

The Desalination Plant of the Future

- Perspectives.
Future water demand and supply, sustainability criteria, energy trends, scale of operation (mega scale to decentralized, local), etc.
Alternate water sources, seawater vs wastewater, the 'one water' approach.
Process developments - UF, NF, (RO), ED, MD.
Introducing FO, PRO and RED.
- Reverse Osmosis.
The role of ultrapermeable membranes (UPMs), potential benefits.
 - bioinspired water channels , including aquaporin-embedded membranes;
 - graphene and derivatives, carbon nanotubes, other novel materials;
 - modules for UPMs (overcoming mass transfer & fouling limitations).
- Advanced Fouling Control.
Developments in pretreatment, physical, chemical & low energy biotreatment.
Biomimicry (quorum quenching/dispersal) for biofouling control.
Novel sensors and the smart e-module concept.
- Towards Minimum Energy.
Thermodynamic constraints.
Using UPMs, process engineering trade offs (staging vs closed circuit semi-batch).
Hybrid processes, FO-RO (predilution), RO-PRO (osmotic energy recovery).
Benefits & challenges of co-location (SWRO + NeWater).
Integration (low impact pretreat+ UPMs + FO, PRO hybrids) for 50% less energy.
Renewable energy issues: intermittency, batteries (including an osmotic battery, involving RO and PRO).
- Brine Management & resource recovery.
Opportunities for brine mining. Enabling technologies.
Example: rubidium recovery from SWRO brine.