Membrane system

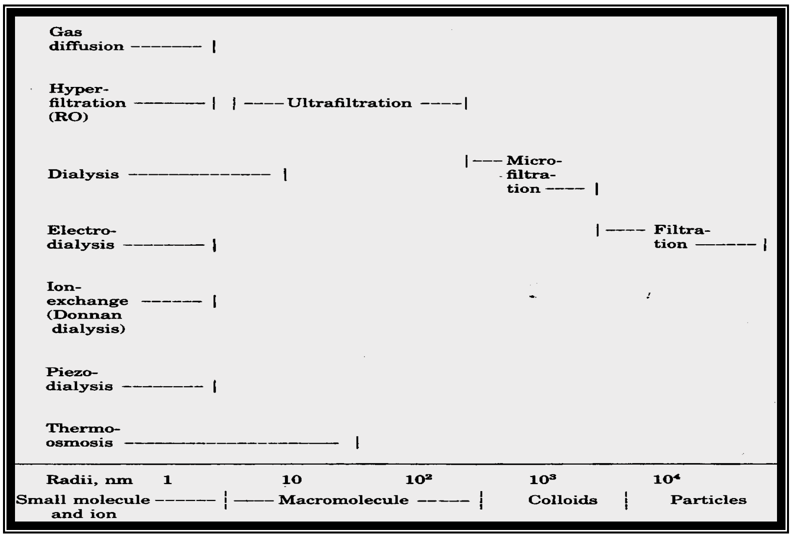
Working principle

Several water purification processes use polymeric membranes. Generally a polymeric membrane can be described as a phase, usually heterogeneous, that opposes to the crossing of ionic or molecular species present in treated waters so stopping the matter transfer or selecting chemical agents.

- Synthetic membrane application

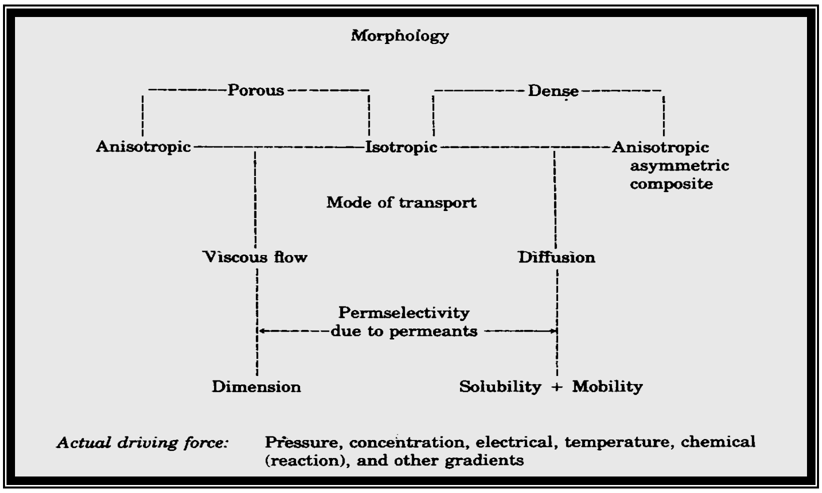
Special applications as permselective barriers	Membranes as permselective barriers	Membrane reactor
ion-specific electrodes	dialysis	immobilization of catalyst and enzyme within the membrane
controlled release	microfiltration	
tissue-culture growth	ultrafiltration	
biosensors[b]	reverse osmosis	
	osmotic pumping	
	pervaporation	
	gaseous separation[c]	
	electrodialysis	
	Donnan dialysis	
	membrane distillation[d]	
	steam filtration	
	thermoosmosis[e]	

- Membrane processes: permeable species dimensions



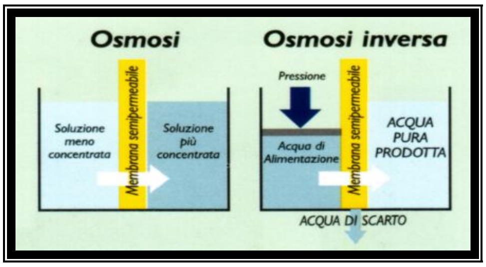
The membrane are represented in four principal system: plate, tubular hallow fiber and capsule, without any restrictive configuration.
The membrane morphology brings about the permeability and selectivity properties.

- Configuration, morphology, mode of transport, permselectivity and driving force of membrane technologies



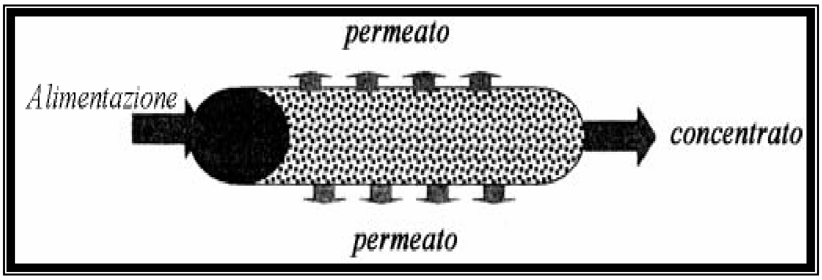
Performance

- Reverse osmosis



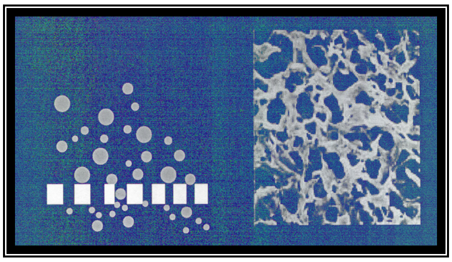
The reverse osmosis is one of more recent and successful technology for water salts content reduction. In the reverse osmosis the water of the concentrated solution is forced to cross the membrane by an outside pressure so that to concentrate more and more the waste water and at the same time to obtain clean water (permeate). Osmosis technologies are working with tangential flows: the turbulent flow on membrane surface continually removes the pollution piling up.

- Ultrafiltration



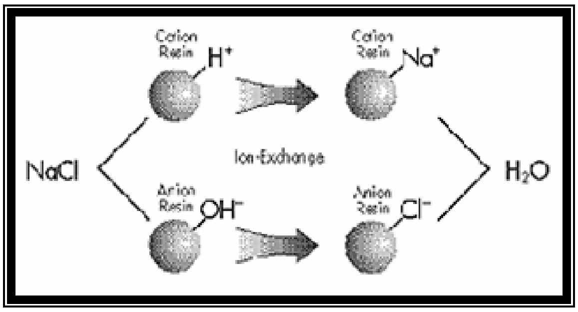
The ultrafiltration process is used in the separation and purification process of dissolved or suspended particles. Ultrafiltration membranes generally are made of a high permeate hard polymeric structure composed by a thin active surface layer supported with a more compact layer. The permeability power is directly correlated to the particle's size and the membrane works similar to a sieve. In this case the working pressure, the running costs and water use are lower than OI technology, the clearing level of very high molecular weight organic substance is optimum, the fouling phenomena are limited, but there isn't separation of the low molecular weight ions and organic particles.

- Membrane microfiltration



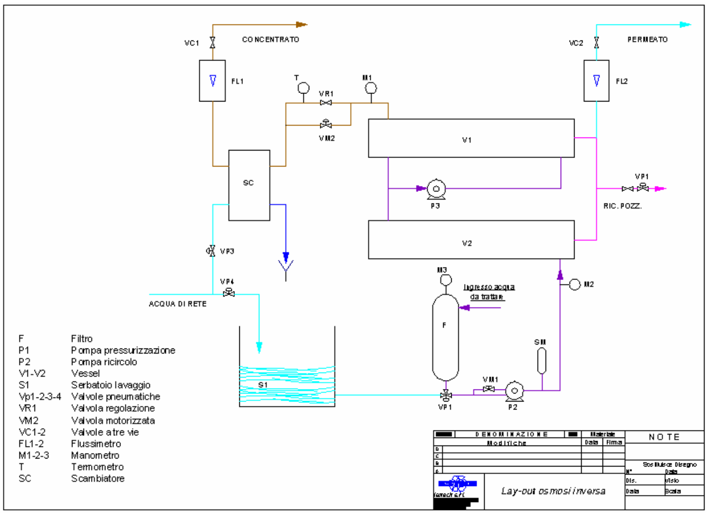
The membrane filters retain every pollutant if the pollutant size is higher than the membrane pore diameter. The membrane filters can work at low pressures with high flows, but don't remove the other pollutants and are easily obstructed.

- Deionization



The deionization technology removes every ion included into the water by little porose balls (diameter 0.3 0.8 mm).
The balls are made of styrene and divinylbenzene polymeric chains functionalized with active chemical chisters.
The deionization process is very efficient to remove ions and ionized organic molecules, but doesn,t remove the micro-organisms and the polymeric chains can be a good medium for the bacterial growning.

MOI Overall view



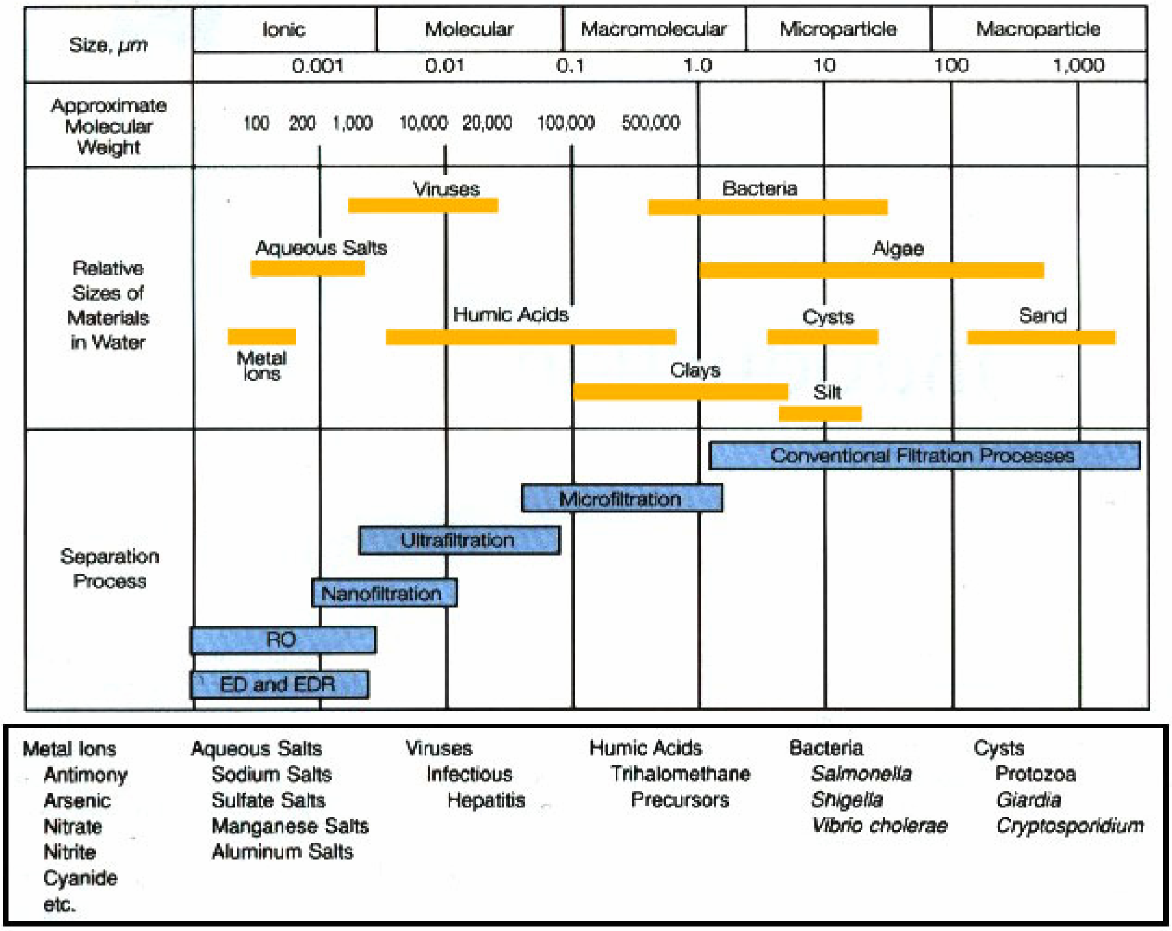
MOI lay-out

System components

- Centrifugal transfer pump from the collection trap, submerged type
- Bag safety filter

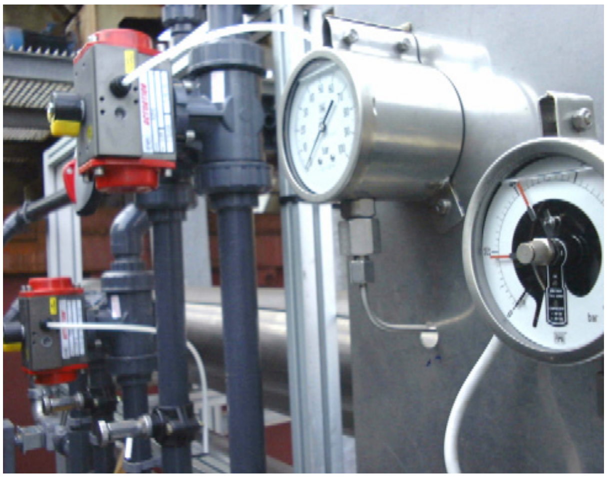
  Filtration 10/20 micron
- Piston pressurisation pump, Triplex type, Complete with throb damper, spring safety valve, motorised by-pass valve
- Recirculation pump on second VESSEL, multi-girating type
- VESSEL containing helically wound membrane modules. No.3 modules per VESSEL
- Washing tank
- Pneumatic valve for power switch wastage and wash water system
- Solenoid valve for recirculation of part of the permeated matter in the trap
- Manual valve for regulating working pressure
- Motorised valve for lowering pressure during the wash cycles
- Three way valve enabling recirculation of the permeated matter and the concentrate in the wash tank during washing of the membranes with detergent
- Conducimeter for control of the permeated matter
- Plate-type heat exchanger

Technical-functional data

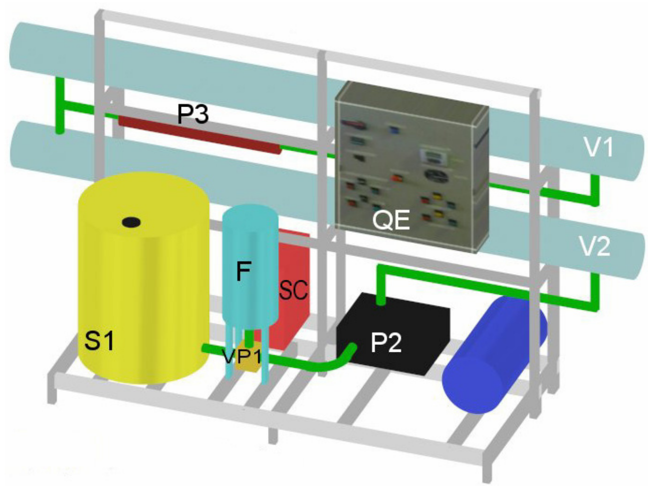


Example: Reverse osmosis plant MOI10

transfer pump	Q=10 m^3/h, H=2 bar, P=1 kW
pressurisation pump	Q=10 m^3/h, H=40 bar, P=15 kW
Recirculation pump	Q=10 m^3/h, H=2.5 bar, P=1 kW
membrane	Modules 8"x 40" type OI high rejection
Working max temperature	45° C
Working max pressure	60 bar
Rejection to the NaCl	98,6 %
Dimensions	3400 x 1200 x 2000 mm



MOI particular



MOI System Prospect