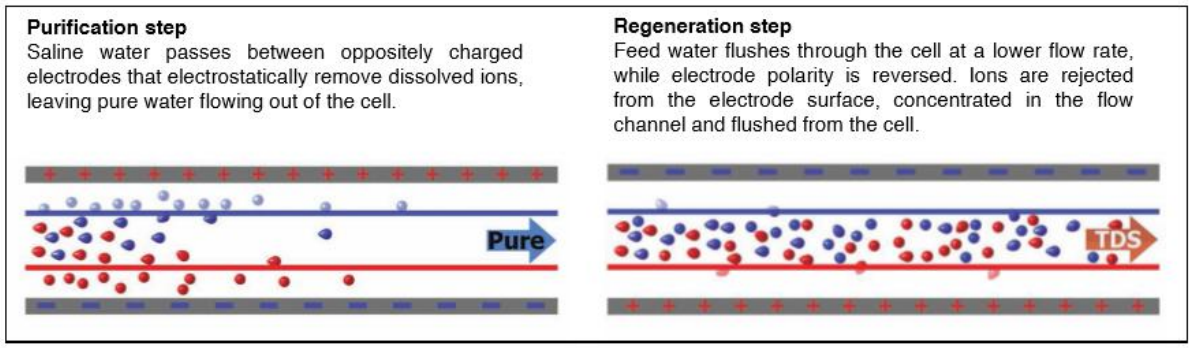
CapDI – Membrane Capacitive Deionization

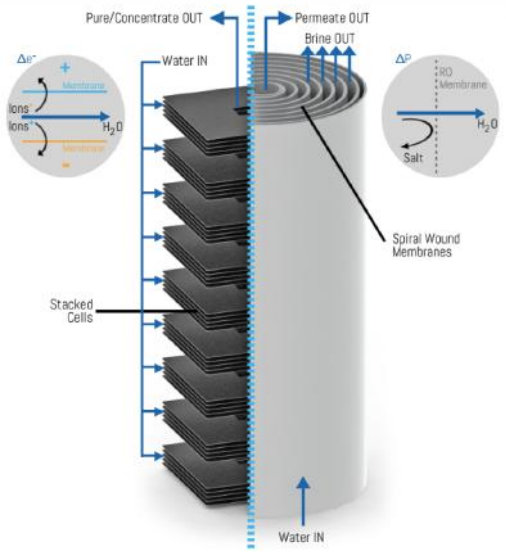
InNow India Pvt. Ltd. in association with Voltea BV, Netherland, offers customized solutions for softening and deionization of water by advanced Membrane Capacitive Deionsaition.

CapDI® is Voltea's patented Membrane Capacitive Deionization technology. It is a tunable water deionization technology that is designed to remove total dissolved salts (TDS) from a variety of water sources ranging from tap water and brackish groundwater to industrial process water. CapDI® achieves this at a lower economic cost and reduced environmental impact than any other available technology in the market.

CapDI® can operate at temperatures ranging from 5-60°C (40-140°F), on challenging higher turbidity feed waters, with minimal operator intervention. This technology is environmentally friendly by its low energy consumption and minimal to no chemical usage. It removes salts (ions) from the feed water by applying an electrical potential difference between two electrodes covered with selective ion exchange membranes. Electrodes are separated from each other by a mesh spacer, whereby water flows and the ions are removed from the feed water, called Purification Step (Figure 1). These removed ions are temporarily stored in the electrical double layers formed at the electrode surface. When the electrodes become saturated with ions, they are regenerated by reversing the applied voltage and/or short circuiting called Regeneration Step (Figure 1). After the ions are released from the electrodes, a concentrate stream is produced and captured ions are flushed from the module. It is important to note that ions are removed through membranes and water molecules stay behind.

Figure 1: Schematic of CapDI© operation.





CapDI advantages

Table 1. Comparison matrix.

	CapDI©	RO	ED/EDR	(C)EDI	IEX Softener
Pre treatment	Low	High	Medium	High	Low
High temp system*	Yes	No	No	No	Yes
Scaling and fouling	Low	High	Medium	High	Low
Dynamic TDS adjustment	Yes	No	No	No	No
Problematic ions in feed	No	Yes	No	Yes	Yes
Chlorine tolerance	Yes	No	Yes	No	No
Chemicals	No**	Yes	Yes	Low	Salt
Consumables	Low	High	High	High	Salt
Maintenance	Low	High	High	High	Low
Energy use	Low	High	Medium	High	Low
Operational pressure	Low	High	Low	Low	Low
Water recovery	75-90%	20-75%	70-90%	90-95%	90-95%
Operation costs	$	$$$	$$	$$$	$$
Price	$$	$$	$$$	$$$	$

* Above 45°C/110°F.

** Acid injection may be required in some applications

Case Study

	CapDI	RO with UF
Application	Boiler feed (through downstream MB)	
Feed Flow (m^3/hr)	50 m^3/hr	
Source of water	Surface water	
Feed Water TDS - ppm	475	
Total Hardness – ppm as $CaCO_3$	200	
Total Alkalinity – ppm as $CaCO_3$	120	
Chlorides – ppm as $CaCO_3$	131	
Sulphates – ppm as $CaCO_3$	80	
Reactive Silica – ppm as SiO_2	5	
Colloidal Silica - ppm	2	
Treated water Conductivity – µS/cm	15	15

	CapDI	RO with UF
Estimated Price of system (INR as Crores)	3.0	2.8
Power Required - Kw/m^3	0.6	0.8
Cost of Power (Rs/m^3 @ Rs 4/KWh)	2.4	3.2
Other Operation & maintenance costs (Rs/m^3)	7.45	8
Total operating cost (Rs/m^3)	9.85	11.2

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