(mm)	①,② Diameter(mm)	③ Diameter(mm)
HS-50	1742.25	200	262	296	60	60
HS-60	1922.25	200	262	296	60	60

Type

- Configuration : Ultrafiltration module
- Nominal Membrane Area : 53 m², 60 m²
- Operating Mode : Inside to Outside Filtration

Application Data

- Typical Filtrate Flux Range : 40 ~ 100LMH
- Maximum Applied Feed Pressure : 5bar
- Maximum Trans Membrane Pressure : 2bar
- Maximum Feed Turbidity : 30NTU
- Maximum Operating Temperature : 40°C
- pH Range : 2~11

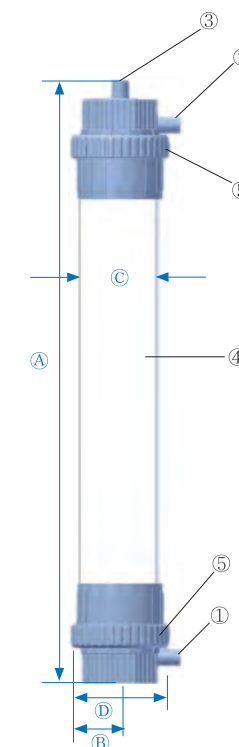
Typical Process Conditions

- Backwash Pressure <1.5 bar
- Backwash Duration : 30 ~ 60 sec
- Backwash flux : 150 ~ 250 LMH
- Cleaning Chemicals : HCl, NaOH, NaOCl, Citric acid

Performance

- Filtrate Flow : 2.1 ~ 5.3 m³/h, 2.4 ~ 6.0 m³/h
- Filtrate SDI : <2.5
- Filtrate Turbidity : <0.2 NTU
- Virus : >4 log

Module Specifications (HMS 1023)



Item	① Feed	② Permeate	③ Concentrate	④ Body Case	⑤ Coupling
Material	ABS	ABS	ABS	ABS	ABS

Module Part No.	① Length(mm)	② Length(mm)	③ Diameter(mm)	④ Diameter(mm)	①,② Diameter(mm)	③ Diameter(mm)
HMS 1023	2,300	180	225	360	Custom	Custom

Type

- Configuration : Ultrafiltration module
- Nominal Membrane Area : 70 m²
- Operating Mode : Outside to Inside Filtration

Application Data

- Typical Filtrate Flux Range : 40 ~ 120LMH
- Maximum Applied Feed Pressure : 5bar
- Maximum Trans Membrane Pressure : 2bar
- Maximum Feed Turbidity : 300NTU
- Maximum Operating Temperature : 40°C
- pH Range : 2~11

Typical Process Conditions

- Backwash Pressure <1.5 bar
- Backwash Duration : 30 ~ 60 sec
- Backwash flux : 150 ~ 250 LMH
- Cleaning Chemicals : HCl, NaOH, NaOCl, Citric acid

Performance

- Filtrate Flow : 2.8 ~ 8.4m³/h
- Filtrate SDI : <2.5
- Filtrate Turbidity : <0.1 NTU
- Bacteria : >6.5 log



Huvis Water have no doubt it is the most efficient and reliable deionizing system. Huvis Water has been manufacturing and installing MDI modules in the power and microelectronic plants to produce high purity water decades. Our breadth of technology, systems, combined with decades of experience in designing, installing and operating MDI can give an excellent opportunity to save cost and improve efficiency to our customers in producing high purity water.

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<http://www.Huviswater.com>



Membrane Deionization

Huvis Water

MDI® (Membrane Deionization) MDI is Huvis Water's electro-deionization product that consists mainly of ion exchange resins, ion exchange membrane and electrodes to produce high purity water.

Unlike the conventional ion exchangers, no use of regenerating chemical, results in no regeneration wastewater, and no interruption during the service process

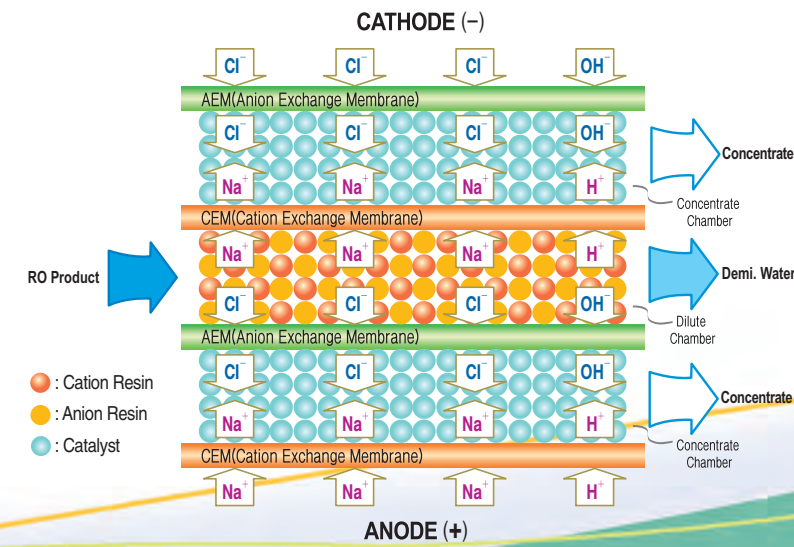
Applications

- Demineralized water in power plant
- Ultrapure water for semiconductor
- Process water in chemical plants
- Pure water for pharmaceutical industry
- Pure water for food & beverage industry
- All places in need of demineralized water

Membrane Deionization

MDI® Advantages

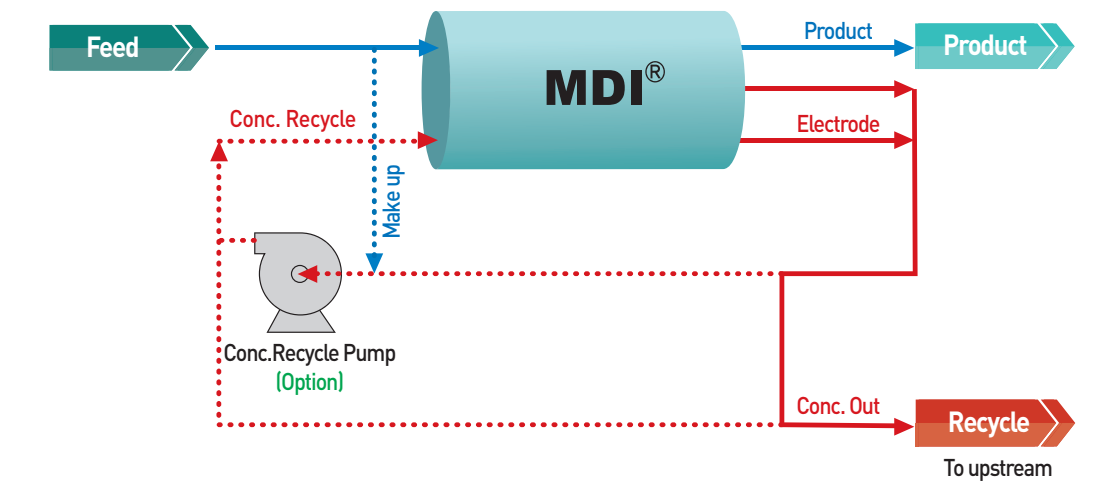
- **Continuous, Easy Operation.**
Eliminates regeneration process and needs only DC power.
- **Economical, Homogeneous Product.**
MDI systems are cost competitive, and product quality is consistent and predictable.
- **No Hazardous Waste Stream.**
Eliminates the waste water treatment, and is environment-friendly technology.
- **No Regeneration Chemicals.**
The absence of chemicals makes it possible for operators to work under the safe conditions.
- **High Recovery System.**
With MDI's chemical-free process, conc stream can be fed back into the upstream in front of the R/O.
- **Easy to Install and Maintain.**
You can configure any size installation to meet your flow requirements by standing stacks in a row.
- **Reduced Facility Requirement.**
MDI systems which don't need chemical regeneration system have a smaller installation area than Mixed-bed system.



MDI® PRINCIPLE

- Cation-exchange membrane which is charged negatively allows only the passage of positively charged cations.
- Anion-exchange membrane which is charged positively allows only the passage of negatively charged anions.
- Ion-exchange resins which are packed between ion-exchange membrane react as medium that increases ion transfer rate and reduces electrical resistance.
- Feed water enters the MDI stack and is diverted into a series of cells.
- DC voltage is applied across each cell, forcing the migration of ions towards their respective electrodes.
- Cations in the water pass through cation-exchange membrane and move to the negative electrode direction, and anions pass through anion-exchange membrane and move to positive electrode direction.
- The high purity water is produced in dilute compartment, and concentrate water is discharged and recirculated in the concentrate compartment.

Flow Diagram of MDI® System



MDI® Specifications

Model	MDI 500V	MDI 400H2	MDI 500H1	MDI 500H2
Type	Vertical	Horizontal	Horizontal	Horizontal
Maximum Feed Water Specifications				
Feed Water Conductivity Equivalent, including CO2 and Silica	<40us/cm	<40us/cm	<40us/cm	<40us/cm
Inlet Pressure	Max. 7.5kgf/cm ²	10kgf/cm ²	10kgf/cm ²	10kgf/cm ²
Pressure Drop	App. 1.5kgf/cm ²	App. 1.2kgf/cm ²	App. 2.0kgf/cm ²	App. 2.0kgf/cm ²
Typical Module Performance				
Recovery	90~95%	90~95%	90~95%	90~95%
Flow Rate : nominal	5~6m ³ /hr	10~12m ³ /hr	8~10m ³ /hr	18~19m ³ /hr
DC Voltage	0~600V	0~600V	0~600V	0~600V
DC Amperage	0~10A	0~10A	0~10A	0~10A
Product Resistivity	>16 megohm-cm	>16 megohm-cm	>16 megohm-cm	>16 megohm-cm
Physical Specifications				
Diameter	600mm	406mm	508mm	508mm
Length	1,150mm	3,220mm	1,753mm	3,316mm
Empty Weight	300kg	350kg	420kg	840kg
Oper. Weight	400kg	820kg	730kg	1,450kg
Material	Carbon Steel with Rubber Lining	Carbon Steel with Rubber Lining	Carbon Steel with Rubber Lining or GRP	Carbon Steel with Rubber Lining

※ Disclaimer : All data above are intended for use of general information only, and since use of the products and information is not within its control, Huvis Water assumes no obligation or liability for such information and does not guarantee results from use of said products or such information, with out Huvis Water's engineer's conformation.

※ Please contact us for more details.



Huvis Water is the industry leader in providing the condensate polishing system for the power plants. Our condensate polishing system is easily constructed to fit into all variations of foot prints specified by our clients. With lots of project experiences, Huvis Water has the knowledges and experiences to supply best technology available design, installation, operation and maintenance including out-sourcing for condensate polishing system.

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Condensate Polishing System

Huvis Water

The Condensate Polishing Plant(CPP) maintains steam generator (SG) reliability, allows operation even with condenser leakage, supplies protection of turbine from deposition and corrosion, and reduces start-up time after a plant trip or refueling. Overall plant economy and efficiency is greatly improved by the condensate polishing system.

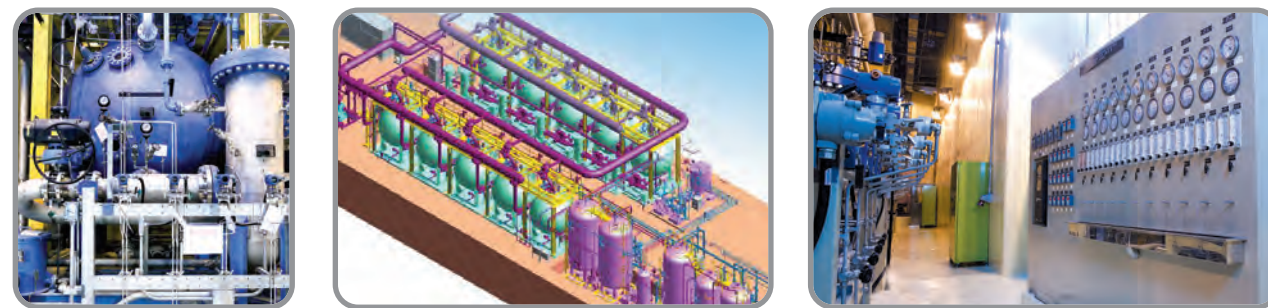
Condensate Polishing System

Condensate Service to CPP

Pre Filter removes corrosion products such as crud, debris, total iron, and other contaminants in the condensate. Huvis Water can provide several types of filters such as precoat filter, candle filter and membrane filter.

Cation Bed Polisher mainly removes ammonium ions from untreated condensate and other cations along with such dissolved solids as crud, debris, total iron, etc.

In the **Mixed Bed Polisher**, the cation resin removes a small quantity of residual cation species from the partially treated condensate and anion resin removes anions such as sulfate and chloride radical.



Optimized Custom Design...

The condensate polishing system consists of specially designed pre-filter or cation bed polisher, mixed bed polisher, regeneration system, monitoring and control system.

- Mixed bed polisher only or pre-filter followed by mixed bed polisher : the most commonly used system at low condensate pH levels.
- Cation bed polisher followed by mixed bed polisher : to minimize transient impurities at high condensate pH levels.



Regeneration System

IMR® Process : Huvis Water Patented External Regeneration Systems

Huvis Water has technical expertise in the field of condensate polishing and has developed its own regeneration method called the 'IMR Process'. The 'IMR Process' is the process of using an intermediate resin(IMR) layer between cation resin and anion resin layers whenever mixed resins are separated in the resin separation and cation regeneration tank(RS/CRT). The 'IMR Process' is one of the best ways to ensure perfect resin separation into cation and anion resins.



Huvis Water's System Advantages

- Compact system with a minimum foot-print : Low capital cost
- Flexible design : On or off site regeneration system
- Automatic remote control system
- Optimal regeneration system
- Very high resin separation efficiency
- High quality water : Lower Na⁺ concentration
- Low operation costs : Less waste and shorter regeneration time
- Proven technology : Strong reliability : Numerous of experiences



Years of Experience

Huvis Water has conducted many condensate polishing system installations for the nuclear power plant and the thermal power plant . We have supplied engineering, procurement, construction (EPC) and operation and maintenance services for the condensate polishing systems.

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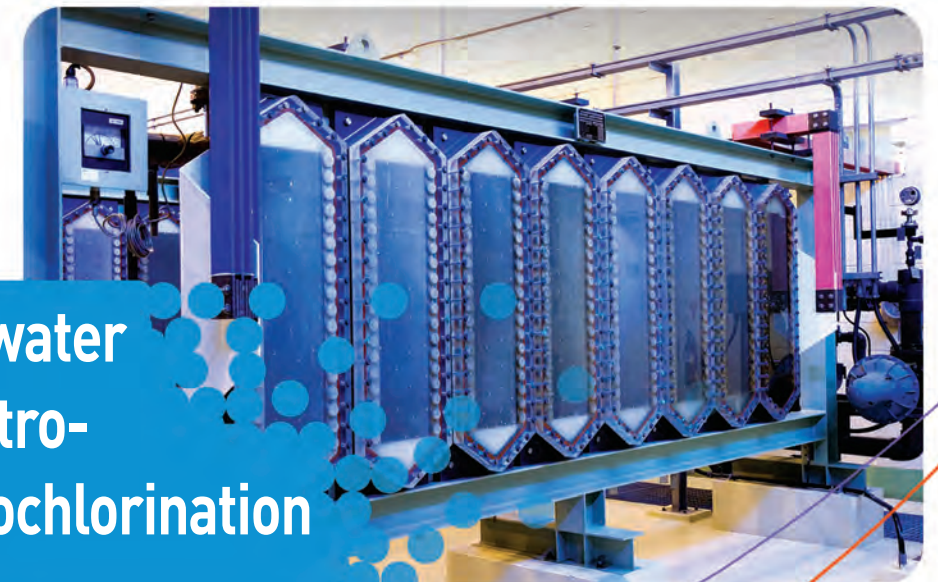
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Seawater Electro- Hypochlorination System



Huvis Water

More and more engineering

and purchasing managers have discovered a way to eliminate the difficulty in handling and storage of chlorine gas. Huvis Water's long experience has helped them achieve a solution to these problems by supplying the Seawater Electro - Hypochlorination System.

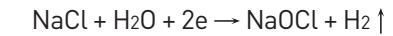
Huvis Water's System Advantages

- Optimum system design
- High efficiency cell module
- Concern for safety - no chlorine gas
- Long term reliability (Electrode life > 5 years)
- Vast experience

Seawater Electro-Hypochlorination System

Principle of Operation

In a typical Seawater Electro-Hypochlorination System, seawater is fed through a strainer, where particles are removed. From this point the seawater is fed to the electrolysis module by way of a flow controller. In the module, passage of direct current through the seawater converts a portion of the salt to hypochlorite by the following reaction :



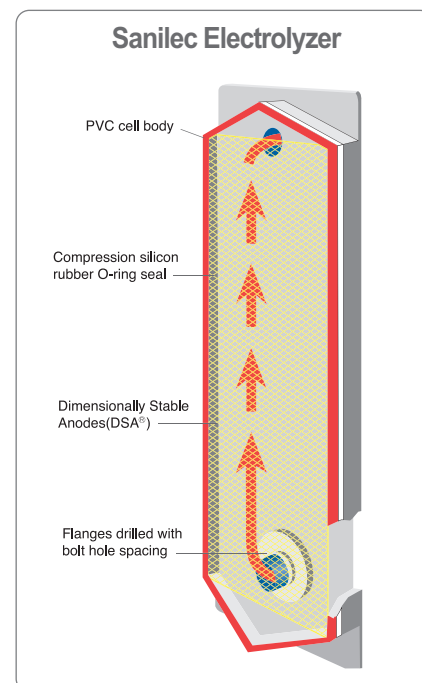
The Best Technical Service

Huvis Water has supplied the best Seawater Electro-Hypochlorination System including engineering, manufacturing, installation, commissioning, and operations and maintenance.

Major Equipment

The Seawater Electro-Hypochlorination System is comprised of the following major equipment:

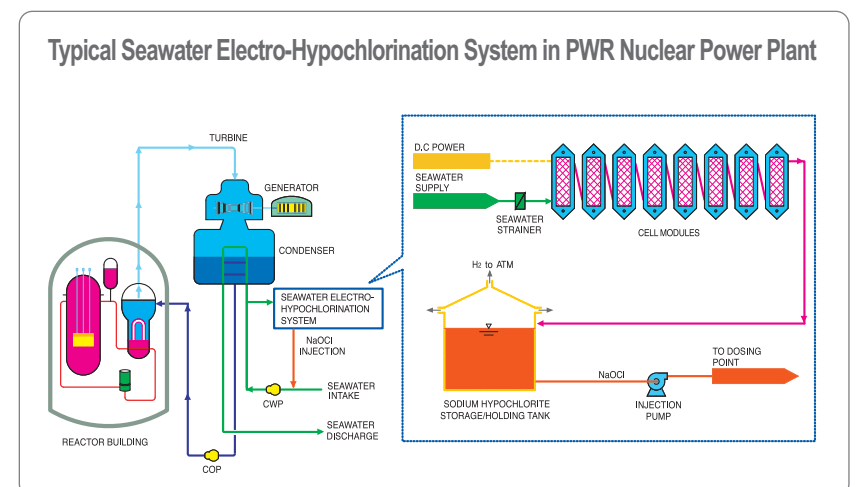
- Sodium hypochlorite generators(Mono-bi-polar modules)
- Rectifiers
- Seawater supply pumps
- Seawater strainers
- Sodium hypochlorite storage / holding tanks
- Sodium hypochlorite injection pumps
- Control panel
- Seawater pretreatment system(if required)



The liquid and gas streams are combined and moved to the gas disengaging/product storage tank. At the tank, the hydrogen gas is separated and vented. Then, the sodium hypochlorite solution is transferred and injected into the points required. Due to impurities in seawater, the cells are cleaned periodically to remove deposits on the electrodes.

Applications

- Cooling water systems
- Nuclear power plants
- Thermal power plants
- Combined cycle power plants
- Desalination plants
- Evaporation systems
- LNG receiving terminals



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Boron Monitoring System



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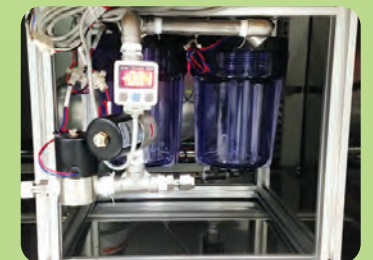
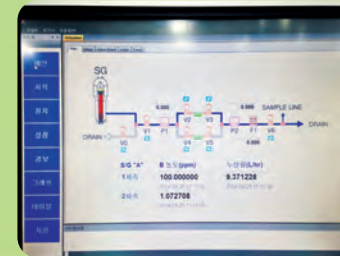
Boron Monitoring System Features:

- Boron Monitoring System(BMS) based on capillary tube Ion-Chromatography is possible to measure boron in real time the range from trace levels ppb to ppm levels in a aqueous solutions of mixed cations and anions within 15 minutes.
- BMS can accurately detect the tube leakage in advance, when tube leakages of heat exchangers like the steam generator(SG) in nuclear power plants occurred. Besides, BMS can be very useful demineralizer plants because boron normally come out earlier than the silica in case of the saturation of the ion exchange resin, and it also has been expected to be reliable and effective method in water treatment plants, because boron ion in the drinking water could have an impact on some genetic problems at over certain amounts.
- This measurement technology using capillary tube can reduce one hundredth of the waste solution in comparison with the conventional Ion-Chromatography, because it needs a very small amount of sample.

BMS Principles and Methods

- Sample moves from a pre-treatment module to the capillary IC system passing through 2-train filters.
- Sample of the IC system was moved by capillary pump controlling a flow rate of an extremely small amount, and concentrated by a loop method. The conductivity of boron was amplified by sorbitol. Finally, the sample reached the suppressor and conductivity detector.
- The signal which was measured by conductivity detector shows on screen display, which is converted into the leak rate through a programmable logic controller(PLC).
- BMS is a measuring technique to amplify the conductivity of boron among the various of ions in water by sorbitol

Boron Monitoring System



BMS Principles and Processes

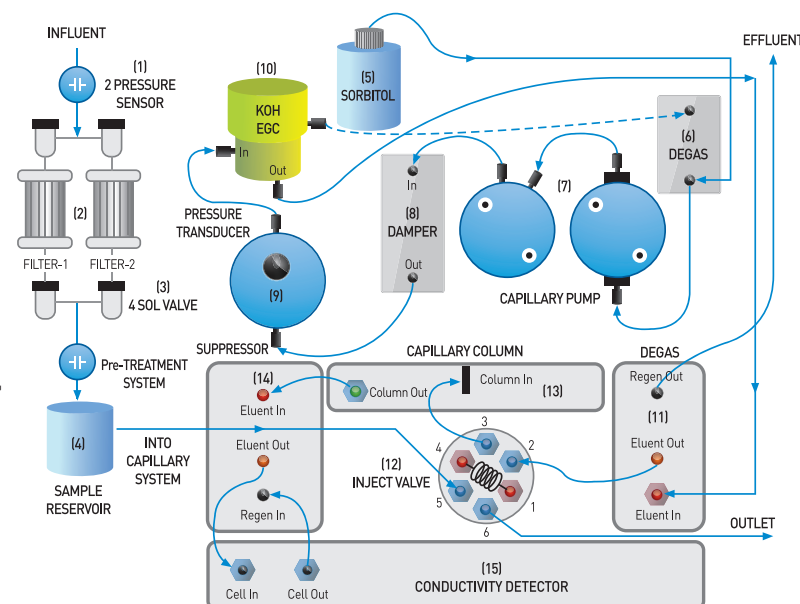
BMS Process Diagram

BMS comprises a pre-treatment module and capillary IC system.

The pre-treatment module was made up of pressure sensors(1), pre-treatment filters(2), solenoid valves(3), and sample reservoir(4).

Capillary IC as a key component of the BMS has micro-capillary column in the size of 4 μm .

That consists of sorbitol injector(5), degas(6), capillary tube pump(7), damper(8), pressure transducer(9), KOH EGC(10), degas(11), injection valve(12), capillary column(13), suppressor(14) and detector(15).

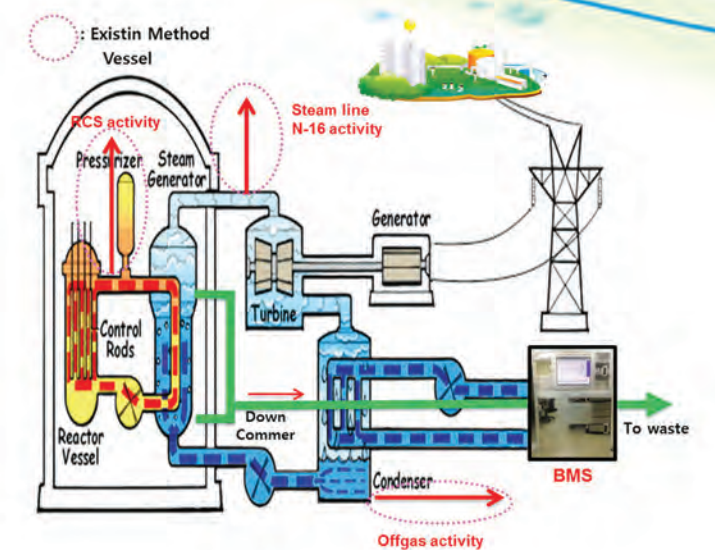


BMS Advantages

- Excellent a peak resolution
- A very small amount of sample
- Reduction of waste solutions about 1/100 than conventional IC
- High accuracy of measurement
- Reliable technology allowing to monitor under abnormal conditions

BMS Applications

- Salt Industries
- Nuclear Power Plants SG Tube
- Demineralizer Plants
- Drinking water plants
- Waste Water Treatment Plants
- Seawater Desalination
- Hot Spring Water
- Mine Waste Water



Application for NPPs for SG tube leakage monitoring using



Steam
Generator
Chemical Cleaning

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Chemical cleaning has been established as an effective means of removing deposits from the secondary sides of PWR steam generators. Steam generator tube corrosion and loss of performance remain a significant problem in PWR operation. Secondary side chemical cleaning has been used to remove accumulated corrosion products and mitigate corrosion problems and loss of performance.

During operating life, pressurized water steam generators in nuclear reactor units accumulate corrosion products. The source of these deposits can be traced to the feed water systems. The feed water systems are the source of aggressive impurities that can concentrate within the deposit accumulations and cause a variety of corrosion problems in steam generators. Steam generator corrosion deposit accumulations can also reduce heat transfer and block support structure flow channels causing severe water level oscillations and localized corrosion in both tubing and support structures.

Steam Generator Chemical Cleaning

The use of chemical cleaning solvents has long been recognized as an effective means to dissolve and remove impurities from steam generators. Work to develop acceptable processes began in the 1970's and has continued until the present.

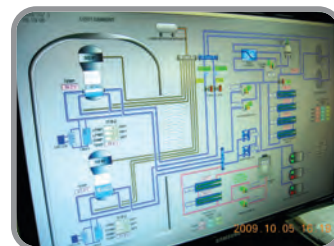
Huvis Water offers the EPRI/SGOG chemical cleaning process with approved solvents:

- Magnetite solvent for iron oxide removal and removing deposits in tube support crevices (EDTA based)
- Copper solvent for copper metal removal (EDA and H₂O₂ based)

Benefits of Steam Generator Chemical Cleaning

- Helps extend steam generator integrity operation
- Thermal performance improvement
- Improvement of steam generator secondary side corrosion

Can be customized to perform steam generator full-bundle, partial-bundle and/or tube sheet chemical cleaning including crevice cleaning.



In general, Advanced Scale Conditioning Agent (ASCA) has several benefits: short duration (typically 24 hours), effective deposit removal (150 to 227kg per steam generator per application), and low carbon steel corrosion. Application temperature typically ranges from ambient to 82°C. Applying the process multiple times over the life of the plant is achievable with less than 0.5 mils of carbon or low alloy steel corrosion expected per application. Chelant replenishment can also be employed to increase deposit removal, if needed.

Why ASCA?

- Small footprint
- Simple application
- Very low corrosion rate
- Effective deposit removal

Types of ASCA Applications

- Bulk Iron removal (maintenance cleaning)
- Top of tube sheet ASCA
- Copper removal ASCA
- Thermal hydraulic improvement ASCA

ASCA technology continues to develop and thrive as a useful technology to maintain and improve steam generator integrity.

