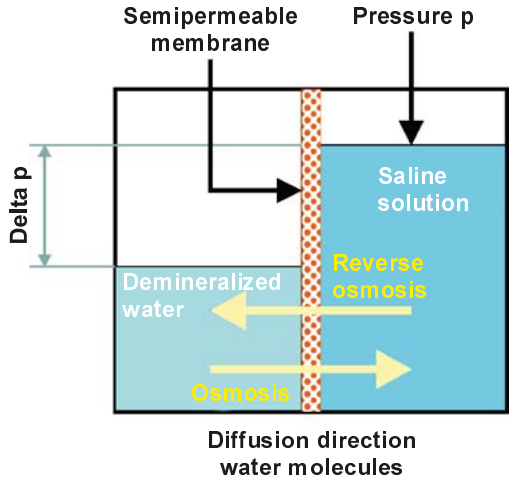
Reverse Osmosis / Stainless Steel Diaphragm Valves



Application

When two different liquids or liquids with a different concentration are separated by a permeable membrane, nature tries to establish a balance between both liquids or concentrations, depending on the permeability/"mesh size" of the membrane, the kind of liquids and the pressures applied. If there is the same pressure on both sides of the membrane and the medium is water, for example, then the water containing more minerals will try to dilute with the less concentrated water through the membrane. This process is called osmosis. If the pressure on the side with the more concentrated water is higher than on the side with less concentrated water, the water will flow in the opposite direction. This process is called reverse osmosis.

If the membrane's porosity is so minute that the molecules of salts and minerals do not pass through, this causes a high-grade filtration effect. The water originally containing minerals is called solvent, the "filtered" water is called permeate and the unfiltered remainder is called concentrate. Reverse osmosis (hypertitration) is the best possible filtration and is used for the demineralization of water in the cross flow process. Here water permanently flows past the membrane surface at an angle of 90°. Part of the water permeates through the membrane and is filtered; the remainder re-enters the circulation as concentrate or is collected and disposed. All particles and molecules, germs and spores smaller than approximately 0.002 micrometers are extracted by filtering.

Plant technology

The membranes are available either in plastic or as hollow tubes made of ceramics. The latter are dimensionally stable and therefore suitable for backwashing. The reverse osmosis filters solutes from the water (physical process) leaving about 1% of the salts in approximately 75% of the water . Thus there is approximately 25% concentrate with a concentration of 99% of the original salts, which must be collected, disposed of or treated. Before this process the water must be pretreated /softened which is usually done by an ion exchanger and/or chemical neutralisation. As high pressures are used in this procedure, the plants are made from stainless steel. With diaphragm valves all the mechanical components are outside the medium wetted parts, therefore the bearing, spindle and diaphragm are not subject to wear. For this reason the diaphragm valve is the most suitable valve for this process. As a rule, pneumatically operated diaphragm valves in sizes DN 15-40 are used rather than manual or motorized versions.

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