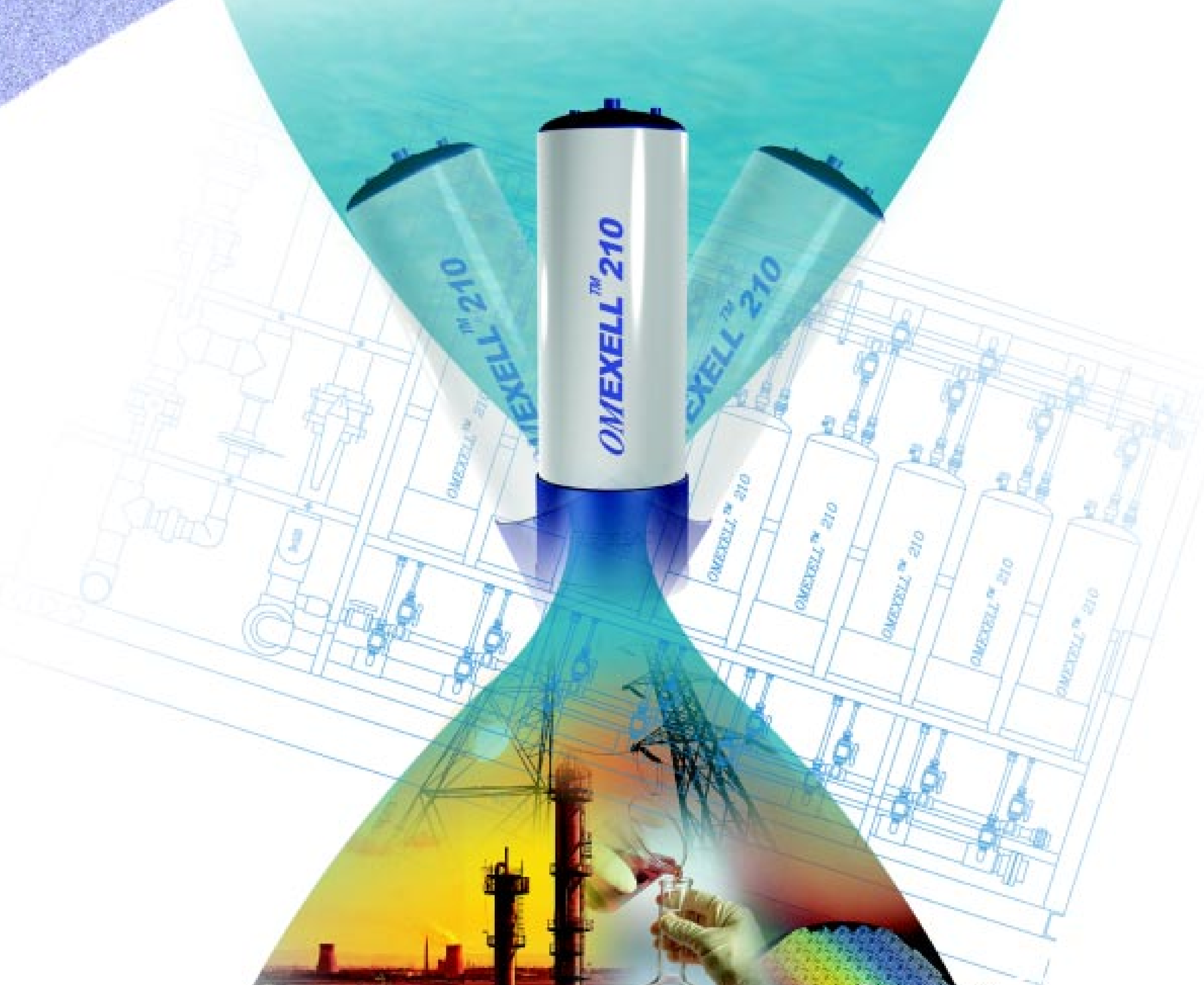
EDI



Omexell™
Spiral Wound
Electrodeionization

OMEXELL™

EDI

OMEXELL™

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 RO permeate and to replace conventional mixed bed ion exchange by eliminating the need to store and handle hazardous chemicals used for resin regeneration and associated waste neutralization requirements.

The Patented Omexell™ EDI

module utilizes a spiral wound membrane (see figure 1) and ion exchange resins, sealed in a high strength FRP pressure vessel. Omexell EDI optimizes performance and maintains continuous product quality and can produce up to 18+ MΩ-cm high-purity water with high silica and boron rejection.

Omexell EDI is the first truly cost effective alternative to post-RO deionization applications.

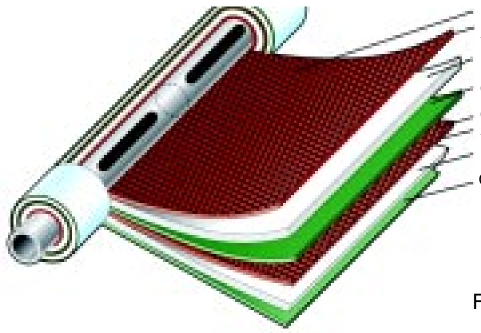


Figure 1

OMEXELL™ Spiral Wound EDI Advantages

High Hardness Tolerance: The patented concentrate flow design of the Omexell EDI is unlike that of the co-current flow design used in conventional plate and frame EDI devices. This unique flow design makes the Omexell EDI modules much more resistant to hardness scaling (see figure 2) allowing for higher hardness concentrations of the feed water (up to 2 ppm as $CaCO_3$) and reducing capital expenditures by routinely eliminating the need for softeners and/or 2nd pass RO (as is normally specified by other EDI systems).

Serviceable†: Resins and/or membranes can be replaced at anytime and anyplace making the Omexell EDI the only serviceable EDI system on the market and dramatically reducing operating costs by extending the life expectancy of the module.

No Leakage: Omexell EDI is reliably sealed with high pressure top and bottom end caps eliminating leakage problems as is commonly associated with plate and frame design.

Low Energy Consumption: The structural design of the Omexell EDI reduces the distance between anode and cathode resulting in less energy needed to remove unwanted ions. The paired wiring sequence of the modules and the Omexell rectifier package† together result in a energy savings of up to 64% when compared to conventional plate and frame systems.

Custom Resin Configuration: Resin configurations can be customized to provide specific performance for varying product quality requirements.

Low Maintenance: Omexell EDI requires less cleaning compared to plate & frame EDI devices (due to the high hardness tolerance) and does not require endless tightening of nuts and bolts. The Omexell system is designed for easy access to the modules.

Cost Effective: The Omexell spiral wound EDI system has both lower capital and operating costs when compared to plate & frame EDI devices and is truly a cost-effective replacement for conventional mixed bed ion-exchange.

†patent pending

How Does Spiral EDI Work?

Omexell™ Electrodeionization uses 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 module completely unique .

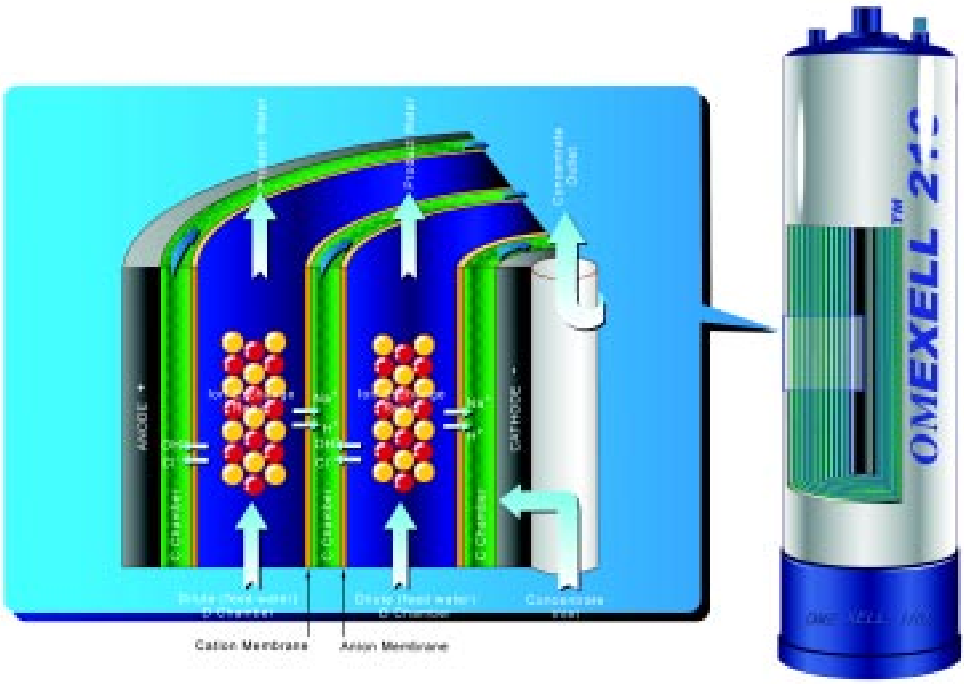


Figure 2

Feed water (dilute stream) enters the Omexell module from below 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 module through the center pipe from below and is diverted into spirally flowing cells known as the ‘C’ (concentrate) chambers.

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 and each will migrate through its respective resin, then through its respective permeable membrane and into the concentrate chamber due to their 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 swept away. 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 EDI module. All EDI module product flows are collected and exit the system (see figure 3).

EDI

System Specifications

EDI System	Max. Permeate Flow Rate		Modules	Electrical	Dimensions (L x W x H)	
	gpm	m^3/h			Inches	Cm
EDI-10	10	2.2	1	6A@ 350V DC	50"x 26"x 79"	125 x 65x 200
EDI-20	20	4.5	2	6A@ 350V DC	50"x 26" x 79"	125 x 65x 200
EDI-30	30	6.5	3	15A@ 350V DC	92" x 40" x 87"	230 x 100 x 220
EDI-40	40	9	4	15A@ 350V DC	102" x 40" x 87"	260 x 100 x 220
EDI-60	60	13	6	25A@ 350V DC	116" x 40" x 87"	295 x 100 x 220
EDI-80	80	18	8	25A@ 350V DC	99" x 63" x 87"	250 x 160 x 220
EDI-100	100	23	10	35A@ 350V DC	110" x 63" x 87"	280 x 160 x 220
EDI-120	120	27	12	35A@ 350V DC	122" x 63" x 87"	310 x 160 x 220
EDI-140	140	32	14	55A@ 350V DC	106" x 83" x 89"	270 x 210 x 225
EDI-160	160	35	16	55A@ 350V DC	106" x 83" x 89"	270 x 210 x 225
EDI-180	180	40	18	55A@ 350V DC	118" x 83" x 89"	300 x 210 x 225
EDI-200	200	45	20	70A@ 350V DC	118" x 83" x 89"	300 x 210 x 225
EDI-220	220	50	22	70A@ 350V DC	134" x 83" x 89"	340 x 210 x 225
EDI-240	240	55	24	70A@ 350V DC	134" x 83" x 89"	340 x 210 x 225
EDI-260	260	60	26	95A@ 350V DC	146" x 83" x 89"	370 x 210 x 225
EDI-280	280	63	28	95A@ 350V DC	146" x 83" x 89"	370 x 210 x 225
EDI-300	300	67	30	95A@ 350V DC	158" x 83" x 89"	400 x 210 x 225
EDI-320	320	72	32	95A@ 350V DC	158" x 83" x 89"	400 x 210 x 225
EDI-360	360	80	36	135A@ 350V DC	236" x 87" x 91"	600 x 220 x 230
EDI-400	400	90	40	135A@ 350V DC	236" x 87" x 91"	600 x 220 x 230
EDI-440	440	98	44	135A@ 350V DC	288" x 87" x 91"	730 x 220 x 230
EDI-460	460	104	46	135A@ 350V DC	288" x 87" x 91"	730 x 220 x 230
Larger or custom systems available upon request						

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OMEXELL™
An Omex Group Company
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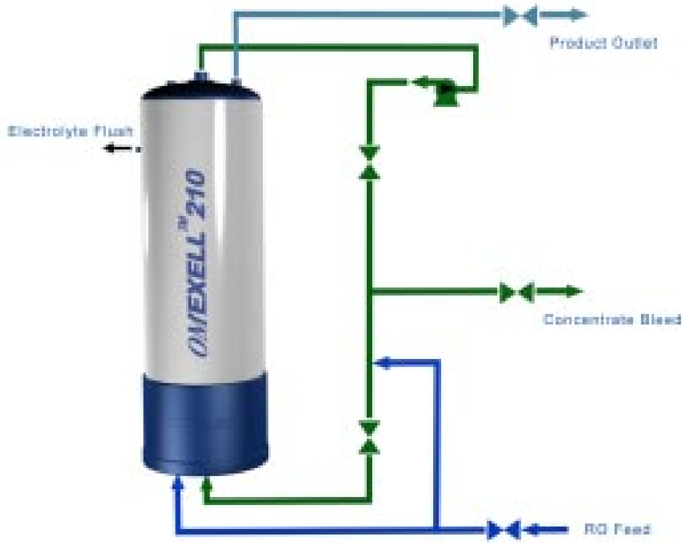
Module Specifications

Feedwater Specifications

Specifications	Omexell™ EDI
TEA (Including CO_2)	≤ 25 ppm ($CaCO_3$)
pH	6.0 - 9.0
Hardness	≤ 2.0 ppm
Dissolved Silica	≤ 0.5 ppm
TOC	≤ 0.5 ppm
Free Cl_2	≤ 0.05 ppm
Fe, Mn	≤ 0.01 ppm
CO_2	≤ 10 ppm



Flow Loop (Figure 3)

Module Dimensions (Figure 4)

Module Operating Conditions

Specifications	*Omexell™* 210	*Omexell™* 210U
Dilute Product Flow Rate	6.6 to 10 gpm (1.5 to 2.2 m³/h)	6.6 to 10 gpm (1.5 to 2.2 m³/h)
Product Resistivity	5 to 15 MΩ-cm	15 to 18+ MΩ-cm
Recovery Rate	80 to 95%	95%
Inlet Temperature	40° to 100°F (5° to 38°C)	40° to 100°F (5° to 38°C)
Inlet Pressure	36 – 100 psi (2.5 - 7.0 Bar)	36 – 100 psi (2.5 - 7.0 Bar)
Dilute Pressure Drop	22 to 36 psi (1.5 to 2.5 Bar)	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)	2.2 to 4.5 gpm (0.5 to 1.0 m³/h)
Concentrate Pressure	5 to 10 psi (0.35 to 0.7 Bar) less than dilute pressure	5 to 10 psi (0.35 to 0.7 Bar) less than dilute pressure
Electrolyte Flush	0.22 to 0.30 gpm (50 to 70 lpm)	0.22 to 0.30 gpm (50 to 70 lpm)
Concentrate Conductivity	250 to 1000 µs/cm	250 to 600 µs/cm
Electrical Current	1A - 9A	3A - 9A
Maximum Working Voltage	160V DC	160V DC

EDI Systems

EDI-20

EDI-140

EDI-30

EDI-100

EDI-320