SOLUTION TO WATER SCARCITY BY DESALINATION AT -COASTAL REGION

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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. Ganpatiphule a major tourist attraction in Ratnagiri district has been chosen from the survey carried in coastal region for the water scarcity affected areas to implement the desalination process using RO technique to cure the water scarcity problem.*

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.

Indian has a abundant amount of water resource with a coast line of 7300 km . Having enough water resources are also not capable to overcome the water scarcity of major developing state of country such as Maharashtra, Gujarat, Tamil Nadu etc rather than having a coastline of 720 Km Maharashtra is also facing a water scarcity with a 40% drought affected area. Ganpatipule has been chosen as major tourist spot near the coast line of Maharashtra facing water scarcity problem. Water scarcity in Ganpatipule leads to affect tourist activities in Ganpatipule therefore it is adopted to be the best side to implement desalination methods to cure the problem.

Desalination works on the principle of removing salt from saline water by the application of external applied pressure
  - ➢ *The most common desalination methods :*
  - o *Electrodialysis.*
  - o *Freezing method.*
  - o *Solar distillation.*
  - o *Reverse osmosis.*
    RO is said to be one of the best adopted technique of desalination. The water flows in reverse direction through a semi permeable membrane and leads to formation of salt free water due to application of external pressure .

2. Methodology-

2.1 Study of coastal region –

Maharashtra is major developing state of India with a coast line of 720 km. Having a abundant water resources the state is not able overcome the water scarcity faced by its 40% land area. Ganpatipule of Ratnagiri district has been taken into account for implementing desalination of behalf of ever increasing gap between the water demand and supply as being the major tourist attraction of Maharashtra.

2.2 Approach to the site-

MTDC resort of Ganpatipule has a demand of 0.45MLD of water .The main source of water of the resort are Shubhrakamal pond and wells situated at a distance of 5km from the resort . Due to seasonal variation the resort has to undergo an extra load of spending 250rs per 1000 litres from external sources .This water scarcity leads to affect the tourist activities at a major level therefore implementing RO technique of desalination consider to be the best proposed solution to the problem.

2.3 Analysing and implementing the methods –

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.

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.
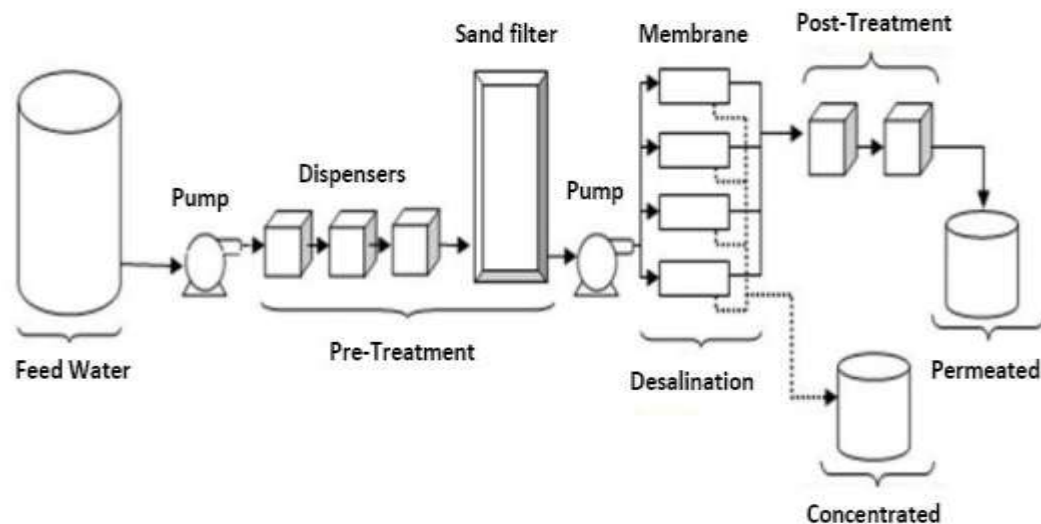

Fig.1 (Operation of the desalination plant)

2.4 Sample collection and testing-

Water sample from three different location of site such as crick, crick-sea intersection and mid way of sea has been collected to carry out its testing in laboratory based of different parameters. Physical, chemical and bio logical parameters plays a vital role in designing the RO specially its membrane. The following table -1 shown below marks the account for various parameters on the basis of which design has been proposed.

Serial No.	Test	Sample collected	Sample collected

		(at crick)	(at sea)
1	pH	6.85	7.96
2	Colour	-12	-2
3	Turbidity	2.79NTU	5.61NTU
4	Alkalinity	111mg/lit	1027mg/lit
5	Hardness	1360mg/lit	2320mg/lit
6	Chloride	90mg/lit	1900mg/lit
7	TDS	5.49ppt	9.99ppt
8	DO	10.98mg/lit	11.07mg/lit

2.5 Design –

The design of desalination plant is totally based on physical, chemical biological parameters which is need to be desalinated. The desalination design consist of following components starting from crick (the inlet)-

- A coarse screen
- Standard pump
- Aeration tank
- Pre-chlorination
- Venturi flow
- Sedimentation tank
- Soften water
- Pressure filter
- Sump tank
- RO
- Mineralisation
- Whole sump tank
- EST
- To distribution

2.6 Pre-treatment – To overcome the load on RO a pre-treatment has been setup which also provoked to increase its efficiency of RO. The pre-treatment includes –

Pre-treatment is the process which is mainly adopted to minimize the load on activity carried by RO .The working condition of RO need to be adequate throughout the design period therefore pre-treatment must be mandatory. A proper selection of pre-treatment methods result in increasing the efficiency of RO. Here the main pre-treatment methods adopted where water softening through life soda process, aeration and use of sand filters followed by post chlorination.

2.6.1 Water softening - Hardness of water is mainly due to presence of calcium and magnesium in it. Hard water can not be used for any of the purposes of day to day life such as washing the garments, preparation of foods etc. Therefore it is necessary to treat the hard water and make it soft for its efficient usage. Lime soda process is the process in which sodium carbonate are used to remove hardness of water. This process resulted in decrease of hardness by three degree to four degree.

2.6.2 Sand filters- Use of filter are on the basis of time required for filtration. The filter has two categories slow sand filter and rapid sand filter. To improve the physical, biological and chemical characteristics of water it is allowed to pass slowly though the layer of sand. It is one of the most suitable method to purify water with affordable maintenance.

2.6.3 Aeration – Colour, odour, taste of drinking water changes due to presence of impurity such as dissolved gases, organic materials and due to addition of contaminated material flowing through the water. Aeration is one of the best method through which all the above problems of impurities can be solved. In this

method the water to be treated is brought in contact with air which results in removal of co_2 up to 65 to70 % ,hydrogen sulphide is also eliminated which results in removal of odour.

The pre-treatment adopted in the design process resulted in increasing the efficiency of overall desalination plant from 30 % to 43% through overcoming the problems bio fouling , scaling ,membrane plugging.

3. Acknowledgement

4. Conclusions

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

2. The water regains its purity 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 BOD, COD and TDS.

5.The efficiency of RO which used to be a 30% has been increase to a remarkable percent by adopting pre-treatment.

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