Reverse Osmosis

Reverse osmosis occurs when the water is moved across the membrane against the concentration gradient, from lower concentration to higher concentration. To illustrate, imagine a semi permeable membrane with fresh water on one side and a concentrated aqueous solution on the other side. If normal osmosis takes place, the fresh water will cross the membrane to dilute the concentrated solution. In reverse osmosis, pressure is exerted on the side with the concentrated solution to force the water molecules across the membrane to the fresh water side.

Reverse osmosis is often used in commercial and residential water filtration. It is also one of the methods used to desalinate seawater. Sometimes reverse osmosis is used to purify liquids in which water is an undesirable impurity.

How reverse osmosis works?

Reverse osmosis is sometimes referred to as ultra filtration because it involves the movement of water through a membrane as shown in Figure 1. The membrane has microscopic openings that allow water molecules, but not larger compounds, to pass through. Some RO membranes also have an electrical charge that helps in rejecting some chemicals at the membrane surface. Proper maintenance is essential to retain effectiveness over time. Some units are equipped with automatic membrane flushing systems to clean the membrane.

What impurities will reverse osmosis remove?

Reverse osmosis (RO) has become a common method for the treatment of household drinking water supplies. Effectiveness of RO units depends on initial levels of contamination and water pressure. RO treatment may be used to reduce the levels of:

Naturally occurring substances that cause water supplies to be unhealthy or unappealing (foul tastes, smells or colors).

Substances that have contaminated the water supply resulting in possible adverse health effects or decreased desirability.

RO systems are typically used to reduce the levels of total dissolved solids and suspended matter. The principal uses of reverse osmosis in Minnesota and the Dakotas are for the reduction of high levels of nitrate, sulfate, sodium and total dissolved solids.

RO units with carbon filters may also reduce the level of some SOCs (soluble organic compounds) like pesticides, dioxins and VOCs (volatile organic compounds like chloroform and petrochemicals). An RO unit alone may not be the best solution for these types of contaminants, but installing a properly design-ed RO unit to reduce the levels of other contaminants may provide a reduction in SOCs and VOCs.