

Membrane Filtration

There are a number of technologies available for separating contaminants from water, and one of the simplest and most cost effective is filtration. The most sophisticated of the filtration processes are membrane filtration systems.

Membrane filtration is a technique used to separate waste material from a liquid for the purpose of purifying it. The main benefit from membrane technology is in its successful operation without the addition of chemicals, its relatively low energy use, with minimum waste. Membrane filtration is a term used to characterise a number of different processes all of which utilise membranes.

The filtration process is based on the presence of a semi permeable membrane, permitting water to pass through, while catching suspended solids and other substances. All membrane systems require periodic flushing of membranes, the frequency depending on the quality and quantity of the water being treated. Waste residues collected from filter membrane flushing require disposal, and filter membranes must be replaced periodically.

Pre-treatment is required for membrane filtration to operate successfully and economically. Suppliers of membrane filtration systems recommend pre-treatment based on water quality sampling along with water quantity requirement calculations.

There are four types of technologies, depending on the size of the impurities, which are to be removed;

- microfiltration,
- ultrafiltration,
- nanofiltration and
- reverse osmosis.

These membrane filtration systems can be grouped into *micro and ultra filtration* and *nano and reverse osmosis filtration*.

Micro and Ultra filtration are used for the removal of particle contaminants from the water. The membranes permeability is determined by the size of the pores in the membrane, which act as a barrier to particles that are larger than the pores themselves, while the rest of the water can pass freely through the membrane.

Nano filtration and reverse osmosis are used when removing salts from water. These filtration systems operate differently by using higher pressures to diffuse the purified water through the membrane.

Microfiltration is used over a wide range of applications such as potable water purification, sewage and wastewater treatment, and as a pre-treatment to advanced water treatment processes. Microfiltration requires the least amount of energy to pass water through the membrane, however it does not screen out most pathogens, requiring additional sanitation treatments.

Ultrafiltration is often used to remove particles and microbiological contamination, and provide a water quality free of turbidity and pathogens. Ultrafiltration when used with a suitable pre-treatment is recommended as a suitable disinfection process for production nurseries when recycling irrigation wastewater or collecting surface runoff. Ultrafiltration can provide a constant filtrate quality using minimum energy, low water consumption, with no or minimum addition of chemicals. Latest generation Ultrafiltration systems are compact, stand alone systems often supplied with pre, post and waste water treatment systems.

Nanofiltration is most often used with water containing low levels of dissolved solids such as ground and surface water. Nanofiltration is also used in the removal of some unwanted salts from groundwater, providing a cost effective source of irrigation water.

Reverse osmosis (RO) membrane filtration is used for the desalination of drinking water, desalination of brackish water and seawater desalination. Desalination of brackish water for irrigation, particularly from bores, is designed to achieve a considerable reduction in the salt content, with little wastewater and minimal operation costs. New generation reverse osmosis (RO) generation units are reliable, efficient with relatively low operation costs. These units are microprocessor controlled, simple to operate, with reduced maintenance and service costs.

The results of water quality testing and quantity requirement calculations allows design and selection of the most suitable reverse osmosis filter membrane and the installation of the most appropriate pre-treatment process.

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