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### DESALINATION OF SEAWATER BY REVERSE OSMOSIS

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#### Abstract

Water is most important thing for all living beings. No one can survive without water. Out of total earth surface, 71% surface of earth is covered by water. On earth 96.5% of the planet crust water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland. Safe drinking water is essential to humans and other living beings even though it provides no calories or organic nutrients. A report issued in 2009, suggest that by 2030, in some developing regions of the world water demand will exceed supply by 50%. Approximately 70% of fresh water used by humans goes to agriculture. Now a days the sources of fresh water are reducing day by day as the used of fresh water takes place by the humans for various purposes therefore the efficiency of water will occur in future. Hence the humans or all of the living beings will be need of water so we have to achieve water by various processes. As we know there is maximum amount of seawater is present on the earth so the Desalination process will be more helpful for humans. There are many types of desalination processes are available in which the desalination of seawater by reverse osmosis process will be most helpful. This paper deals with the generation of water by using desalination of seawater by reverse osmosis process with affordable cost without damaging the nature.

**Index Terms:** Impurities present in seawater, osmosis, reverse osmosis, etc.

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#### 1. INTRODUCTIN

Desalination is the process in which the removal of salt and other contaminants from water. Desalination has a long history in ancient and practice. Desalination has been used for thousands of years, the Greek sailors boil the seawater from which he separates fresh water and salt from seawater and clay filter was used by Romans to separate freshwater and salt from seawater. Now a day various methods are used for separation and distillation of water in which the reverse osmosis process is most helpful for the desalination of seawater. Worldwide there about 15000 desalination plants are available from which the biggest plants are situated in the United Arab Emirates, Saudi Arabia, and Israel. There are maximum amount of plants are used reverse osmosis process for the process of desalination. In the process of reverse osmosis the salt and minerals are removed from passing through osmosis membrane.

The process of osmosis was first discovered by JEAN ANTONIE NOLLET in 1748. About 200 years the process of osmosis was observed only in laboratory, but after 200 years the University of California and the university of Florida first investigated desalination of sea water using semipermeable membrane and successfully produce fresh water from seawater. Reverse osmosis is the process which is responsible for the purification of water in which the semipermeable membrane gives full resistance to the impurities and salt present in waste

water or seawater and making it clean for dinking or for other purposes.

#### 2. IMPURITIES PRESENT IN SEA WATER

There are large amount of germs and bacteria's are present in sea water. Germs are responsible for the salty taste of water. There are number of impurities present in seawater. It contains maximum amount of salt and remaining amount of other impurities like dissolve ions and minerals. Sea water consider as an aqueous solution containing dissolve solid and gases such as chloride and sodium ions are present in very high concentration. There are two major constituents, sodium and potassium, are extremely difficult to determine accurately.

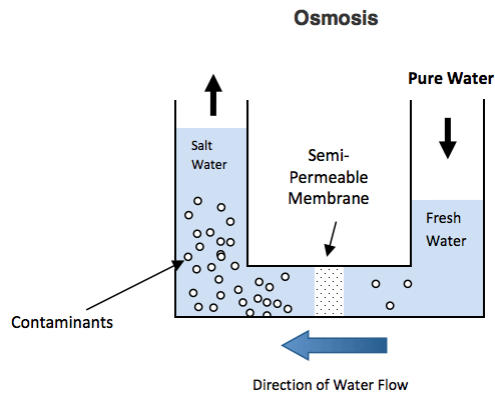
**Table: Impurities in seawater  
(In gm. per kg of water)**

Chloride	19.135
Sodium	10.76
Sulphate	2.712
Magnesium	1.294
Calcium	0.473
Potassium	0.387
Bicarbonate	0.142
Bromide	0.067
Strontium	0.008
Boron	0.004
Fluoride	0.001

Sea water contains dissolved ions more than fresh water. It contains about 2.8 times more bicarbonate than river water. Small amount of amino acid at concentration of 2 microgram of nitrogen item per litre. Bacteria are found at depth in water column. The regions of dirty water are garbage fertilizers, heavy metal as hazardous waste.

### 3. OSMOSIS

Osmosis is a term in which the solvent moves from less concentrated solution to high concentrated solution through a semipermeable membrane. Osmosis has life preserving function-It helps plants to receive water; it helps for preservation of fruit and meat, it also used in kidney dialysis. In osmosis osmotic pressure plays an important role. It is minimum pressure which needs to be applied to a solution to prevent the inverted flow of water across a semipermeable membrane. Osmosis plays an important role in plants for preparing their daily routine.

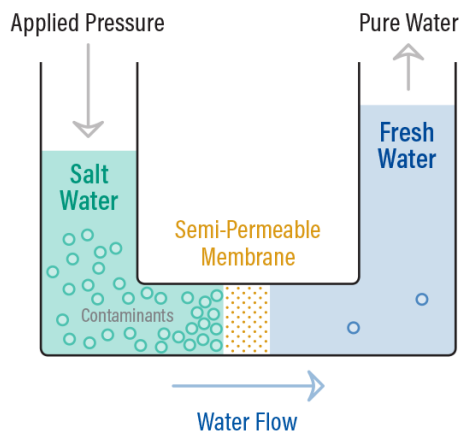


#### 3.1 WORKING OF OSMOSIS

Osmosis in plants takes place in plant cells surrounded by a cellulose wall but plant cells take water by osmosis when placed in pure water. As we know the roots of plants are growing towards the water inside the land. When the tip of the root reaches up to the water the cellulose cells get active. The cell wall of cellulose exerts pressure called turgor pressure due to this the cells take up water.

### 4. REVERSE OSMOSIS

#### Reverse Osmosis



It is the reverse process of osmosis. Reverse osmosis is the process of water treatment in which it removes contaminants from water by using pressure to force the water molecule through a semipermeable membrane. The world's first reverse osmosis plant was built in Coalinga, California with the help and direction of Josef McCutchan and Sidney Loeb in 1965. During this process contaminants are filtered out and flushed away to make water clean. Reverse osmosis is commonly called as RO; this process is helpful for cleaning the water in water purifiers. Reverse osmosis uses a multistage filtration process to remove impurities, transforming the drinking water into fresh tasting. It reduces Barium, Chromium, Radium and other substances in the water. It also removes macroscopic particles from water which are responsible for cloudiness. It removes odour from water. When pressure is applied to the concentrated solution to overcome osmotic pressure, the flow of water will be reverse. The water molecule can form hydrogen bonds in the membrane and molecules that enter the membrane by hydrogen bonding can push under pressure. The microscopic type of impurity and other impurities are separated by a reverse osmotic membrane called a semipermeable membrane.

#### 4.1 SEMIPERMEABLE MEMBRANE

A semipermeable membrane is a layer through which very small amounts of molecules can pass. Membranes are the best filtration media for water. Membranes are very thin sheets of synthetic plastic materials which have very fine pores. The sizes of pores are different for different purifiers. The semipermeable membranes are of two types: it can be natural or artificial.

The natural membranes are also called as biological membranes. Generally the biological membranes are seen in plants in the form of "phospholipids" which form an excellent semipermeable membrane. The biological membranes are not permeable to solute but they are permeable to water so the water moves out of cells. The biological membranes also allow proteins to pass through these cells. Human skin is also a semipermeable membrane which is not allowable for dust particles and any type of substances.

The artificial membrane can be organic as well as inorganic. It is made from organic material such as polymers. In separation industries the synthetic membranes are made from polymeric structures. The artificial semipermeable membranes are designed of various types for the purpose of water filtration. In the process of desalination by reverse osmosis, polymer electrolyte membranes are used which are mainly characterized by ion exchange membranes and mostly the microfiltration, ultrafiltration and the Nano filtration. These semipermeable membranes are used in the process of reverse osmosis, which only allow water to pass through it. It restricts the solutes which are dissolving.

in solution. The microscopic solutes are also restricted by the semipermeable membrane.

### 5. ADVANTAGES

- It is eco-friendly to environment.
- It not produces any harmful chemicals during the process.
- Very small amount of power is require for this process.
- It works well in home filtration system because it is small in size.
- Test of water is good.
- It removes minerals, other impurities and odour from water.
- The water removes from the system is less corrosive.
- The purified water is good for health.
- The water purified by the process of desalination of sea water will be helpful for other purposes.

### 6. DISADVANTAGES

- This process requires large amount of water.
- It takes long time to purify the water.
- If we want to purify the water in large amount then the transporting problem will occur.
- For large amount of water it will take more energy.

### 7. CONCLUSION

Reverse osmosis process is good and effective for getting fresh water. It is easiest process to get fresh water than the other processes. Desalination process reduces the efficiency of water for human purposes. Desalination by reverse osmosis will very helpful in future for humans when the problem of water will occur. It will used for agricultural and industrial purpose also. As the water come out from this process is more purified then the lake or river water.

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