



WATER TREATMENT

Electrical Sorption Technology E-Sorp

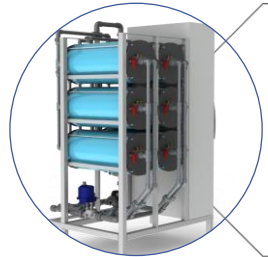
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E-Sorp Basic Introduction



Desalination

- Desalination cut between 1-99%
- Chemical free
- High recovery, low energy, low pressure



Softening

- 90% removal of Calcium and Magnesium
- Chemical free, salt free
- No Sodium added



Denitrification

- Removal of 90% Nitrate
- Chemical free, salt free
- No Chloride added

E-sorp

- Low pressure operation no matter the salt concentration
- Recovery up to 90%
- Under conditions no pre-treatment
- Chemical free
- Environment friendly
- Zero noise level
- Immediate quality control
- Quality tuning
- Low footprint



Added Value Applications



Any Industrial process requiring desalinated and softened water; process water $\leq 10\mu\text{S}/\text{cm}$, product water, cooling make-up water, rinsing and washing, laundry, waste-water desalination etc.



Potable water: households, food and beverage, brewery make-up water, wineries. Point-of-use drinking water production; very low energy requirements



Agriculture: irrigation, livestock water, potable water. Point-of-use production; very low energy requirements



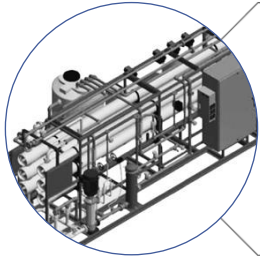
RO brine recovery: RO concentrate treatment silica unaffected, produced water re-use in oil & gas industry, mining water reclamation.



Green technology: Chemical-free desalination, chemical-free softening, chemical-free denitrification, no waste pollution, low pressure, low energy, high recovery,

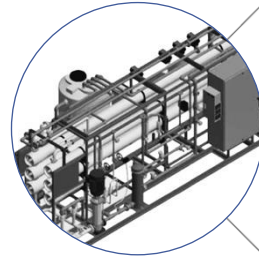


E-Sorp vs. Spiral Wound Reverse Osmosis



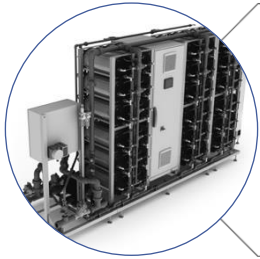
OPEX

- RO up to 80 bar, chemicals
- E-Sorp operates 2.0–6.0 bar: lower OPEX, zero noise level, energy efficiency, lower breakage, no SS pipes → no corrosion, no chemicals



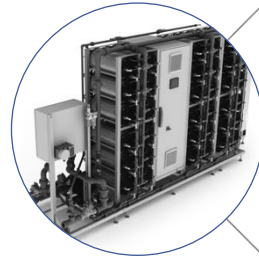
Pre-treatment

- RO requires sophisticated pre-treatment
- E-Sorp operates with higher ion and solid entry levels resulting in much less pre-treatment; fouling and scaling less likely



Desalination Cut

- RO up to 99.8%
- E-Sorp up to 99.0%: smart Batch system can reach high desalination cut



Plug-and-Play

- RO incl. pre-treatment can be very complicated
- E-Sorp is plug and play system with literally pushing a button and starting the operation. Each unit is wet tested and pre-set at BKG



Recovery

- RO up to 90% only at very specific conditions
- E-Sorp recovery booster system allows for 90% recovery almost anytime

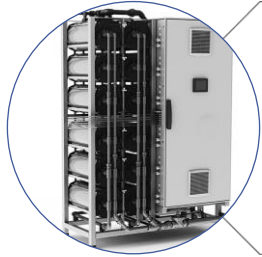


Maintenance

- RO incl. pre-treatment can be very complicated
- E-Sorp consists of less parts and can be easily monitored and re-adjusted via remote access

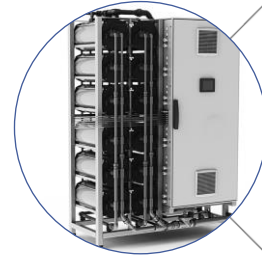


E-Sorp vs. Ion Technologies



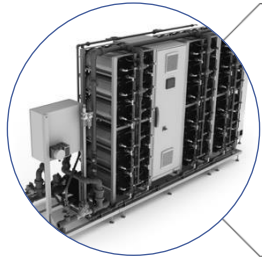
Chemicals

- Ion Exchange require lots of chemicals
- E-Sorp is chemical-free technology



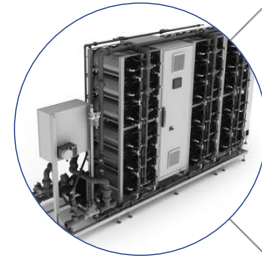
Ion Composition

- Ion Exchange changes unfavourably the ion composition; adding ions to the feed
- E-Sorp removes ions without adding ions to the feed



OPEX

- Chemicals and rinsing water cause high OPEX
- E-Sorp as chemical free technology together with high recovery offers more competitive OPEX at any time



Foot Print

- Ion Technologies require often extensive foot print plus sophisticated neutralisation
- E-Sorp offers low foot print at the site and cost effective transport



Waste

- Ion Technologies drain lots of chemical waste which is hazardous to local environment
- E-Sorp releases concentrated feed to the drain

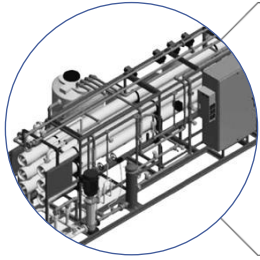


Maintenance

- Industrial Ion Exchange can be very complicated
- E-Sorp consists of less parts and can be easily monitored and re-adjusted via remote access

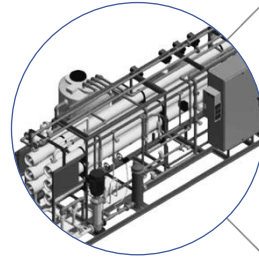


E-Sorp vs. Disc RO for Complicated Feed



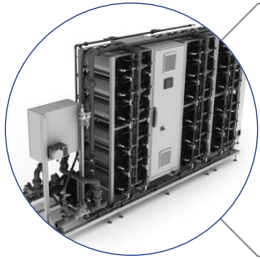
OPEX

- Disc RO between 60- 180 bar
- E-Sorp operates 2.0–6.0 bar: lower OPEX, zero noise level, energy efficiency, lower breakage, no SS pipes → no corrosion



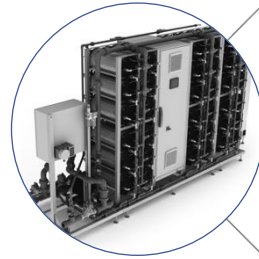
Chemical Limitations

- Disc RO operates with similar limitations as spiral wound RO
- E-Sorp is electrically driven process without actual barrier leading to number of advantages



CAPEX

- High CAPEX for Disc RO
- CAPEX for E-Sorp is lower; comparable quality results



Plug-and-Play

- Disc RO is very complicated technology
- E-Sorp is plug and play system with literally pushing a button and starting the operation. Each unit is wet tested and pre-set at BKG



Practical

- Disc RO @ high pressure is very noisy, hazardous to humans, requires safe location
- E-sorp is silent technology, low pressure provides no hazard, trivial troubleshooting



Maintenance

- Disc RO is very complicated technology
- E-Sorp consists of less parts and can be easily monitored and re-adjusted via remote access



Green E-Sorp



Chemical-Free

- E-sorp can be operated in many cases completely without chemicals. If chemicals have to be applied due to specific feed water chemistry then the consumption is highly reduced compared to traditional technologies



Energy Consumption

- The absence of high pressure leads to significant reduction of energy consumption compared to traditional technologies



Elimination of Blending

- Water tuning allows desired quality without water blending. Harmful concentrate salts are not discharged to local ecosystem which helps to stop local eco-salt pollution



E-Sorp Summary



Quality Tuning: refers to ability to control the product quality & ion composition by adjusting inlet current in-rush to the modules within set limitations. Client controls the product quality; immediate impact



Robust and Reliable: E-Sorp consists of very few components. It is very simple process which is unlikely to destroy by mistake, by force or by staff ignorance paired with highly sophisticated current in-rush logics and by BKG build-to-last electronics



Scalable: scalability is similar to RO systems, small footprint



Plug and Play: every unit is wet-tested at BKG and pre-set. After connecting the unit it is literally push-the-button system



Green technology: Chemical-free desalination, chemical-free softening, chemical-free denitrification, no waste pollution, low pressure, low energy, high recovery,

