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OMEXELL™

Spiral Wound Electrodeionization

Electrodeionization or EDI, is a continuous and chemical-free process of removing ionized and ionizable species from the feed water using DC power. EDI is typically used to polish reverse osmosis (RO) permeate and to replace conventional mixed bed ion exchange, which eliminates the need to store and handle hazardous chemicals used for resin regeneration and associated waste neutralization requirements.

The patented OMEXELL™ EDI module utilizes a unique, leak free, low maintenance spiral wound design containing membrane (see figure 1, below) and ion exchange resins, sealed in a high strength (FRP) pressure vessel. OMEXELL EDI modules optimize performance, maintain continuous product quality and can produce up to 18 MΩ-cm high-purity water with high silica and boron rejection. OMEXELL EDI modules are the first truly cost-effective alternative to post-RO deionization applications. OMEXELL EDI modules are the first truly cost-effective alternative to post-RO deionization applications.

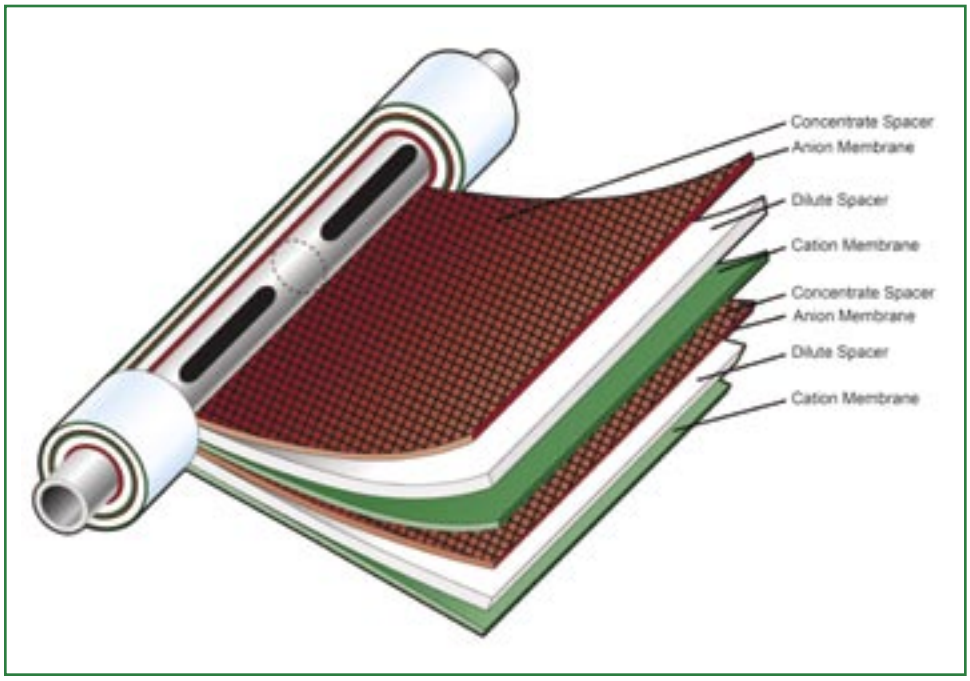

Figure 1

†patent pending

OMEXELL™ Spiral Wound EDI Advantages

No Leakage: The OMEXELL EDI module is reliably sealed with high pressure top and bottom end caps, eliminating leakage problems commonly associated with plate and frame designs.

Quality Control: Each OMEXELL EDI module is performance and pressure tested prior to leaving our factory to ensure trouble free start-up and operation.

Low Maintenance: Unlike plate and frame EDI systems OMEXELL™ EDI modules do not require tightening of nuts and bolts at installation or the retorquing of bolts on an ongoing basis to prevent leaks.

Light Weight Modules, Modular, Easy Access Designs: The OMEXELL EDI modules result in very modular systems that allow easy access and the light weight modules are easy to work with, no special lifting devices are required. Each module comes with complete with an individual permeate sample port.

Cost Effective: The spiral wound OMEXELL EDI modules allow system integrators to build systems that have both lower capital and operating costs when compared to plate and frame EDI devices and is truly a cost-effective replacement for conventional mixed bed ion-exchange.

How Does Spiral EDI Work?

The OMEXELL™ EDI modules use electrical current to force a continuous migration of contaminant ions out of the feed water and into the reject stream while continuously regenerating the resin bed with H^+ (hydrogen) and OH^- (hydroxyl) ions that are derived from water splitting. The patented flow process of the dilute and concentrate streams make the OMEXELL EDI module completely unique.

Feed water (dilute stream) enters from the bottom of the OMEXELL EDI module and is diverted into vertically spiraled cells known as the “D” (dilute) chambers. The dilute stream flows vertically through ion-exchange resins located between two membranes (an anion membrane specifically designed to allow migration of only anions, and a cation membrane specifically designed to allow migration of only cations).

Concentrate enters the bottom of the module through the center pipe and is diverted into spirally flowing cells known as the “C” (concentrate) chambers.

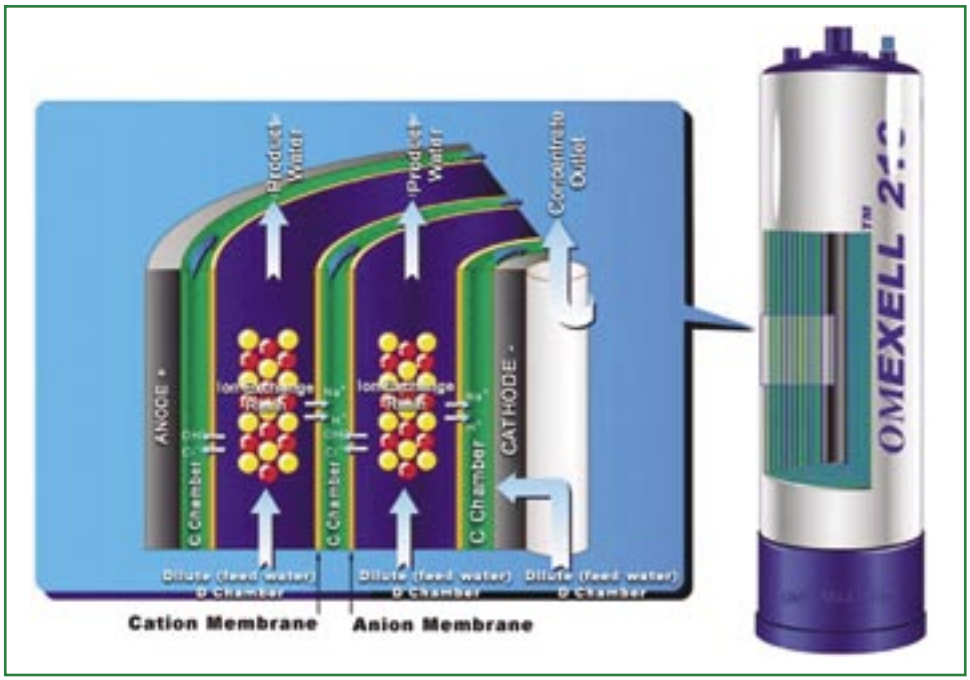

Figure 2

DC current is applied across the cells. The DC electrical field splits a small percentage of water molecules (H_2O) into hydrogen (H^+) and hydroxyl (OH^-) ions. The H^+ and OH^- ions attach themselves to the cation and anion resin sites, continuously regenerating the resin. Hydrogen ions have a positive charge and hydroxyl ions have a negative charge. Each will migrate through its respective resin, then through its respective permeable membrane and into the concentrate chamber due to its respective attraction to the cathode or anode. Cation membranes are permeable only to cations and will not allow anions or water to pass, and anion membranes are permeable only to anions and will not allow cations or water to pass.

Contaminate ions, dissolved in the feed water, attach to their respective ion-exchange resin, displacing H^+ and OH^- ions. Once within the resin bed, the ions join in the migration of other ions and permeate the membrane into the “C” chambers. The contaminant ions are trapped in the “C” chamber and are recirculated and bled out of the system.

The feed water continues to pass through the dilute chamber and is purified and is collected on the outlet of the “D” chambers and exits the OMEXELL EDI module. All OMEXELL EDI modules product flows are collected and exit the system (see figure 3, right).

OMEXELL™ EDI-210 Performance Specifications

Product Water Resistivity	≥ 5 MΩ-cm	≥ 15 MΩ-cm
Total Exchangeable Anions (TEA)	≤ 25 ppm ($CaCO_3$)	≤ 8 ppm ($CaCO_3$)

Based on standard test solution, actual module performance is based on specific feed water conditions.

OMEXELL™ EDI-210 Feed Water Requirements

Parameter	Specifications
pH	5.0-9.0
Hardness	≤ 0.5 ppm ($CaCO_3$)
Dissolved Silica	≤ 0.5 ppm
TOC	≤ 0.5 ppm
Free Cl_2	≤ 0.05 ppm
Fe, Mn	≤ 0.01 ppm
Turbidity, NTU	≤ 0.1
Oxidizer, mg/L	None

Based on RO permeate feed water.

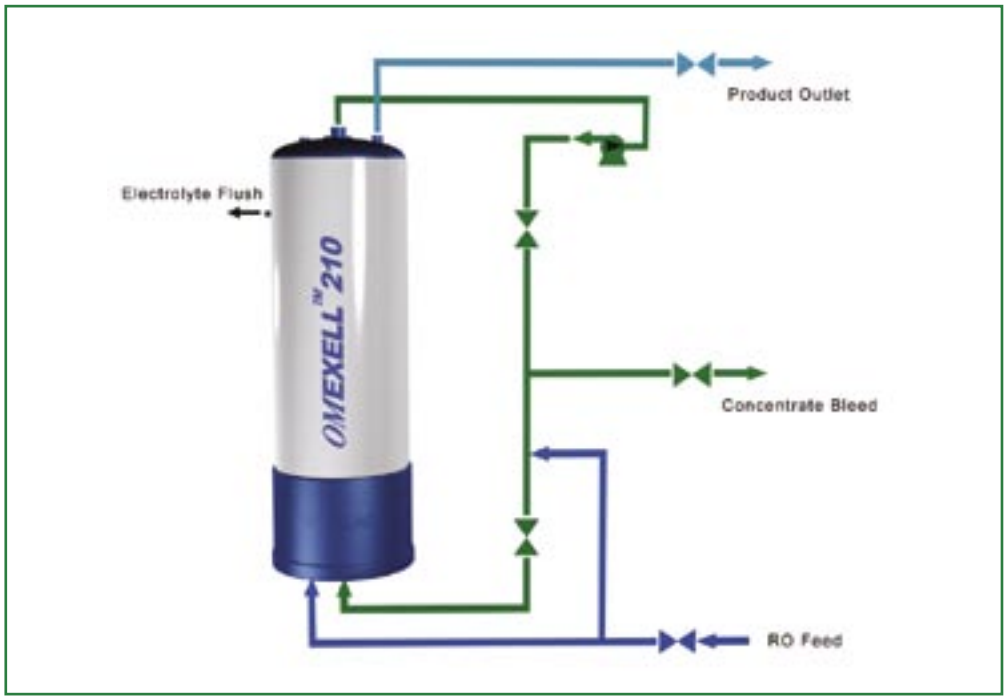

Figure 3:
Flow Loop

Module Operating Conditions

Parameter	Specifications
Dilute Product Flow Rate	6.6 to 10 gpm (1.5 to 2.2 m3/h)
Recovery Rate	up to 95%
Inlet Temperature	50° to 100°F (10° to 38°C)
Inlet Pressure (continuous operation)	36 to 80 psi (2.5 to 5.5 Bar)
Dilute Pressure Drop	22 to 36 psi (1.5 to 2.5 Bar)
Concentrate Inlet Flow	2.2 to 4.5 gpm (0.5 to 1.0 m3/h)
Concentrate Pressure	7 to 10 psi (0.5 to 0.7 Bar) less than dilute pressure
Electrolyte Flush	0.22 to 0.30 gpm (50 to 70 lpm)
Concentrate Conductivity	250 to 600 µs/cm
Maximum Electrical Current	9A
Maximum Working Voltage	160V DC

Figure 4

Figure 5

MODULAR DESIGN: Original equipment manufacturers (OEMs) and system integrators can build small or large systems by combining multiple OMEXELL™ EDI modules. Here are a few examples:

EDI 20

EDI 30

EDI 100

EDI 140

EDI 320

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For more information, contact us:

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