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SEA WATER DESALINATION BY THERMAL METHOD

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Abstract: Desalination methods are used to convert saline/brackish water to drinkable freshwater. Major processes use either thermal energy (conventional distillation) or pressure energy (Reverse osmosis). Different methods of desalination are discussed and their influence on overall water production has been highlighted. With the increase in appreciation for a green technology, desalination methods using renewable/waste energy are drawing significant attention in recent years

Keywords: Desalination, Distillation, MED MSF and Thermal method.

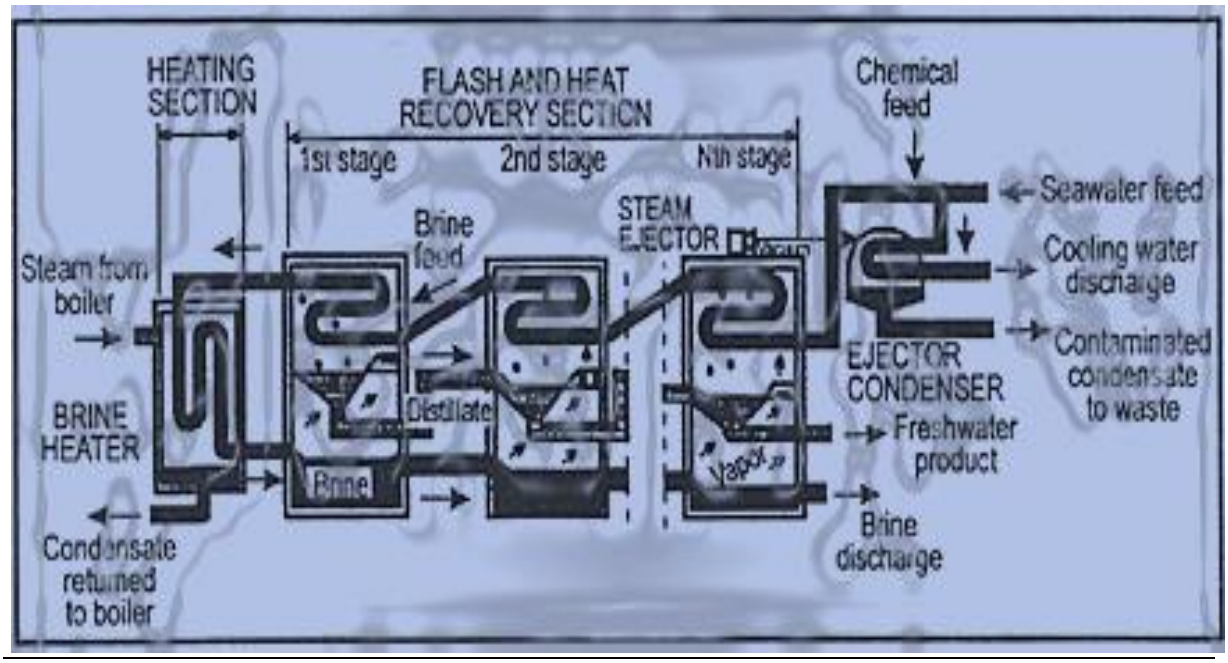
1. INTRODUCTION

Water is one of the basic materials of human survival and development. At present, about a third of the populations live in water shortage areas around the world. Thermal desalination is a process that involves changing saline water into vapor. This vapor, or steam, is generally free of the salt, minerals, and other contaminants that were in the saline water. When condensed, this vapor forms high-purity distilled water. There are several different methods of achieving this distillation.As populations increase and sources of high quality, fresh drinking water decrease, using desalination processes to provide freshwater when other sources and treatment procedures are uneconomical or not environmentally responsible is becoming more and more common

2. EXPRIMENTAL

2.1. THERMAL DESALINATION

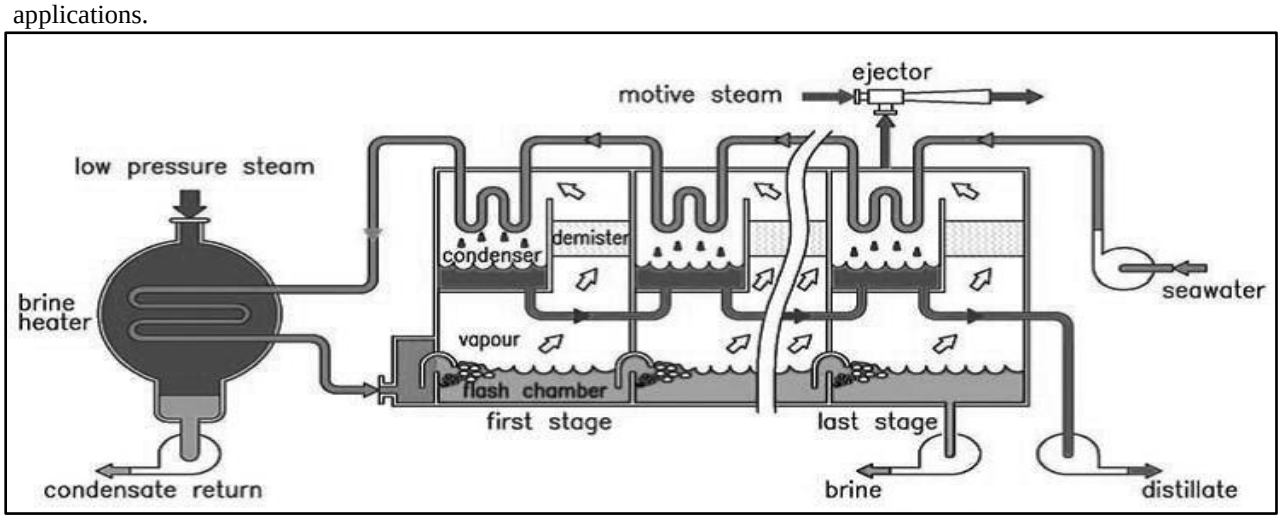
Thermal processes, except freezing, mimic the natural process of producing rain. Saline water is heated, producing water vapour that in turn condenses to form distilled water. These processes include multistageflash (MSF), multiple-effect distillation (MED), vapour compression (VC) and low temperatureevaporation (LTE). In all these processes, condensing steam is used to supply the latent heat needed to vapourize the water. Owing to their high-energy requirements, thermal processes are normally used forseawater desalination. Thermal processes are capable of producing high purity water and suited forindustrial process applications. Thermal processes account for 55% of the total production and their unit capacities are higher compared to membrane processes.



2.2. MULTI STAGE FLASH (MSF) PROCESS

The basic principle involved in the MSF process is to heat the sea water to about 90– 120°C using theheat of condensation of the vapour produced and supplementing with external steam. The heated sea Water is subsequently flashed in successive stages maintained at decreasing levels of pressure.

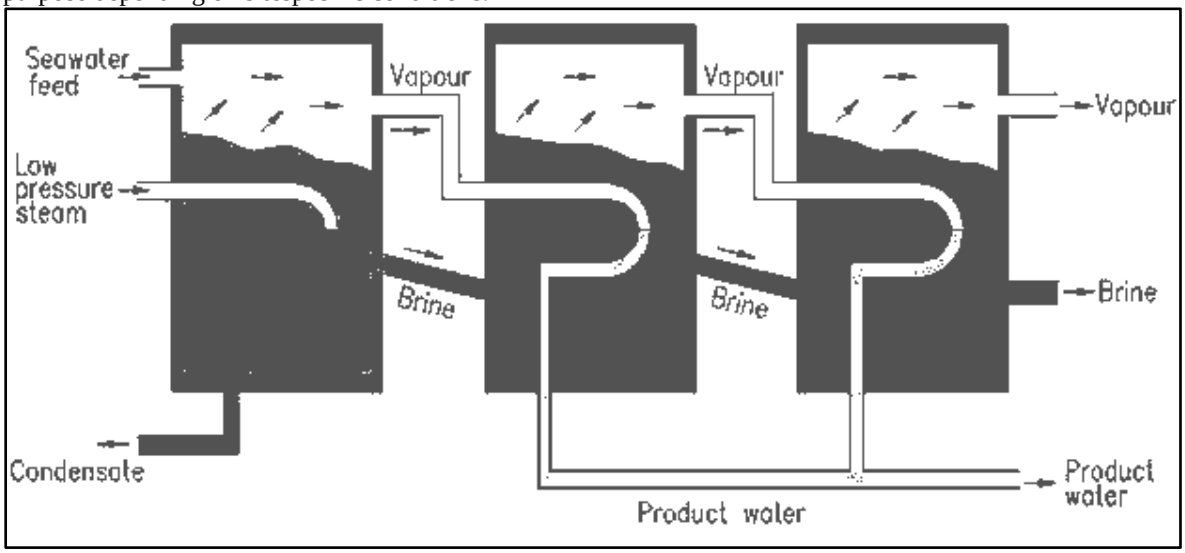
The vaporproduced is condensed and recovered as pure water. MSF can accept higher contaminant loading (suspended solids, heavy metals, oil, grease, COD, BOD etc.) in feed sea water. It is capable of producing distilled quality product water good for power plants, process industries and several other high purity applications.



2.3. MULTI EFFECT DISTILLTION (MED)

MED plant has two or more effects. Each effect operates at a successively lower temperature and pressure. The first effect is heated by low pressure steam (about 0.3 bars). Vapours are generated from the feed sea water in the first effect and directed to the second effect. Thus vapours from the previous effect serve as the heat source to the succeeding effect for evaporating the brine. Vapour from the last effect is condensed in the final condenser where sea water is used as the coolant.

The vapour producedin each effect is passed through the demisters to next effect. It is condensed inside the tubes transferringthe latent heat to the brine falling outside the tube enabling a portion of the brine to evaporate.Low temperature MED unit operates at about 65°C and therefore allows the use of cheaper materialsof construction due to less scaling and corrosion problems. MED is capable of producing pure distilledwater similar to MSF. The possibility of low temperature operation, low grade heat and wasteheat utilization, low cooling water requirement and low energy consumption have made MED anattractive alternative in recent years for sea water desalination.Efficiency of MED plant can be improved by adding a vapour compressor. Mechanical VapourCompressor (MVC) or Thermal Vapour Compressor (TVC) is used for this purpose depending on sitespecific conditions.



2.4. LOW TEMPERATURE EVAPORATION (LTE) DESALINATION USINGWASTE HEAT

As the energy cost component is a major fraction of the desalinated water cost, utilization of waste heat as energy input for seawater desalination is an attractive option. It is one of the eco-friendly ways to produce desalinated water as it does not require chemical pretreatment of feed seawater. Ocean thermal energy can also be utilised for sea water desalination. The desalination unit essentially consists of three portions i.e. heater, separator and condenser. In theheater shell, vertical tubes are used. Feed sea water enters the unit at the bottom of the tubes and partlyevaporates by the time it comes out from the top. After water and vapour mixture come out of thetubes, the vapour rises through the vertical shell, enters the horizontal tube bundle kept at the top ofthe vertical shell and condenses around the tubes (which are cooled by sea water flowing inside) producingdesalinated water. The product water is pumped out.

4. RESULTS AND DISCUSSION

From the table it evident that how much amount of minerals present in sea water. The Experimental tests were carried out for all minerals. The results obtained are summarized in the following table.

MINERAL CONTENT OF SEAWATER

Constituents	**Seawater(mg/L)**	**Portable water (mg/L)**
Barium	0.03	1.1
Calcium	406	78
Carbonates	25	168
Chloride	18500	280
Copper	0.0004	1.2
Fluoride	1.5	1.3
Iron	0.003	0.2
Lead	0.0000005	0.06
Magnesium	1350	54
Manganese	0.0002	0.08
Mercury	0.003	0.001
Nitrogen	12	10
Phosphate	0.05	0.05
Potassium	3350	8
Slica	2	6.8
Sodium	10550	195
Sulphates	890	350
TDS	35617(ppm)	500(ppm)
PH	8.2	6.5-8.5
Turbidity	3.5-14 NTU	6.5-8.5 NTU

6. CONCLUSION

This paper provides an overview of different desalination processes and their appropriate applications. It can be very promising with the aid of waste heat / solar energy to get freshwater from seawater at a much cheaper price. Future planning of water treatment must focus on exploring different desalination methods to find a better way to resolve water issues.

REFERENCES

[1]. Water, The Power, Promise, and Turmoil of NorthAmerica's Fresh Water, National Geographic Special Edition, November 1993.
[2]. A.A. Alawadhi, Regional Report on Desalination-GCC Countries, in: Proceedings of the IDA World Congress on Desalination and Water Reuse,Manama, Bahrain, March 8–13, pp. 2002.
[3]. Drinking Water from the Sea, Middle East Electricity,April 2005, pp. 21–22.
[4]. IDA Desalting Inventory 2004: DesalinationBusiness Stabilized on a High Level, Int. Desal. Water Reuse, 14 (2) (2004) 14–17.
[5]. IDA Desalination Inventory Report, No. 17, InternationalDesalination Association, Topsfield, MA,USA.