IMPLEMENTING DESALINATION OF SEA WATER TECHNIQUE THROUGH R.O

P.M.Pathak[1], Harshavardhan Sabale[2], Shubham Chhajed[3], Shubham Singh Rathore[4], Gunjan Sonawane[5], Sourabh Solanki[6]

[1]*Assistant Professor, Department of Civil Engineering, Sinhgad Academy of Engineering, India.*

[2,3,4,5,6] *UG Students, Department of Civil Engineering, Sinhgad Academy of Engineering, India.*

***Abstract**: Desalination is considered to be one of the most traditional process to generate potable water. The rise in demand for potable water and scarcity of fresh water resources, this process has gained special importance. Desalination processing is the current article target to supply an adequate amount of drinking, irrigation water and waste water treatment for safe disposal to people across the new communities along the remote and arid areas in Indian region. This process works on separation of nearly salt free water from sea or brackish water. The desalination process is becoming a solution for water shortage in the world. The method of water desalination preferably RO is used in this study as complementary methods. This system is economic and cost effective as compared to other techniques of desalination. The work adopted was to search information about localities with drinking water shortages, population, salt water availability.*

***Keywords**- Desalination, Potable water, Scarcity, RO.*

1. Introduction

Universe consists of 97% of saline water. Water is major source of livelihood. Water scarcity has adverse effect on society. At present scenario, India is going through major water scarcity problem due to ever increasing gap between demand and supply. In this century, the most crucial problem influencing people around the world is global water scarcity. The rapid growth in population has resulted in greater demand of drinking water.

Desalination is mandatory in arid countries and in cases where good-quality water is required for industrial purposes with a scarcity of fresh water. The RO desalination plant process is shown in following fig.1. Feed saline water pressure is increased by pumps supplied with electrical energy. The water transverses some tubes with interior semi permeable membranes, which resists the passage of salts and leave the water to flow. Thus the water is separated into two streams, one with a high salt concentration (the current that has not crossed the semi permeable membrane), which is known as concentrated while the other with low salt concentration (the current that has crossed the semi permeable membrane), known as water product. The permeated water is in low pressure; whereas concentrated water is in high pressure therefore, part of its energy is recovered through various energy recovery systems like Pelton turbines, pressure exchange systems and turbochargers. The RO desalination technique adopted has several advantages such as efficiency of output, maintaining the quality of water and fulfilling the needs and demands of areas facing water scarcity. Having several advantages it has a major drawback of having its convenience only to the coastal areas.

In RO the membrane role is critical, since it must possess the following characteristics:

It must be able to withstand the operating pressures. It must remove a higher percentage of salts so it gives a good quality product. It must be sufficiently permeable so as the supplied water flow is high.

In some coastal arid areas, desalination is a common way to gain access to potable water. Now a days , desalination has been used in many places of the world such as Middle East, North Africa, the US, and Europe. Desalination largely alleviates the pressure on freshwater resources in these areas. The operation of desalination plants requires huge amount of energy and can have adverse impacts on the environment. Desalination plants consumes high amounts of water and energy . It also release large amounts of CO_2 during the production process.

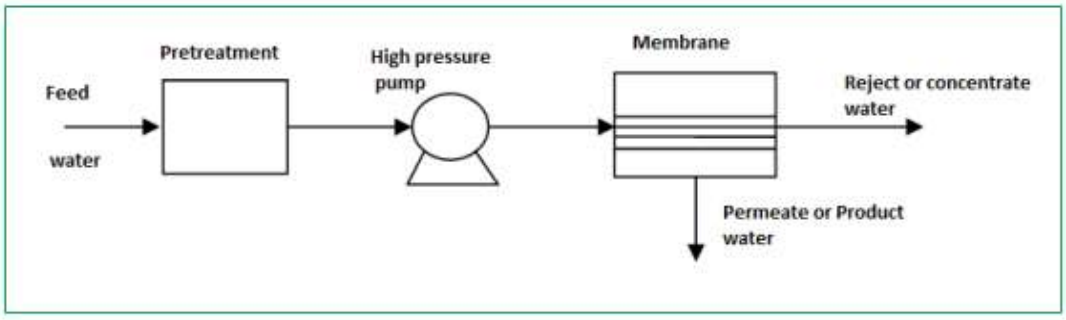

Fig.1 （Operation of the desalination plant)

2. Review on literatures

[1] Garud R. M., Kore S. V., Kore V. S., Kulkarni G. S [2015] conducted study on Pre treatment, membrane performance and efficiency RO process. Water containing organic matter, suspended particles and inorganic salt may deposit on the membrane and damage the membrane because of size of particles and pressure acting on membrane. The priority to remove these deposition by way of pre-treatment will determine the efficiency of RO system. RO membrane performance can be checked to avoid the damages to the RO membrane. The success of RO system depends upon the pre treatment given to feed water. Post treatment of saline water stream present a major problem with growing desalination capacity to minimize the damage on the ecology which depends upon the location of plant

[2] F. Muñoza and L.A. Becerrila[2014] conducted study on solar Desalination plant. Solar energy can be used in the seawater or brackish water desalination using solar photovoltaic energy and can be adapted to low capacities. The use of solar energy is beneficial but up to the mark because of several factors affecting the efficiency of RO.

[3] Dr C Robert Reiss [2011] conducted study on RO desalination process. The RO desalination process produces two streams; a product water stream that is essentially “pure” water used for further purposes and a concentrate stream whose salt content includes the salt that remains when the product water is produced. The expected environmental impacts of a plant will depend on the design of the desalination process including the pre-treatment and discharge system, and the location of the facility including its intake and outfall.

[4] P.S. Goh, A.F. Ismail and N. Hilal [2016] have conducted study on the Sustainable and revolutionary solutions for membrane desalination. Rapid population growth, urbanization and rapid industrialization are constantly putting pressure on global water demand. Desalination has a feasible option to provide safe drinking water in many deserted areas, coastal regions or remote locations. Coastal area facing water scarcity is best location for adopting such technologies.

[5] Dong Han[2015] has conducted study on zero emission desalination system based on MVR. Large scale desalination plant requires large amount of energy. The large sea water desalination plant generates huge amount of rich salt water and it disturb the ecological balance of surrounding water due to high salinity. So mechanical vapour compression (MVR) is used to for effective energy saving purpose. This increases the capacity and overall efficiency of plant

3. Conclusions

From the review of above literatures it has been observed that

1. The reverse osmosis is capable of being used to desalinate brackish water as well as water with higher salt concentration.

2. The water is purified by using the membranes in RO plant. It converts the saline water into potable water which can be used for irrigation, domestic, and drinking process..

4. RO membrane is capable to reduce BOC , COD and TDS.

5. Desalination plant is suitable near coastal region.

4. References

1. R.I. McDonald, et al., Urban growth**. "***Urban growth, climate change, and freshwater availability*", PNAS 108 (2011) 6312–6317.

2. Emily A. Grubert , Ashlynn S. Stillwell , Michael E. Webber. *"Where does solar-aided seawater desalination make sense"* Energy Procedia 75 (2015) 1436 – 1444.

3. S. Mitraa, K. Srinivasana, P. Kumara, S.S. Murthy, P. Duttaa, "*Solar driven Adsorption Desalination system*", Energy Procedia 49 (2014) 2261 – 2269.

4. P.S. Goh, A.F. Ismail, N. Hilal, "*Nano enabled membranes technology: Sustainable and revolutionary solutions for membrane desalination"*, Desalination 380 (2016) 100–104.

5. F. Munza, L.A. Becerrila, "*Low-capacity reverse osmosis solar desalination plant*," Energy Procedia 57 (2014) 2787– 2793

6. Ng KC, Thu K, Kim Y, Chakraborty A, Amy G, "*Adsorption desalination: An emerging low-cost thermal desalination method, Desalination,"* 308(2013), 161–179.

7. Jiahong Liu, Silan Chen, Hao Wang, Xiangdong Chen, "Calculation of carbon footprints for water diversion and desalination projects*"* Energy Procedia 75 (2015) 2483 – 2494

8. E.A. Abdel-Aal , M.E. Farid , Fatma S.M. Hassan , Adila E. Mohamed, "*Desalination of Red Sea water using both electrodialysis and reverse osmosis as complementary methods"* Egyptian Journal of Petroleum (2015) 24, 71–75

9. L.F. Greenlee, D.F. Lawler, B.D. Freeman, B. Marrot, P. Moulin, "*Reverse osmosis desalination: water sources, technology, and today's challenges"* Water Res. 43 (2009)2317–2348.

10.,A.S. Stillwell, C.W. King, M.E. Webber, I.J. Duncan, A. Hardberger, "*The energy-water nexus in Texas*" Ecol. Soc. 16 (2011).