We make any water usable

innoflow
이노플로우 테크놀로지스

CONTENTS

Company Introduction

CSDS (Containerized Seawater Desalination System)

EDI (Electrodeionization)

ReDI Service

ED (Electrodialysis)

BPED (Bipolar Electrodialysis)

MD (Membrane Distillation)

Custom Stack & Engineering

Water Quality Analysis & Technical Diagnosis

Company Introduction

Founded in 1991, Innoflow Technologies has spent more than several decades advancing industrial water treatment through membrane separation technology. Our vision, “We Make Any Water Usable,” guides everything we do. Our core expertise lies in ion exchange membrane processes: electrodialysis (ED), bipolar membrane electrodialysis (BPED), electrodialysis metathesis (EDM), and electrodeionization (EDI). We complement these with reverse osmosis and membrane distillation.

Through continuous R&D at our in-house research center, we have turned these technologies into commercial systems. They have been delivered to the semiconductor, display, secondary battery, pharmaceutical, petrochemical, and power generation industries, and serve applications from ultrapure water production to selective ion separation and resource recovery.

We do not simply supply equipment, but focus on optimizing the technology for each application. Our work runs from feed water analysis and pilot testing through stack design, process engineering, and commissioning, so that every system performs reliably in the field.
We will keep working to make industrial water, and the valuable resources within it, usable again.

CSDS

Containerized Seawater Desalination System



Seawater desalination is a process that takes away mineral components from seawater to produce water suitable for human consumption or irrigation.

Containerized Seawater Desalination System Adventages

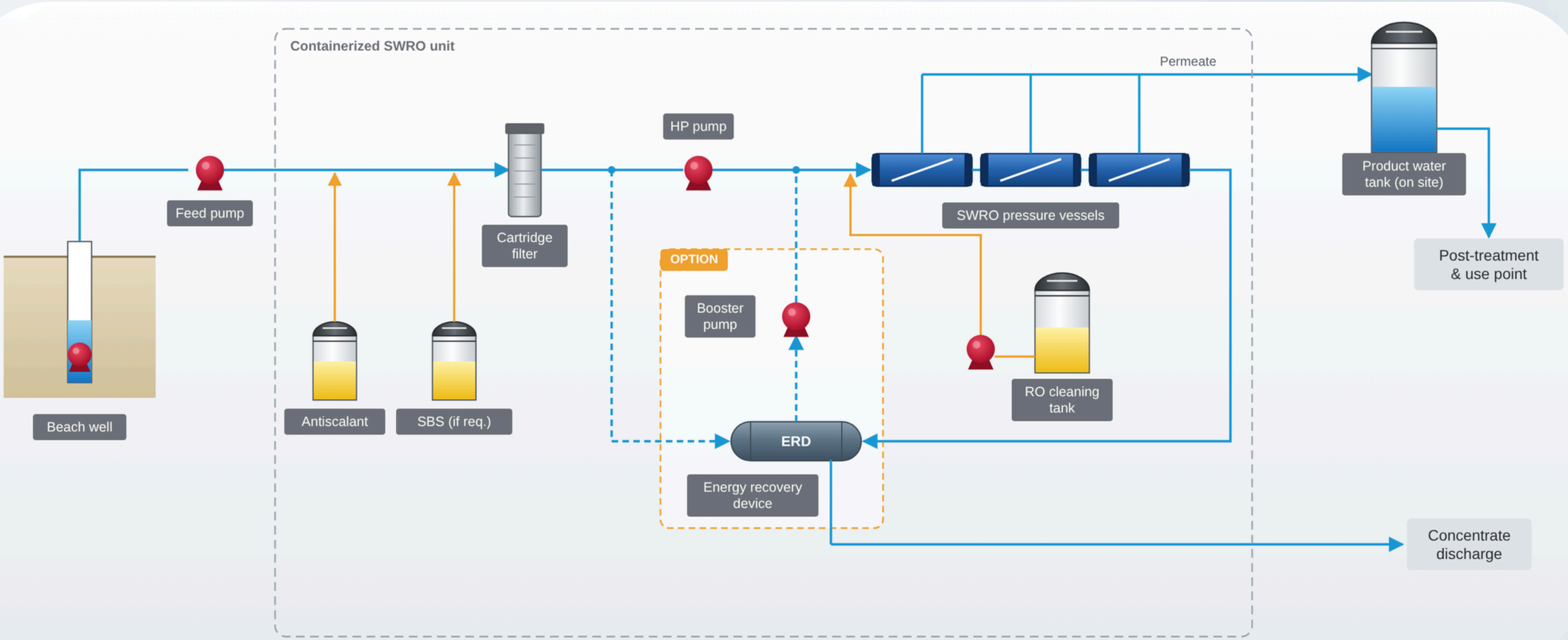
- Compact (all in container)
- Mobile (can go and install to anywhere)
- Reasonable maintenance costs
- Easy enlargeable modular system

for clean seawater from beach well
250m³/day – One (1) 40-ft container
300m³/day – One (1) 40-ft container
500m³/day – Two (2) 40-ft container

for seawater requiring pre filtration
250m³/day – One (1) 40-ft container
300m³/day – One (1) 40-ft container
500m³/day – Two (2) 40-ft container

CSDS

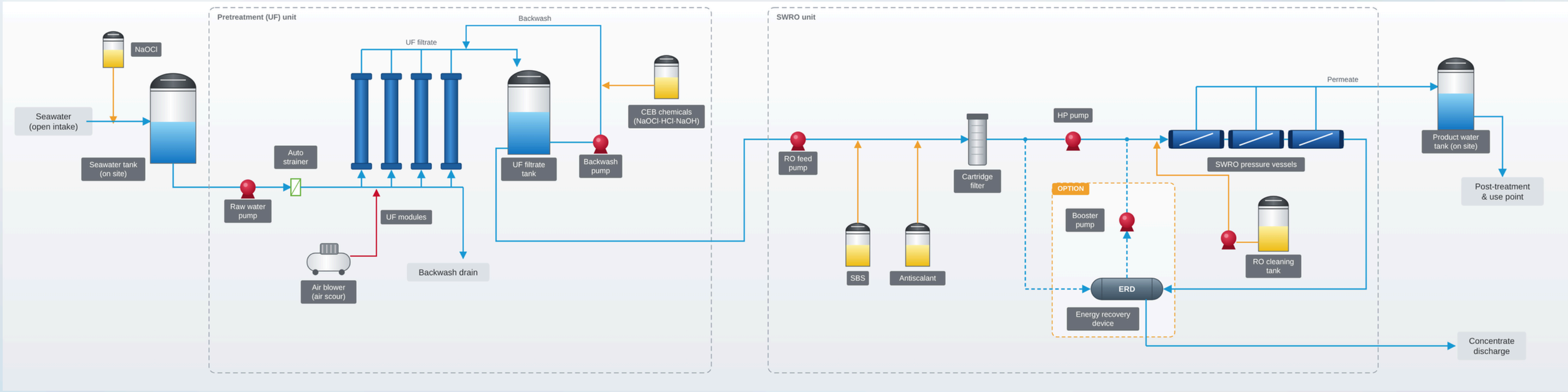
Containerized Seawater Desalination System Flow Chart-Example Type A



Beach well option: ※250,300m³/day-1ea 40ft container ※500m³/day-2ea 40ft container

CSDS

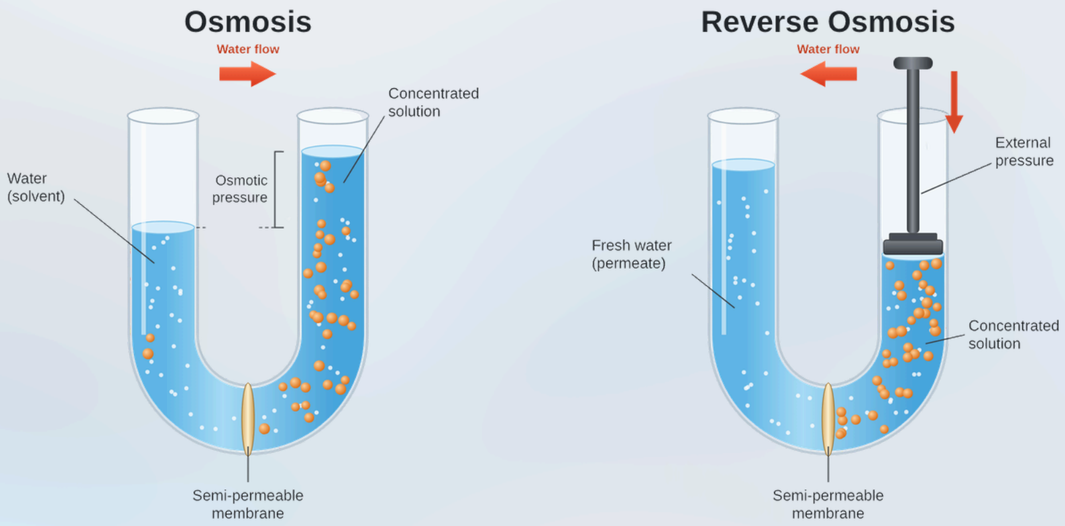
Containerized Seawater Desalination System Flow Chart-Example Type B



Prefiltration option: ※250, 300m³/day-one 40ft container ※500m³/day-two 40ft containers

RO System

Reverse Osmosis System



RO System is the pure water generating process by removing the ionic solutes through the shifting the solution from high concentration to low concentration by reversely utilizing the driving force of concentration gradients created from the semi-permeable membranes.

Our RO System can remove the ionic solutes from the water up to 95~99% and also filter the bacteria and organic compounds having molecular weight of 250 or more at least up to the level of 99%.

RO System

Adventages

- Process automation is available, for not only the whole Process Flow Design and the Scale up are easy but the operation and the facilities are simple.
- There are no phase changes in the solution during the process of filtration.
- Can be widely adaptable for various industries, adequately applicable for the areas demanding less temperature changes during the processes.
- Specific types of solutes can be selectively separated by the function of the membrane used.
- The quality of the outcoming water is stable and not sensitive to the outside environment.

Characteristics

- Inorganic solutes are separated easier than organic solutes.
- For the case of removal of inorganic ions, it is easier to remove the ions having larger radius of the aquated ion rather smaller radius of the aquated ions.
- Electrolytes rather than non-electrolytes are easier to remove.
- For the electrolytes, the higher the electric charges of them, easier to separate them.
- For the non-electrolytes, the bigger the size of the molecules, easier to remove them.
- The penetration rates of the membranes for the salts made from the gases are usually high while the removal rates of the gases such as ammonia, chlorine, carbonic acid and hydrogen sulfides are low.
- The removal rate of weak acids are low.

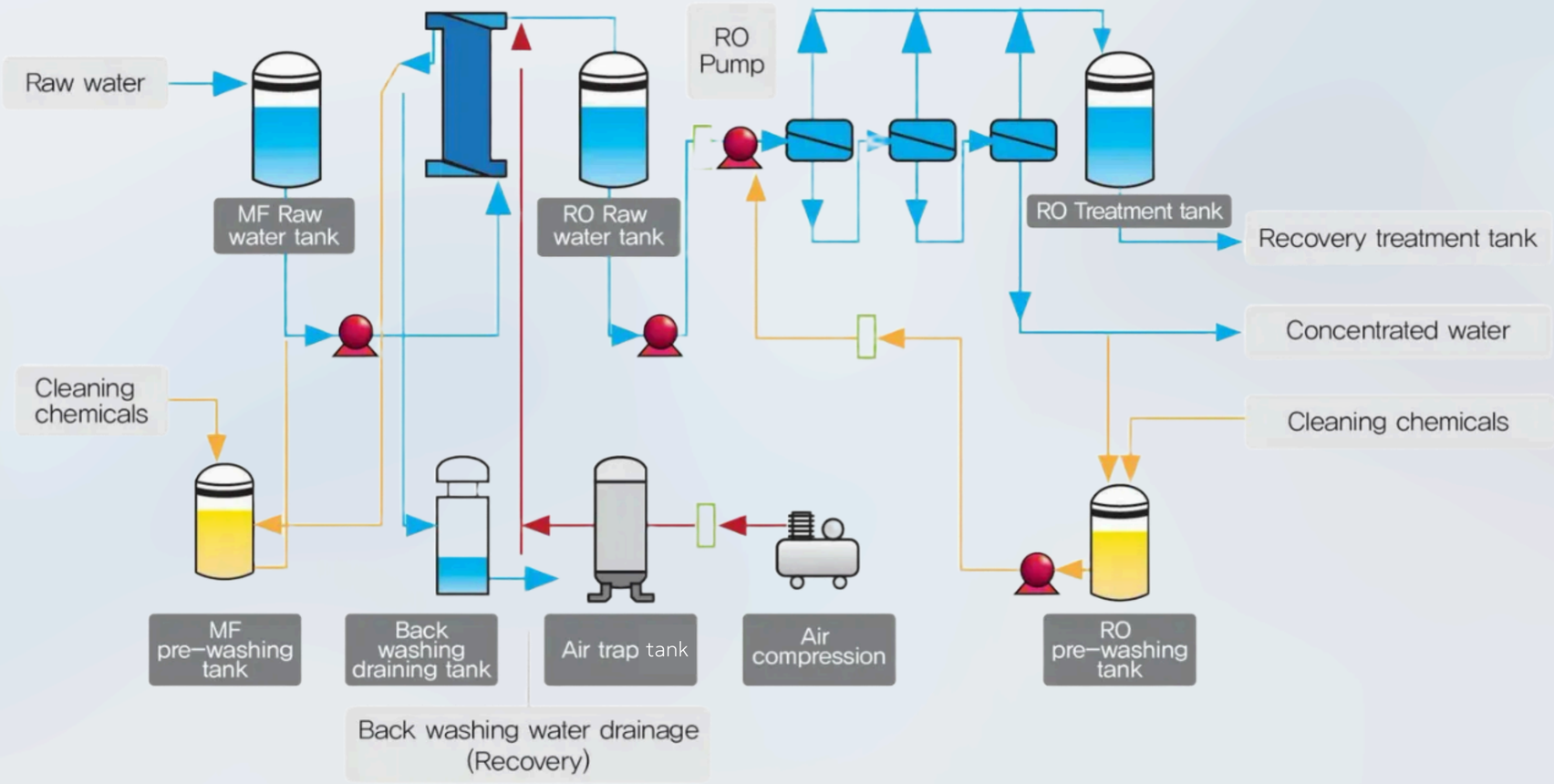
RO System

Application Area

Field	Applications
Water treatment, Waste water treatment	Sewage, gray water, treatment of the regenerated water from ion-exchanger, treatment of the waste waters after washing nuclear active materials.
Sea water Industries	Sea-water & Brackish water desalination, Pre-treatment of service water, Production of ultra-pure waters, etc.
Chemical Industries	Petroleum Chemical industry, Waste waters from pulp, etc.
Pharmaceutical Industries	Removal of Pyrogens, Concentration and purification of Herb medicines, Manufacturing of Medical/Pharmaceutical service waters.
Textile/Dye Industries	Waste waters from Dyeing, etc.
Surface Treatment and Mechanical Industries	Oil-containing waste water treatment, Recovery of electro-deposition aluminium electro-deposition coatings, Waste waters from paints, etc.
Dairy Farming/Fisheries/ Livestock Farmings	Recovery of Lactose from Cheese Production, Separation of amino acids during fish meat processing, etc.
Food Processing Industries	Waste waters from Soybean Processing, Processing of vegetables and Fruits, etc.

RO System

Flow Diagram (Example)



RO System

System Design Elements

• Because the quality of the inlet water such as temperature, pressure, concentration, etc are affecting the efficiency and lifetime of the membranes, it is prerequisite to acquire the information of condition and compositions of the incoming waters.

• By pre-treatment process, the SDI equal to 5 or lower and the Turbidity equal to 1 or lower can be maintained.

• After operation: At the same time of stop operation, the system has to be washed with fresh water (15~30 min/wash)

• Cleaning In Place (CIP): 2~4 turns/year

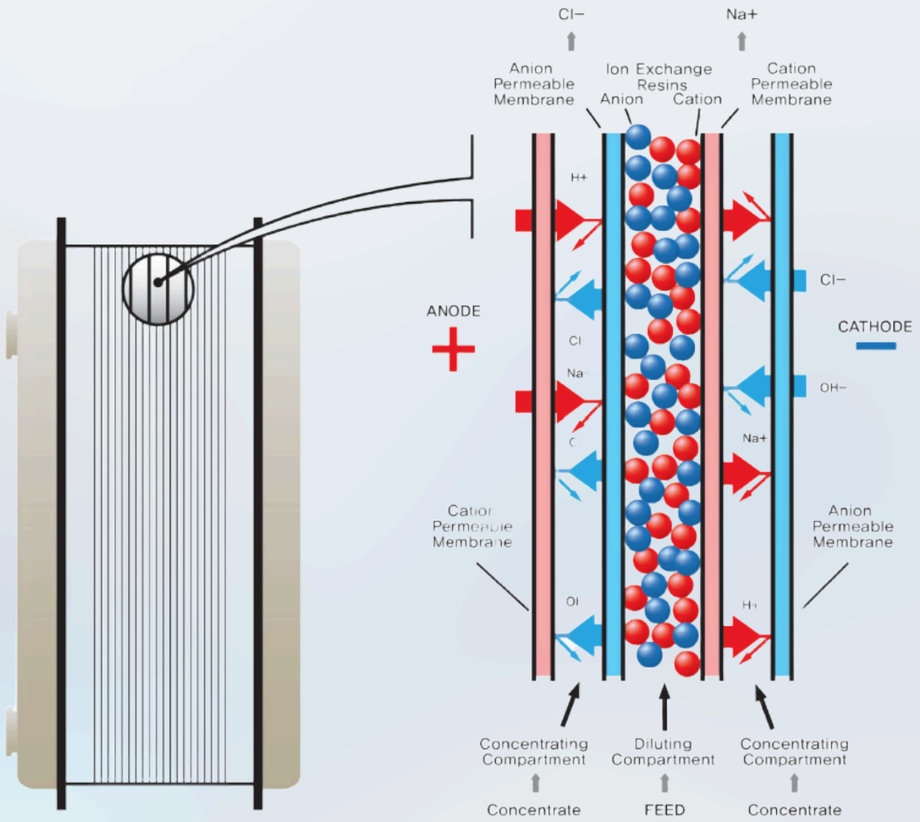
• Every year 10~20% of new membrane have to be replaced. For the separation of sea water from the surface, 20~30% replacements are required.

• Inductive piping systems have to be equipped on Air Valves and on Drain Valves to prevent scatterings.



EDI System

Electrodeionization Technology



EDI combines ion exchange membranes, ion exchange resins and a DC electric field to produce pure and ultrapure water continuously. Conventional ion exchange resin systems must be stopped for chemical regeneration and produce regeneration wastewater. EDI was developed to overcome these limitations.

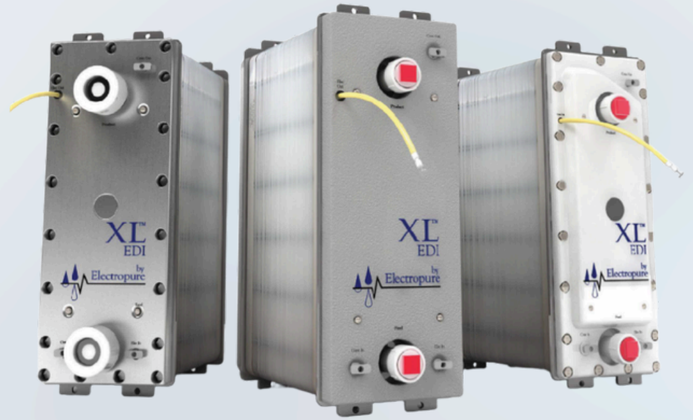
An EDI module has cation and anion exchange membranes arranged alternately between two electrodes, forming dilute, concentrate and electrode compartments. The dilute compartment is filled with mixed cation and anion exchange resins, and this repeating unit is called a “cell pair.” The conductive resin bed keeps electrical resistance low and current efficiency high during operation.

When DC power is applied, ions move from the dilute compartment through the membranes into the concentrate compartment, so the product water becomes progressively purer. At the same time, H^+ and OH^- ions produced by water splitting continuously regenerate the resins, so no acid or caustic is needed.

As the exclusive distributor of SnowPure in Korea, we design and supply EDI systems built on Electropure™ modules.. XL and EXL Series modules cover a wide range of capacities, and all systems run automatically under PLC control.

EDI System

Key Features and Advantages of Electropure™ Modules



- Produces ultrapure water up to 18 MΩ·cm
- Product flow from 50 L/h to 8 m^3/h per module
- Compact, lightweight modules for space-saving system design

1. Thin-Cell Technology

The Cell thickness of the Electropure is only 4 mm comparing to 10 mm of that from other company's, which affects the increment of ions' flowing forces and enhances the treated water quality and efficiencies.

2. Thin-Concentrate Technology

The thin layer of 700μm thickness of the Concentrating Compartment creates the vortex onto the surface of the membrane, which removes any possible contaminate on the surface and maintains the condition of water pH close to 7 around, which prevents the foulings and scalings. Furthermore, there are no cumulation of ion exchange resins in the Concentrating Compartment, which hinders the formation of foulings and reduces the amount of current consumption.

3. Non-fouling Electrode Technology

The Electropure™ employs a very special Anode Technology to restrain the generation of chlorines, which increases the lifetime of EDI modules and maintains the acidic condition of the electrodes, and therefore it prevents the formation of scales on the Electrode surfaces and inside of the System.

EDI System

Applicable Industries

• Production of ultra-pure waters for Semi-conductor Industries.

• Production of pure/ultra-pure waters for Pharmaceutical and/or BioTech Manufacturing Processes.

• Production of pure/ultra-pure waters for Facility Lines of Power Plants and/or Cogeneration Plants.

• Substitution for the current aged conventional Ion-Exchange Resin System.

• Applicable to any facility demanding pure/ultra-pure water supply system.









ReDI Service

What Is ReDI Service?

ReDI is a service that restores end-of-life EDI modules to like-new performance by replacing their key components.

When You Need ReDI

Your EDI module has reached the end of its service life and needs replacement
Your EDI module was damaged during operation
You need to run CIP frequently
Performance does not recover even after CIP
You want to reduce maintenance costs

Advantages of ReDI

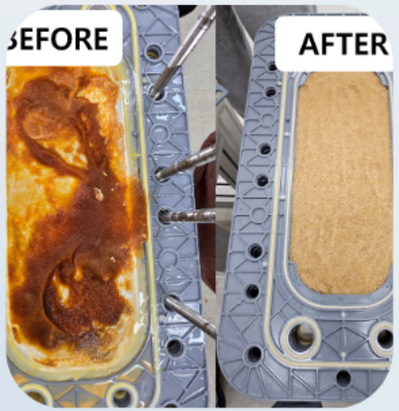
Performance proven over more than 5 years (reference list available on request)
Quality and service life equal to a new module, with a 1-year free warranty
Reasonable cost compared with a new module
Immediate response on request

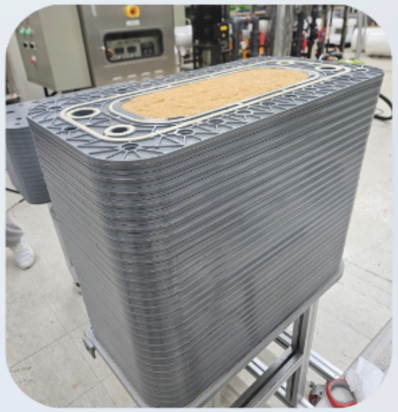
ReDI Service

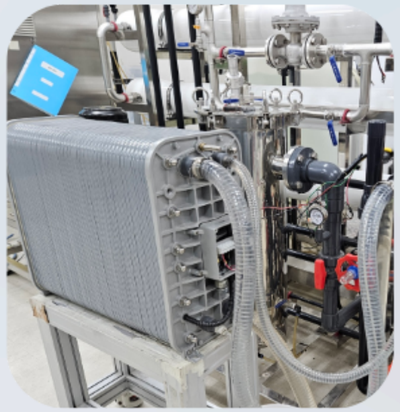
ReDI Service Process













Service Request	Pickup	Cleaning / Component Replacement	Reassembly	Performance Test	Delivery

Water Quality Anaysis

Water Quality Analysis





Innoflow Technologies provides water quality analysis and technical diagnostic services that support the design, operation, and troubleshooting of water treatment systems.

We go beyond reporting analytical results. Water quality data is correlated with the operating conditions of ED, EDI, RO, and other membrane processes to identify the root causes of water quality issues, and we recommend suitable treatment methods and operational improvements.

Key Analysis & Diagnostic Areas

General Water Quality Analysis

pH
Conductivity
Resistivity
Hardness
Major Dissolved Ions

High-Purity Water & EDI Analysis

Silica
CO_2 & Alkalinity
Residual Chlorine & Oxidants
RO Permeate Quality
EDI Feed & Product Water Quality

Water Quality Anaysis

Membrane System Troubleshooting

Scaling Potential Assessment
Membrane & Resin Fouling Analysis
EDI Voltage & Current Abnormality Analysis
Pressure & Flow Variation Analysis
RO / EDI Operating Condition Review



Technical Analysis

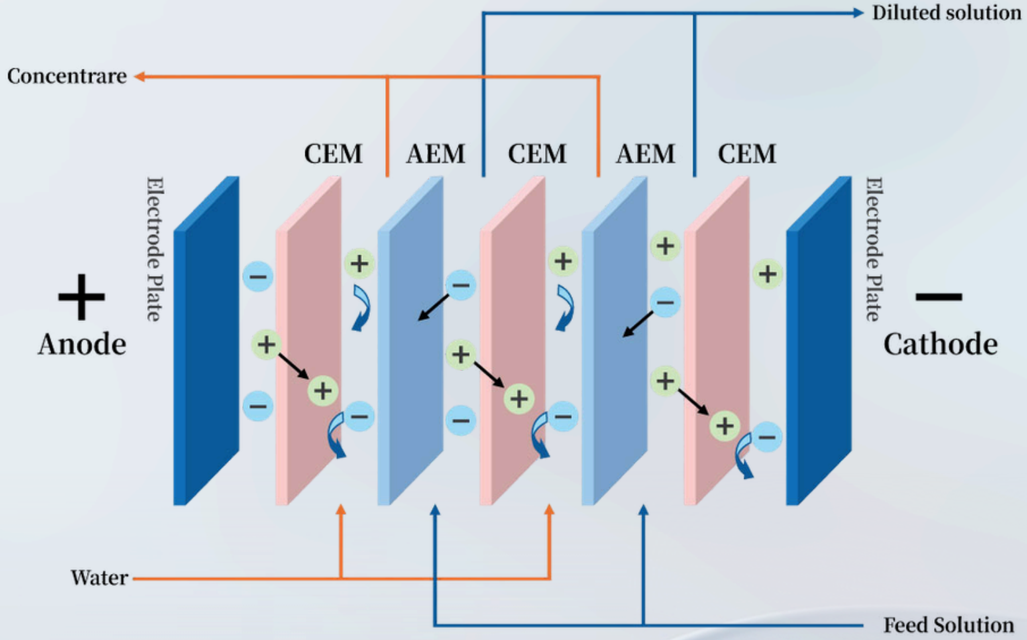
Water Analysis → Operating Data Review → Problem Diagnosis → Process Evaluation → Improvement Proposal

We review water analysis results together with actual operating data to go beyond numerical analysis, identifying root causes across the entire treatment process and recommending improvements as an engineering service.

ED System

Electrodialysis Technology

Electrodialysis (ED) is an ion exchange membrane process that uses a DC electric field to separate and concentrate dissolved ions in a solution. It can serve the same purpose as ion exchange resins, but it needs no chemical regeneration, generates far less wastewater and is simpler to operate.



An ED stack consists of cation exchange membranes (CEM) and anion exchange membranes (AEM) arranged alternately between two electrodes. Depending on the flow arrangement, the stack is divided into diluate, concentrate and electrode compartments.

When DC power is applied, cations move toward the cathode and anions move toward the anode. Cations pass through the CEM but are blocked by the next AEM, and anions pass through the AEM but are blocked by the next CEM.

As a result, ions are depleted in the diluate compartments and accumulate in the adjacent concentrate compartments. Desalination and concentration therefore happen simultaneously in a single process.
By adjusting the current density, voltage, flow rate and number of stages, the product water quality and the degree of concentration can be controlled precisely. With selective membranes, specific ions such as monovalent and multivalent ions can also be separated.

ED System

Characteristics and Advantages

- Desalinates and concentrates in a single process.
- Needs no regeneration chemicals, which greatly reduces wastewater compared with ion exchange resins.
- Handles high-salinity industrial wastewater and brines.
- Operates at feed temperatures up to 40 °C (up to 60 °C with heat-resistant membranes).
- Easy to operate, with low maintenance costs.





ED System

Applicable Industries

Concentrations

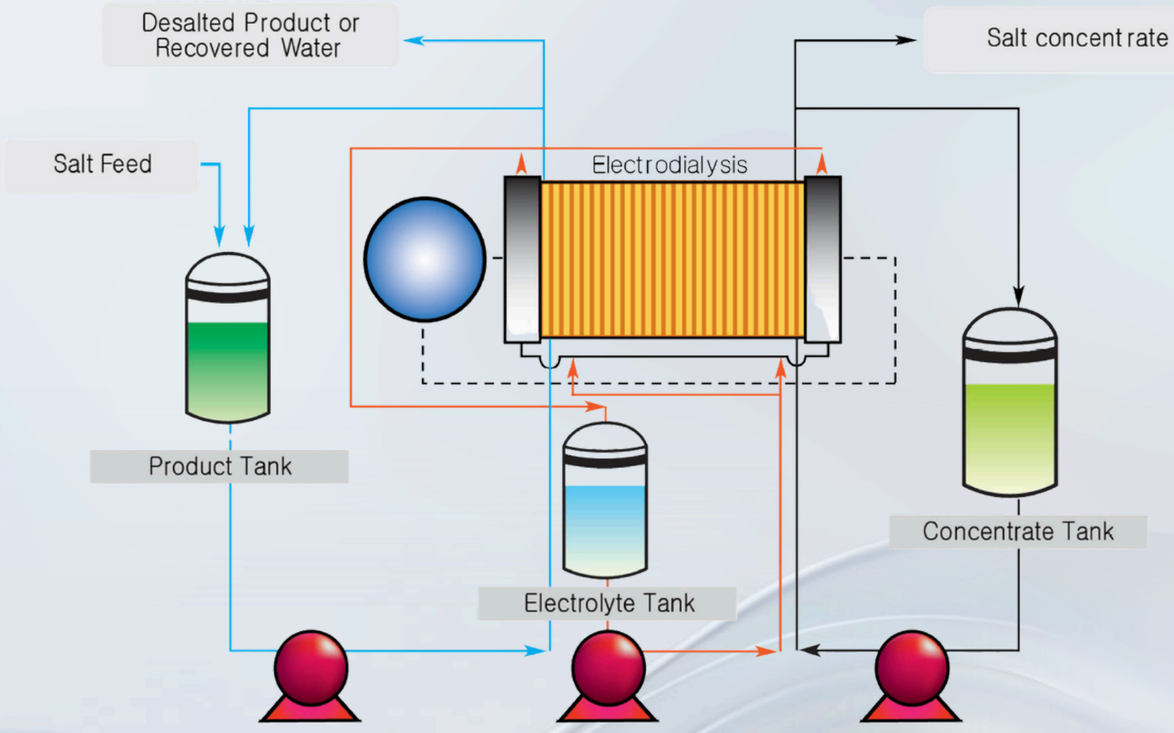
- Manufacturing table salts by concentration of sea water.
- Recovery of usable metals from the waste waters of electroplatings.
- Concentrations and purifications of organic acids.
- Pre-concentration of inorganic salts for vaporization and solidification.

Desaltings

- Manufacturing Drinking/Industrial waters from sea or salt waters
- Desalinating the solutions of raw materials for Food and Pharmaceuticals.
- Desalting the waste waters, circulated cooling waters for re-use.
- Pre-treatment of waters for Boiler Facilities.
- Pre-treatment of waste waters from electroplatings.

Desalting and Concentration of Organic materials

- Desalting natural-original juices, sugars.
- Desalting and purification of enzymes.
- Controlling the salt concentration of the seasonings made of amino acids.
- Purifications of vitamins.
- Desalinations and purifications of monomers and intermediates for organic syntheses.



ED System

Applied Case

Desalination of amino acid solution

Item	Before desalination	After desalination
NaCl (g/l)	60	2.4
pH	5.0	5.2
Conductivity (ms/cm)	84.5	9.5
Viscosity (c.p.)	2.0	-
Concentrate Solution	0.1% as NaCl	-
Electrolyte	1% as Na_2SO_4	-
Desalination rate of NaCl (%)	96%	-

Desalination of sugar

Item	Before desalination	After desalination
Concentration of sugar	Brix 10°	-
Conductivity (ms/cm)	14.5	1.5
pH	6.5	5.5
Temperature (℃)	25	-
Concentrate Solution	NaCl	-
Electrolyte	Na_2SO_4	-
Removal rate (%)	90%	-

Desalination of pharmaceutical base materials (Antibiotic)

Item	Before desalination	After desalination
Conductivity (ms/cm)	16	1.3
Viscosity (c.p.)	15	-
pH	7.3	6.85
Temperature (℃)	20	20
Concentrate Solution	0.3% NaCl	-
Electrolyte	0.25N NaCl	-
Desalination rate of NaCl (%)	92%	-
Reduction rate of pharmaceutical base materials	8%	-

Separation of Organic Matters

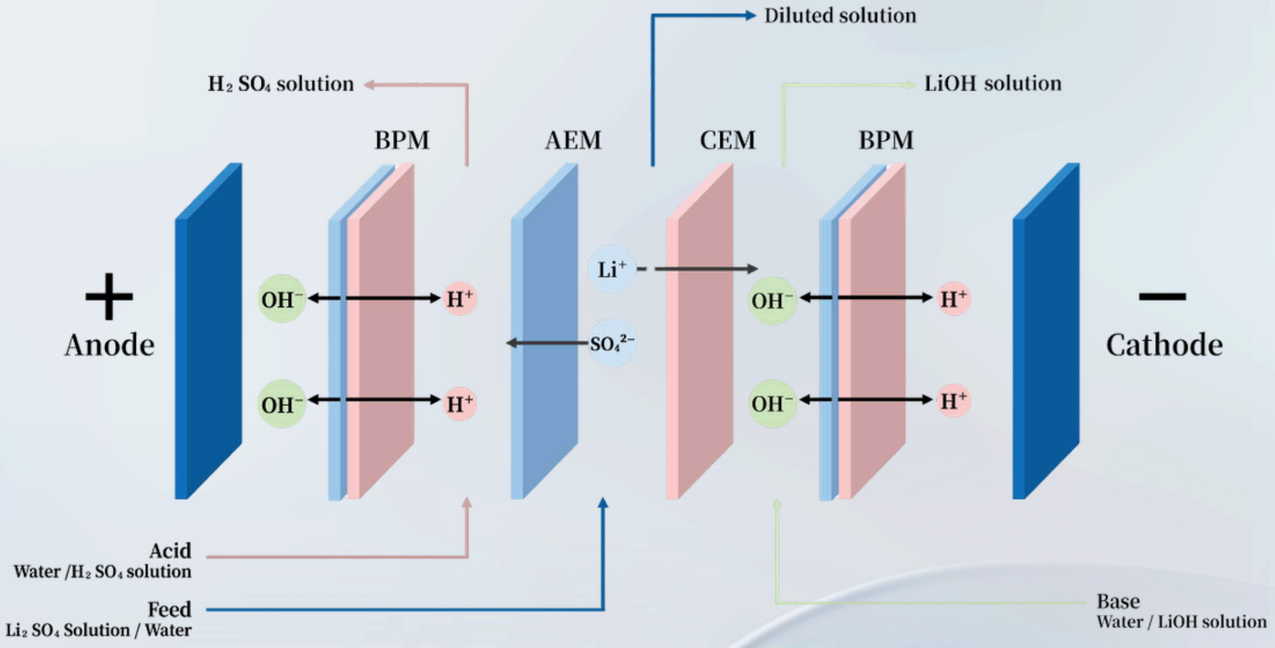
Item	Before desalination	After desalination
Organic matter	1.0N	1.2N
NH_4Cl	1.2N	126ppm as Cl
pH	6.3	6.4
Conductivity (ms/cm)	94.0	-
Temperature (℃)	25.0	-
Concentrate Solution	1N as NH_4Cl	-
Electrolyte	Na_2SO_4	-
Desalination rate (%)	99%	-
Reduction rate of organic matters (%)	4.6	-

BPED System

Bipolar Electrodialysis Technology

Bipolar Electrodialysis (BPED) is a process in which the salt ions are separated using an anion exchange membrane and a cation exchange membrane. This process simultaneously produces acid and alkali by converting the salts in the solution into hydrogen ions and hydroxide ions. It is used in applications like high-purity chemical production and wastewater treatment

The general reaction is:
$MX + H_2O \rightarrow HX + MOH$ (M^+: cation, X^-: anion)



Characteristics and Advantages

- Produces high-purity acid and alkali.
- The system can be developed to be more efficient by utilizing existing infrastructure.
- Can be applied to various industries.
- The system is simple and compact, making it efficient and cost-effective

BPED System





Applications

Wastewater: Recovers valuable chemicals from wastewater, simultaneously treating the wastewater.
Pharmaceuticals: Produces pure acids and alkalis needed for high-purity chemical production.
Electronics: Used in semiconductor manufacturing processes to produce high-purity chemicals.
Food and Beverage: Produces food-grade acids and alkalis using fermentation processes, applied in beverage, dairy, and food additives.
Chemicals: Utilized in various chemical processes to produce high-purity acids and alkalis, improving process efficiency

Applied Case

Model	Case 1 Bipolar Electrodialysis (LiOH) Production	Case2 Bipolar Electrodialysis (Bio Disposal, Hydroxide Production)
Membrane effective area (m2)	6.4 × 3 = 19.2 m2	6.4 m2
Size (mm)	506 x 504	506 x 504

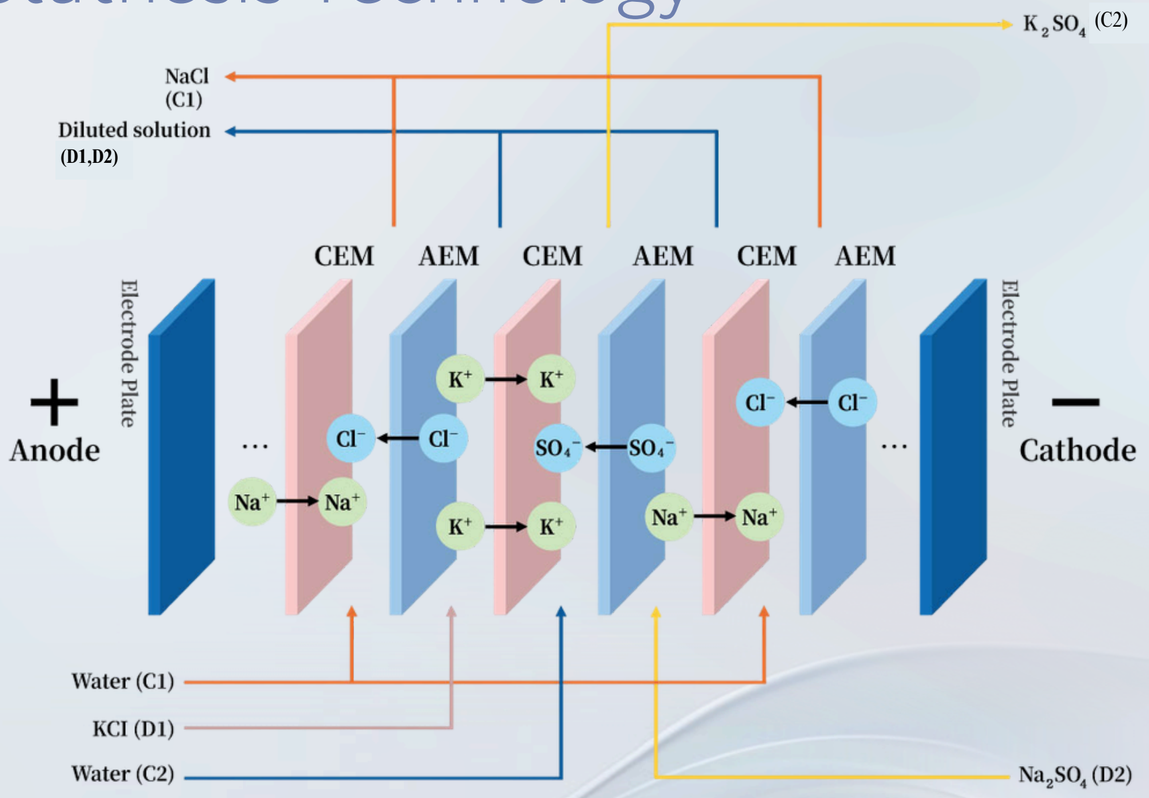
EDM System

Elelctrodialysis Metathesis Technology

Electrodialysis metathesis (EDM) is an ion exchange membrane process that separates the cations and anions of two different salts with an electric field and recombines them into new salts.
A typical EDM stack uses cation exchange membranes (CEM) and anion exchange membranes (AEM) arranged in a four-compartment repeating unit: two feed channels and two product channels.
When DC power is applied, the cations and anions of each feed solution pass selectively through the membranes. In the adjacent product channels they combine with different counter-ions to form new salts.

The general reaction is:
MX + NY → MY + NX

For example, sodium sulfate (Na_2SO_4) and potassium chloride (KCl) can be converted into potassium sulfate (K_2SO_4) and sodium chloride (NaCl), depending on operating conditions.
EDM therefore goes beyond simple desalination and concentration. It changes salt composition in the desired direction and concentrates the products at the same time.



EDM System

Key Advantages

- Salt conversion: Produces new salts by recombining the cations and anions of different salts.
- Simultaneous conversion and concentration: Ion exchange and product concentration take place in a single membrane process.
- Control of sparingly soluble salts: With a suitable exchange salt, sparingly soluble salts can be converted into more soluble forms, reducing scaling risk in downstream concentration.
- Tailored product composition: Choosing the feed salt, exchange salt and membrane arrangement makes it possible to design the product salt composition for each purpose.
- Value-added use of waste salts: Converts industrial by-product salts and high-salinity wastewater into useful salt products or process raw materials instead of discharging them.

Applications

Waste and by-product salt conversion

- Conversion of industrial by-product salts such as Na_2SO_4 into useful salts
- Composition change between chlorides, sulfates and other salts
- Separation, conversion and recovery of salts from high-salinity wastewater

High-value salt production

- Production of chloride-free fertilizer salts such as K_2SO_4
- Production of high-purity inorganic salts
- Salt manufacturing for the chemical and materials industries
- Composition change of organic and inorganic salts

High-salinity wastewater and ZLD

- Control of scale-forming ion composition in high-salinity wastewater
- Conversion of sparingly soluble salts into highly soluble salts
- Salt composition optimization ahead of evaporation and crystallization
- Brine valorization integrated with Zero Liquid Discharge (ZLD) processes

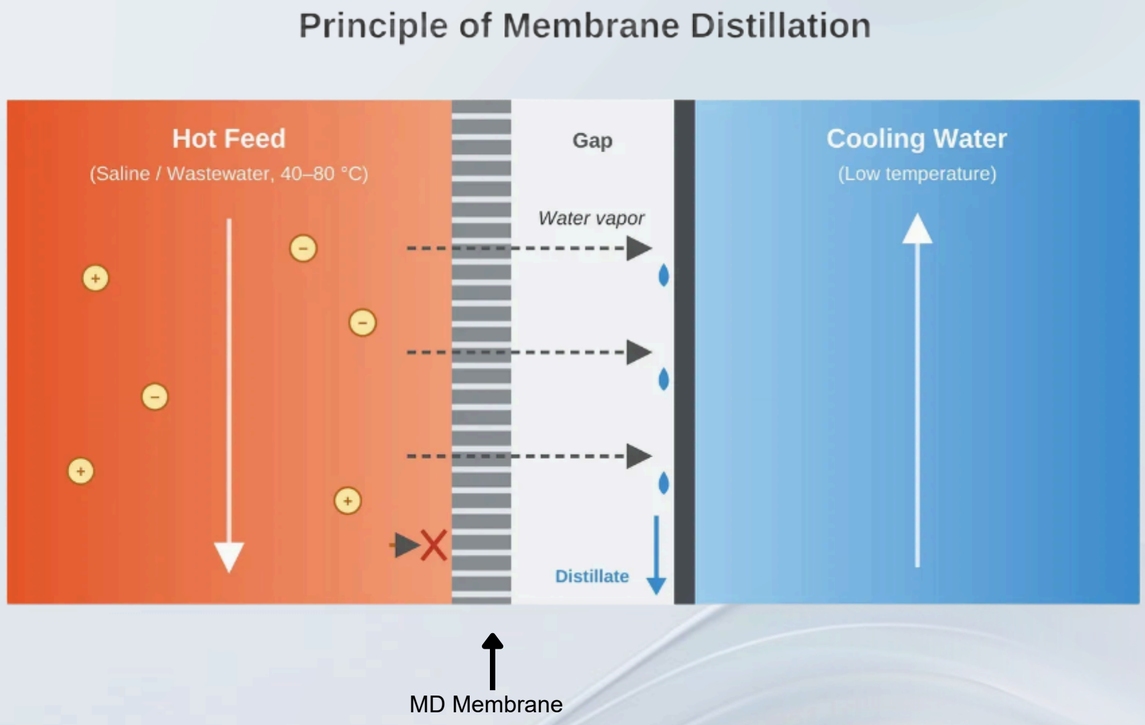
MD System

Membrane Distillation Technology

Membrane Distillation is a thermally driven separation process that uses a hydrophobic microporous membrane. Water evaporates at the hot feed side, passes through the membrane pores as vapor, and condenses on the cold side, while salts, minerals and other non-volatile substances are retained. Because only vapor can pass through the membrane, MD produces very high-purity water regardless of the feed's salinity.

How It Works

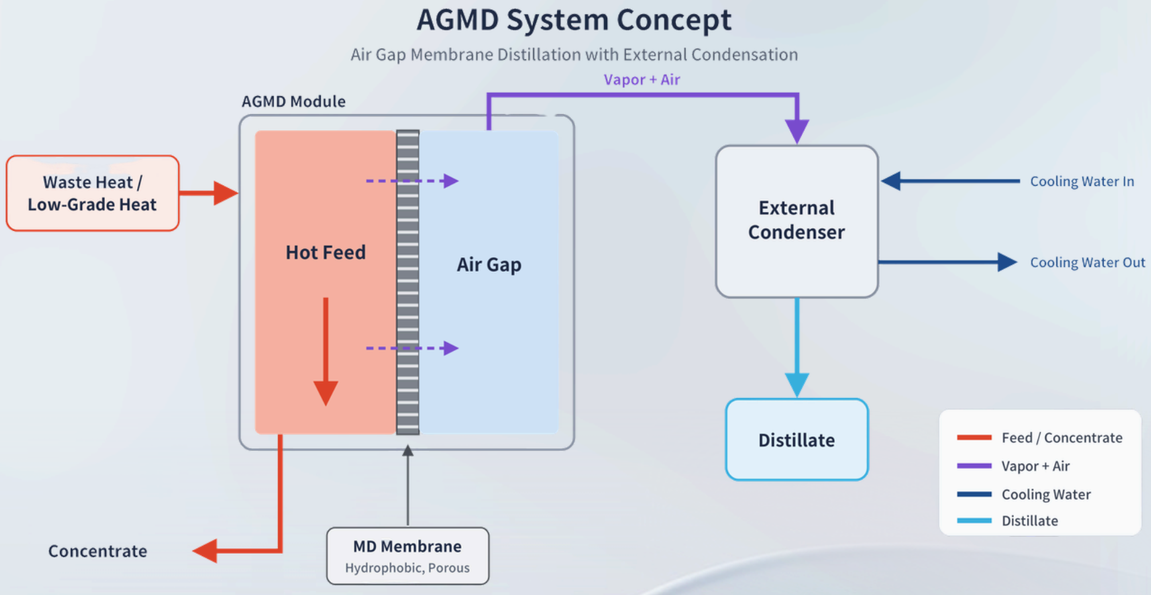
- A temperature difference across the membrane creates a vapor pressure difference, which drives separation
- The hydrophobic membrane blocks liquid water and dissolved solids, allowing only water vapor to pass
- Operates at moderate temperatures (typically 40–80 °C) and near atmospheric pressure



MD System

Applications

- Concentration of RO brine and high-salinity industrial wastewater
- Wastewater treatment and water reuse in semiconductor, secondary battery and petrochemical plants
- Recovery of valuable resources from process streams
- Ultrapure water pretreatment and seawater desalination



Advantages

- Near-complete rejection of non-volatile solutes, producing high-quality distillate
- Handles high-salinity feeds beyond the practical limits of reverse osmosis
- Low operating pressure reduces equipment stress and energy for pumping
- Can use low-grade heat sources such as industrial waste heat or solar thermal energy
- Contributes to Zero Liquid Discharge (ZLD) by concentrating brine to high levels

Custom Stacking

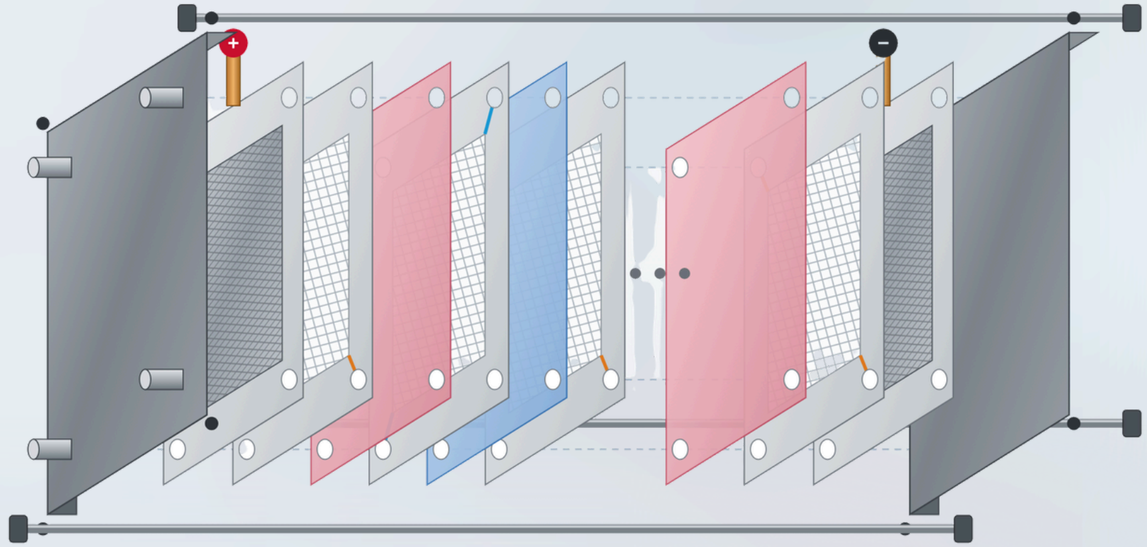
Custom Stacking Service

Principle

Innoflow Technologies designs and manufactures custom ion exchange membrane stacks and processes based on each customer's feed characteristics, treatment objectives, and operating conditions.

We evaluate membrane type and selectivity, effective membrane area, number of cell pairs, spacer structure, flow path design, current density, and operating conditions to deliver stacks and systems optimized for ED, BPED, EDM, and EDI processes.

Our support goes beyond equipment manufacturing. We cover the full project cycle, including process validation through lab, pilot testing, stack scale-up, system engineering, and on-site implementation.



Key Capabilities

Customized Stack Design
Membrane type, cell structure, effective area, and cell pairs optimized for capacity, feed composition, and target quality.

Flow & Spacer Engineering
Spacer and flow path design that accounts for flow distribution, pressure drop, concentration polarization, and scaling.

Electrical & Operating Optimization
Optimized current density, voltage, flow rate, temperature, and concentration ratio for stable operation.

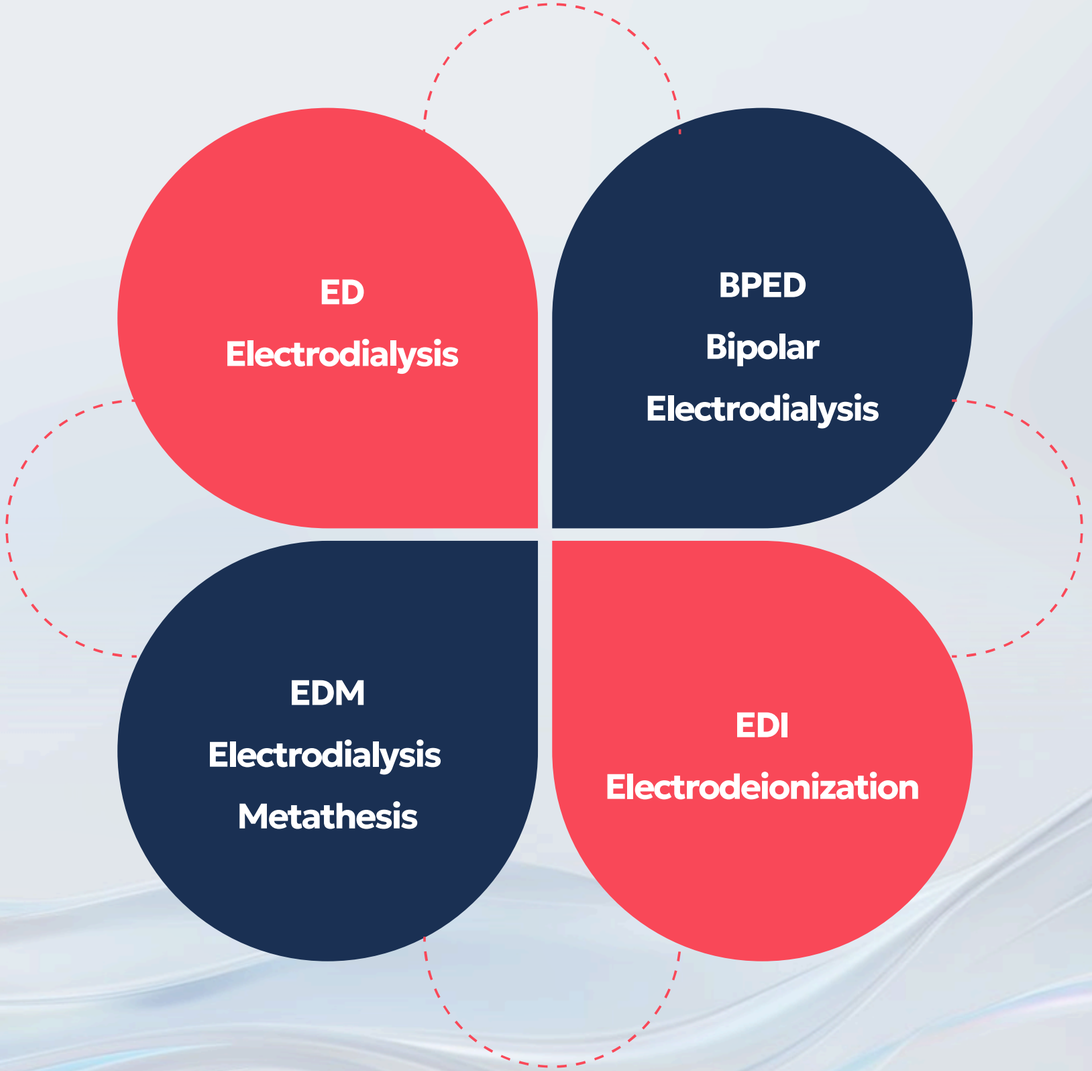
Lab & Pilot Validation
Testing with actual feed water to verify separation performance, recovery, energy consumption, and long-term stability.

Scale-up & System Engineering
Commercial-scale stack and system design based on test data, integrated into the full process.

Field Application & Technical Support
Support for manufacturing, installation, commissioning, and operational optimization.



Optimized Technologies



Thank You

Web : www.innoflowinc.com **Mail** : master@innoflowinc.com Tel: 031-8002-2500