AQSim
OLI electrolyte solutions

OLI Reverse Osmosis Membrane block in Flowsheet: ESP

OLI is introducing a new RO membrane simulation block. This tool offers the ability to evaluate your wastewater stream against different vendor membranes and simulate the behavior of the membrane for your chemistry.

The RO Membrane block is vendor-neutral. The membrane list is not limited to a specific company or brand. When new membranes become available, there is a library tool in which the membrane specification data can be added.

OLI's reverse osmosis membrane simulation is vendor-neutral.

Membrane simulation can now be integrated within the Process Design. Users can now integrate membrane in their process design. The RO Membrane block is a process unit, like a mixer or separator. Thus, the complete process: mass, energy, and chemistry balance can now be modeled in a single user interface. There is no longer a need to copy-paste composition data from your design program to the membrane program and then transcribe the resulting membrane output back to the design program.

What-if? scenarios are now simple to test! Because the RO Membrane block is part of a flowsheet simulator, testing what-if conditions, or optimizing a design can be completed in a single flowsheet calculation. Similarly, this block can be used to detect scaling issues as they are developing over changing water composition that affect concentration or pH.

Use the model to customize your membrane configuration. The membrane and membrane units are customizable. The user can select the number of elements in a vessel, and customize the flow configuration of the vessels. In this way, any number of configuration can be tested. There is also a built-in, permeate recovery optimizer. The user can specify each vessel's recovery, and the software computes the number of required elements.

Innovative technology for RO membrane simulation

This technology is innovative for RO membrane simulation. Typically, engineers rely on vendor membrane software to select the membrane best suited to their situation. And vendor membrane software uses simplifying assumptions about water chemistry and species permeabilities to 'rate' a membrane. In fact, a client's wastewater stream is more complex, and may not be represented accurately by simplifying assumptions.

Will the RO Membrane block duplicate the results of a vendor software?
That is a great question! OLI's membrane uses a first-principles approach to

calculate permeabilities. Temperature, speciation, hydration radius, complexation, pH, water viscosity are all used to predict a more rigorous permeate composition.

OLI RO membrane block uses a first-principles approach to calculate permeabilities

Thus, the RO Membrane block in OLI Flowsheet: ESP will NOT duplicate the permeate composition calculated in membrane software. Instead, a more representative composition should now be computed for your process.

Flow and composition of the Concentrate and Permeate are solved rigorously.

At each iteration of the membrane calculation, an equilibrium flash is performed on the concentrate and permeate stream. The intermediate properties; osmotic pressure, solids saturation and amount, and cation/anion speciation, are used to calculate a more representative permeability, fouling factor, concentration polarization, and scale formation in the next iteration. This creates a more accurate representation of the membrane's performance.

Expanding predictions beyond Vendor measurements

Vendor specification sheets generally limit permeability measurements to NaCl, boron (boric acid), SiO_2, and a few other components. OLI supplements these measurements with correlations based on hydration radii values and aqueous fluid properties to calculate the permeability for every species in solution.

Users can add their own results of permeability measurements to the OLI membrane library.

You can also add your own permeability measurements to the membrane library and create a customized membrane performance. This works to improve membrane predictions for the more complex solutions.