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Evaluate Effectiveness of Ro System for Thermal Power Plant-A Case Study of RAYRU Filtration Plant

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Abstract

This paper focused on the treatment of bore well water from the distilleries plant. The membrane selection process was theoretically designed using well known design software, like KOCH and ROSA. To design the treatment plant system based on the analytical report and software membrane reverse osmosis system was used. To compare the experimental and theoretical (KOCH and ROSA software) values for the characteristics of distilleries effluent, the results revealed that the KOCH software membrane show more recovery, high TDS reduction, less power consumption and low investment cost than ROSA type members in the treatment of effluent from power plant.

Keywords: Power plant, Filtration, RO system. KOCH, ROSA.

1. Introduction

The world water is found in oceans, lakes, reservoirs, rivers, and streams, glaciers and snowcaps in the Polar Regions, in addition to ground water below the land area. The water locked up in the oceans and sea is too salty and cannot be used directly for human consumption that is for domestic, agricultural or industrial purposes. The distilleries plant consumes a large scale of water.

3MW power plant located in Rairu Gwalior (M.P). The filtration was taken report in RO plant. In a coal fired thermal power plant water is required for various applications raw. Reverse osmosis is required pressure driven membrane process. Boiler water supply is full treated in RO plant and mix the chemical regent water cat ion &anion resin. Reverse osmosis is pressure driven membrane separation process. That is capable or separating dissolved solutes from a solvent, usually water. The solute may be organic or inorganic in nature and range in size from 1-10 angstroms or less. The ability or reverse osmosis membrane to reject substances depends upon the molecular weight geometry of the solute and other factors. A well – designed RO system is capable of removing 90-99% or the most of dissolved organic and inorganic compounds.

Reverse Osmosis membranes are constructed from Cellulose acetate, polyamides or other polymers.

Process: When a salt solution is separated from dematerialized water by semi permeable membrane the higher osmotic pressure of the salt solution causes demine raised water to flow into the salt solution compartment (see Fig. above) water will continue to flow and rise in the solution compartment until the increase in water heights equals the osmotic pressure of the salt solution. If the pressure is exerted on the salt solution compartment. Water can be made to flow in the reverse direction. This is the process of reverse osmosis. The osmosis pressure is a function of the specific solute and its concentration in water and in practical terms it is the minimum pressure required to produce the first drop of pure water from a solution of solute at s' specific concentration

The membrane at a rate higher than the multivalent salts like calcium sulfate the molecular weight cut off lies in the range of 100-1000 MW for the reverse osmosis membrane. Osmotic pressure of a solution is expressed by the following equation II= θMi RT

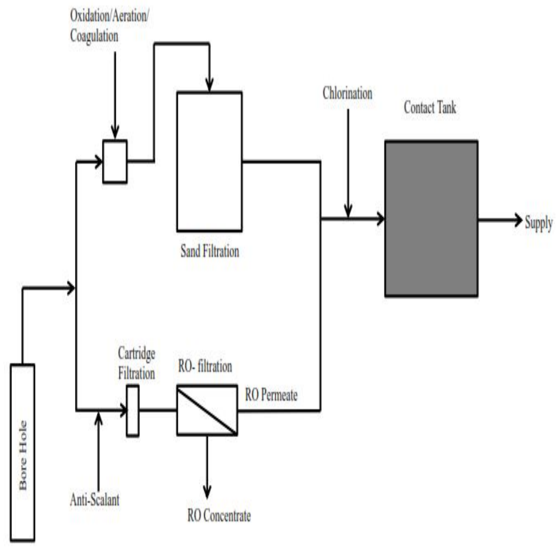

Fig. 1: Schematic diagram of RO filtration system.

2. Material and Method

Distilleries limited in located at Gwalior M.P. India. The sampling and effluent characteristics' were analyzed as the following parameters pH, TDS. Cl. SiO_2 using Koch software for Koch Software members "ROPRO", TFC 8040 x R 375 membranes was used in Ro stage –I and TFC 8040 SW 335 membranes was used in Ro Stage –II. For array classification $5 \times 6: 3 \times 6$ was used in Ro Stage –I and $2 \times 5: 1 \times 5$ in Ro Stage – II although, Ro feed flow is 40 m^3/h, permeate flow is 30 m^3/h reject flow is 10 m^3/h and Ro recovery is the pressure required in Ro stage , respectively. Present the Koch software membranes.

Using Rosa software – for Rosa software membrane film Tec Bw 30-365 FR membrane was used in Ro. Number of elements used in RO stage, respectively and the total number of elements. Although, Ro feed blow is 40 m^3 /h permeate flow is 30m^3/h reject flow is 10 m^3/h and RO recovery is 75 percent the pressure required in RO.

Table 1: Comparison of reverse osmosis (KOCH, ROSA) feed, permeate of theoretical (KOCH, ROSA) versus experimental for distilleries.

Parameter	**Experi RO feed ppm**	**Theoretical value for RO permeate ppm**		
	(Before)	Koch software(After)	ROSA software Afte	**Experimental value (After) RO**
PH	7.8	4.92	5.28	6.5
TDS	590.5	93.62	324.47	50
cl^-	127.8	51.31	172.12	75
Sio_2	12	0.40	0.90	0.25

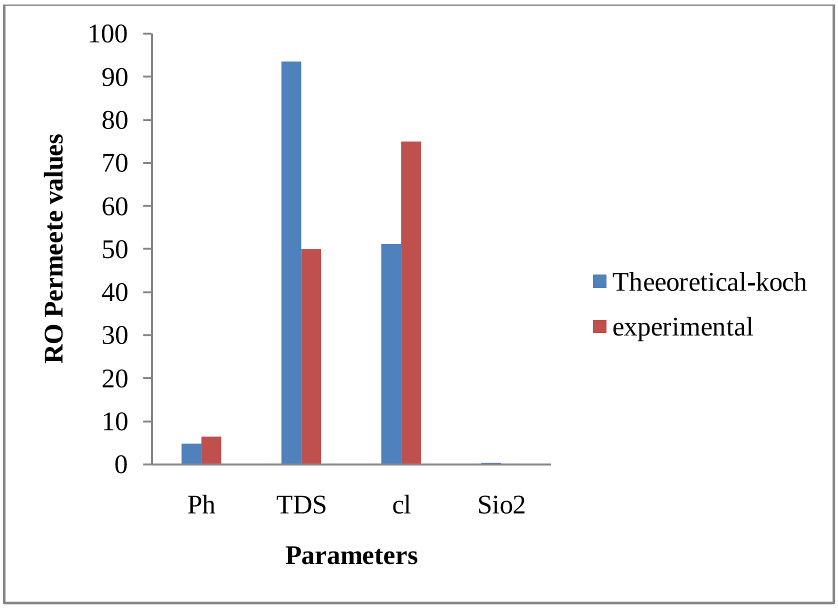

Fig. 2: Versus Comparison of reverse osmosis (RO) permeate, experimental for RO theoretical-KOCH.

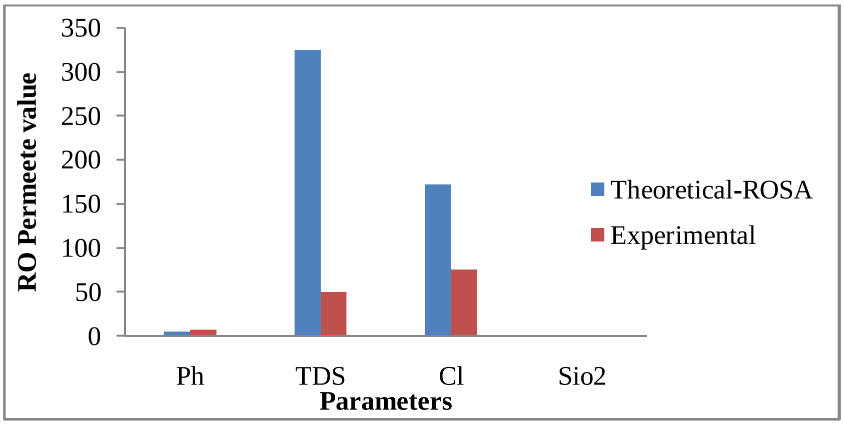

Fig. 3: Versus Comparison of reverse osmosis (RO) permeate, theoretical- ROSA versus theoretical KOCH.

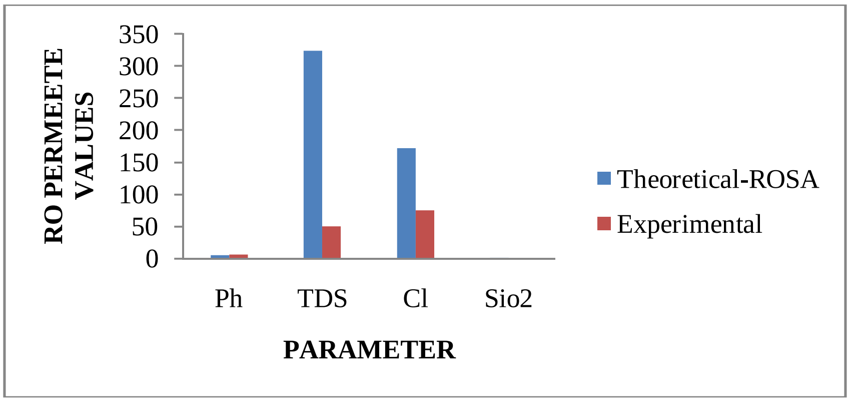

Fig. 4: Versus Comparison of reverse osmosis (RO) permeates, experimental for RO theoretical- ROSA.

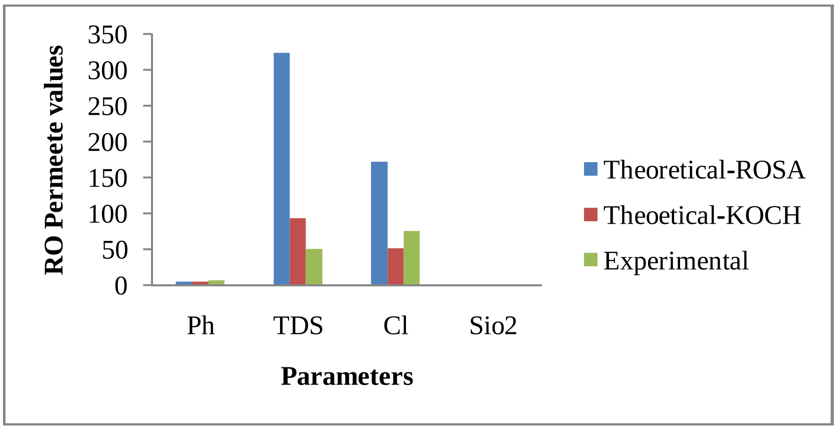

Fig. 5: Comparison of reverse osmosis permeate, theoretical (KOCH, ROSA) versus experimental for RO.

3. Contaminants of Water Supplies

Hardness: A water containing. Calcium and magnesium salt in considerable amount is termed as Hard water whenever the hard water is heated. The calcium & magnesium salts form hard stony scales on the surface of the metals such as pipes, heating coils cooking utensils etc. the scales are bad conductors of heat therefore scale formation on the metal surface results in the increased consumption of fuel.

Calcium & magnesium salt that cause hardness in the water supplies are divided into two types

(1) Carbonated or temporary hardness
(2) Non – Carbonate or permanent hardness

The various combinations of calcium and magnesium salts as classified above are given below

Calcium carbonate (Ca CO_3) commonly know as limestone it is rare in //lightly soluble

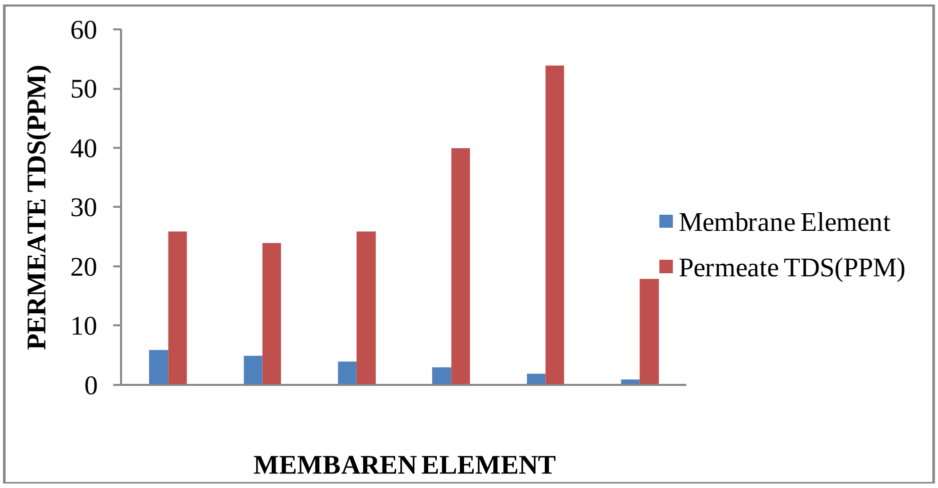

Fig. 6: Operation & Regeneration Flow (Separate Regeneration of Cation & Anion Resin)

4. Result & Discussion

The basic parameter of power plant. There are located the Ryaru Gwalior. The basic difference between two power plants. As it can be seen, during the 3ton boiler of newly installed dual filter bed, the produced filtered water presented slightly variation in turbidity values, in comparison with the power plant. It is known that new filter beds, need, a certain period of filtration. De carbonated water is then stored in the storage tank, P S T water is fed to mixed bed 'unit resin. Mixed bed typically contents both CATION & ANION resins is regenerated using 5% HCL& Anion resin with 5% NaOH solution. The Versa G F filter is designed for a maximum load of 50 NTU turbidity to produce outlet water of less than 5NTU turbidity. The versa G F filter removes particulate turbidity of >30 micron However, should the turbidity increase more than 50NTU at the inlet of the filter. OR particulate size required is less than, 30 micron, coagulant chemical will have to be added prior to versa G F unit with sufficient retention time

The total quantity of processed in at stem unit is 350-360Kl/day. A comparison was also made between theatrical KOCH&ROSA designed and experimental designed values which are show in table.

From the experimental results, it can be seen that KOCH type membrane shows more recovery high TDS reduction and reduction, and low investment cost than ROSA type membranes.

5. Conclusion

In this paper the operation basic parameter of the power plant. The operation of two phase filtration schemes.

This fact results in about 10% higher water production of the dual bed, which can lead to an overall increased production of water in the treatment plant. Generally the substitution of single beds with the dual ones can offer grater water productivity as well as easier programming of the back washing stage. Experimental data showed that direct filtrations is a process, which demands excessive monitoring, because even small variation in the quality of raw water may cause serious operation al problems as rapid ds o Theoretical and experimental studies, following membranes , RO stage 1 and RO stage 2, were found to be more effective for improvement of the boiler sector.

It is also found that approximately 75% of treated water can be used for recycling purposes in houses and the remaining 25% of rejected waste can be sent to air dust are remove 40% steam recycle the boiler water.

References

[1] Abari A, Remigy JC (2002). Treatment of textile dye effluent using a polyamide – based nonofiltration membrane. Chem. Engr. Prod 41: 601-609

[2] Abbul Sattar Kahdim . Saleh Isamail and alaa Abdulrazag jassim (2003). Modeling of reverse osmosis system, Desalination, 158: 323-329.

[3] Akbari A, Desclaux S, Remigy JC (2002). Treatment of textile dye effluent using a new photografted nonofitration membrane, desalination, 149:101-107.

[4] APHA (1998). Standard methods for the examination of water and wastewater , 20th Ed. American public health association , Washington DC,USA, India.

[5] M. Mickley, R. Hamilton, L. Gallegos, and J.Truesdall, Membrane Concentrate Disposal. AWWWA, ISBN 0-89867-710-6, 1993.

[6] M. Mickley, Regulation and disposal of membrane concentrate in the United States, International Workshop: Membranes in Drinking water production, Paris, 1995.

[7] C.J. Chuang and K. Y. Li, Sep. Purif Technol. 12 (1997) 229-241.

[8] R.G. Tredgett, AWWA, 66(1974) 103-109.

[9] L. Clesceri, A. Greenberg and R. Trussell (Eds.), Standard methods for the Examination of Water and waste water, APHAAWWA-WEF, Washington DC, 1989.

[10] F.Amini and H.V. TRUONG, Water Qual. Res,33(1998)589-594.