Membrane water softening and desalination

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Membrane separation processes

Water treatment systems

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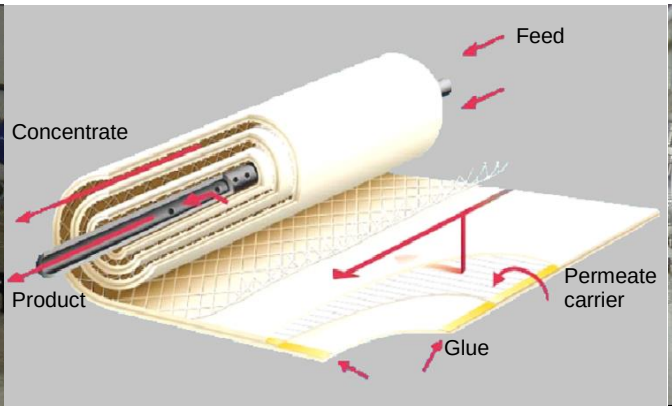

Reverse osmosis skid

Spiral wound module configuration

Detail of pressure vessel

Membrane technology

Membrane technology allows the rejection of anything down to simple ions such as Na^+ and Cl^-.

A number of treatment applications are therefore possible in the municipal and industrial water fields.

Water softening

Water softening (e.g. hardness and sulphate removal) using membrane filtration processes represents an interesting treatment application for improving the quality of fresh water. Water containing high amounts of sulphates or calcium can be satisfactorily treated thanks to the very fine porous structure of the membrane, which, depending on the chosen pore size (smaller pores require a higher applied pressure), allows a 94% to 99% rejection.

Disinfection by-product precursors removal

Disinfection by-products (DBPs) are a major target contaminant and they are formed when natural organic matter (NOM) in drinking water reacts with chlorine or other chemical oxidising agents. Reverse osmosis and nanofiltration membranes can reject more than 90% of the DBP precursors from surface and groundwaters with a high organic load.

Desalination

Seawater and brackish water treatment are the most common applications of reverse osmosis in the municipal water field. With the introduction of specially designed energy recovery systems, modern plants are becoming more cost efficient than traditional desalination methods such as seawater distillation.

Reverse osmosis and nanofiltration

The most selective filtration technique is defined as reverse osmosis (RO), whereas nanofiltration (NF) pores are typically larger than the reverse osmosis ones, thus allowing to differentiate between desired and undesired raw water constituents.

As particle-free water (< 1 NTU) is required for both RO and NF, pretreatment steps such as sand filtration or ultrafiltration (UF) are often necessary.

Membrane material and configuration

Reverse osmosis and nanofiltration membranes are often made from cellulose acetate or composite polyamides. In the most common configuration, 1m-long spiral-wound elements are installed in pressure vessels (up to eight elements per vessel).

Compactness and modularity

An advantage of all membrane processes is the compactness of the treatment plants, which can be easily extended thanks to their modular design.

Applied pressure and power consumption

External pressure is applied to the saline solution, so that water can flow by diffusion from a more concentrated saline solution through the semipermeable membrane to the permeate side.

The operating pressures depend on the quality of the raw water and on the type of membrane:

- Softening of fresh water: 8 – 15 bar
- Brackish water desalination: 15 – 25 bar
- Seawater desalination: 40 - 80 bar (modern plants equipped with energy recovery systems have a power consumption of 2 – 3 kWh/m^3).

For all problems related to water treatment,
Membratec can offer an integrated membrane solution adapted to your needs.

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