

## **1.8 DESALINATION OF BRACKISH WATER**

### **Reverse Osmosis**



## 1.8 DESALINATION OF BRACKISH WATER

Water containing high concentration of dissolved salts or solids of peculiar salty or brackish taste is called **brackish water**. The sea water contains about 3.5% of dissolved salts. Before the removal of these salts, it is unfit for most of the domestic and industrial applications.

The process of removing common salt (sodium chloride) from the brackish or saline water is known as **Desalination** or **Desalting**.

Salinity of water is expressed in ppm or mg/L.

Based on the quantity of dissolved salts present, water is graded as,

- ✓ **FRESH WATER**

It contains less than 1000 ppm of dissolved salts.

- ✓ **BRACKISH WATER**

It contains above 1000 and below 35,000 ppm of dissolved salts.

- ✓ **SEA WATER**

It contains above 35,000 ppm of dissolved salts.

The different methods of desalination are,

- ✓ **Distillation** – it involves separation of water from salts by evaporation followed by condensation.
- ✓ **Freezing** – it is based on the separation of pure water in the form of ice leaving the salt in the mother liquor when the saline water is cooled.
- ✓ **Electro dialysis** – It is the method of separation of ions from the salt water by passing electric current using a pair of electrodes and a pair of thin rigid plastic semipermeable membranes.
- ✓ **Reverse Osmosis**

The commonly used method of desalination are Electro dialysis and Reverse Osmosis.

### REVERSE OSMOSIS

When two solutions of different concentrations are separated by a semi-permeable membrane, solvent molecules flow from a region of lower concentration (dilute) to higher concentration side. This process is called **Osmosis**. The driving force in this phenomenon is called **Osmotic pressure**.

If a pressure higher than that of osmotic pressure is applied on the concentrated side,

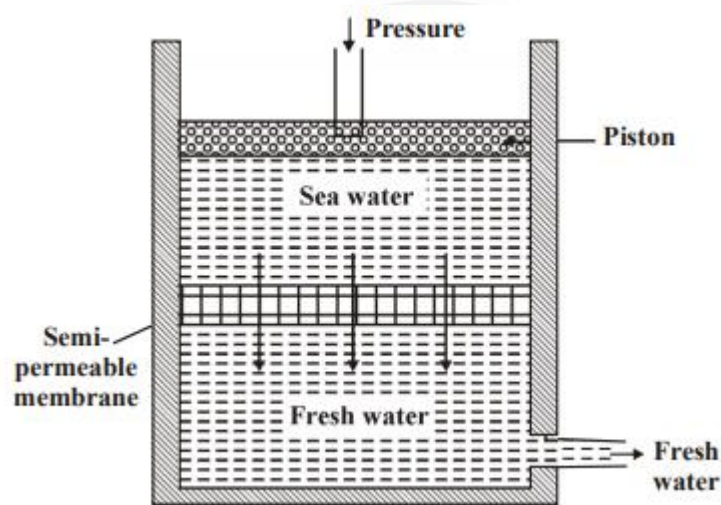
solvent flow reverses. That is the solvent molecules pass from concentrated side to dilute side through the membrane. This phenomenon is called **Reverse Osmosis**.

Using reverse osmosis, pure solvent (water) is separated from salt water. This membrane filtration is also called **Super Filtration** or **Hyper Filtration**.

The membranes consist of very thin film of cellulose acetate and cellulose butyrate. Polymers like polymethacrylate and polyamide of superior quality are also being used.

## METHOD

In this process, pressure of about 15 to 40 kgcm<sup>-2</sup> higher than that of osmotic pressure is applied to sea water so that pure water is forced to move through semi permeable membrane to pure water side. The membrane consists of very thin films of cellulose acetate.



**Figure.1.8.1 Reverse Osmosis process**

[Source: "Engineering Chemistry II" by Dr.Syed Shabudeen.P.S., Page1.79]

## ADVANTAGES:

- ✓ It removes ionic as well as non-ionic and colloidal impurities.
- ✓ Life time of the membrane is high (2 - 3 years) and it can be replaced within few minutes.
- ✓ Maintenance cost is less.
- ✓ Capital cost is low and operation is simple.