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Investigation regarding obtaining demineralization water using IC46D installation.

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Abstract

In this work we tray to obtain the pure water using ions exchange resign, both cationites and anionites. We have to mention that both cationites and anionites are found in the same column. We have analyzed the water parameters both at the enter and at the end of the system.

1. General description

Early on, stills were used to produce purify water. Zeolites and later, sulfonated coal and greensand were used to soften water. The commercial use of ion exchange resins for boiler feed did not become feasible until the late 1940's when strong base resins for the removal of silica became available.

Ion exchange is a reversible chemical process based upon selectivity of the exchanger for certain ions. Water containing a variety of ions is passed over ion exchange column and the undesirable ions are removed. When the resin is exhausted, regeneration is done to remove the undesirable ions from the resin.

Over the years, improvements and engineering modifications were made to meet the requirements of the customers. A number of different methods have been employed to improve the product water quality, capacity utilization, and regeneration.

For such industrial applications as boiler feed water and spraying and rinsing applications. Without purified water for boiler feed, scale builds up on heat transfer surfaces and boiler metals become brittle. In spraying and rinsing applications, minerals in water also scale spray equipment and cause imperfections on product surfaces.

Water treatment by ion exchange is a common unit operation in chemical, petrochemical, oil refining, semiconductor manufacturing, and utility plants.

Ion exchange resins effectively remove silica, dissolved solids and total organic carbon for reduced chemical regeneration usage, waste handling, and maintenance costs.

The main considerations for demineralization operation are operating economics, quality and reliability of resin performance, and minimizing environmental costs.

The primary variables in determining the operating economics are costs associated with regeneration, waste neutralization and disposal, as well as, resin replacement and disposal.

Field experience and lab tests show that Purolite ion exchange resins used in IC 46 D plant offer numerous advantages over resins with a conventional Gaussian particle size. These advantages include, efficiency, greater operating capacity, reduced leakage, insoluble in all common solvents and better rinse characteristics.

2. Purpose

Getting demineralised water to a conductivity of 0.014 ms, complete lack of both cation and anion foreign of water.

Keywords: *water depollution, ionic conductivity, pollution*

3. Methodology

For obtaining this type of water we used plant IC46D with these technical features:

Technical Data	**IC46D/500**
Feed water pressure atm.	2
Max flow rate of H2O production lt/h	500
Purity of demineralized water produced > ohms	5 MΩ
Corresponding saline residue < mg/l	0,2
H2O cyclic production rate referred to total salinity of treated water expressed in CaCO3: • 20°F/si (200 mg/l) lt • 30° F/si (300 mg/l) lt • 40°F/si (400 mg/l) lt	3.000 1.900 1.300
• Reactives for regenerating substances: • Hcl 30 % (20°bè) lt	4.5
• Diluition water lt	11.5
NaOH (scales) Kg.	2.2
• Diluition water lt.	50
or • NaOH in solution 30% lt	5
• Diluition water lt	45
Water necessary for rinsing: • first rinsing lt	100
• second rising lt	200
Feed voltage V.	220
Complessive watts absorbed (points) Watt	300

We used ion exchange Purolite A200MBOH and Purolite C100MBH type, one is for anions exchanger other is for cations exchanger.

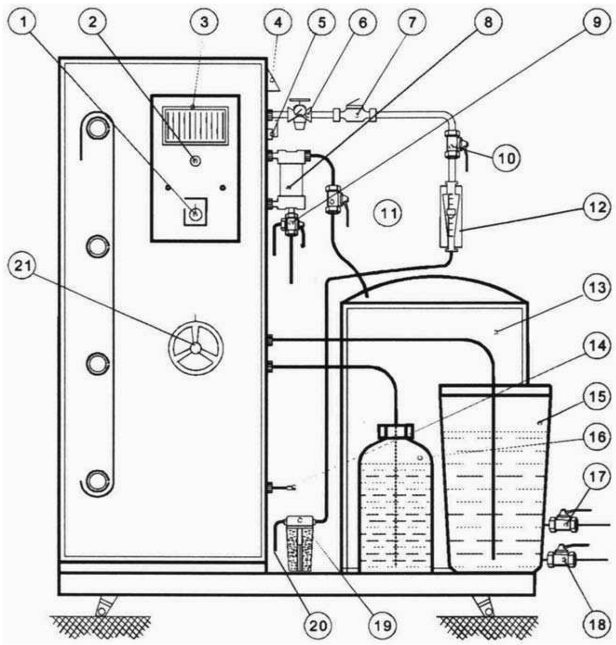

Fig. 1 Operating diagram

1. Electric three position commutator "regeneration - o - production"
2. Electric wsitch for manual mixing of resins
3. Programmer, electronic timer with reading of purity of water produced
4. Little protection box containing terminal board for electric connections
5. Valve for manual inlet of feed water
6. Water pressure reducer with manometer
7. Liter counter
8. Filter
9. Three ways ball valve
10. Flow rate control valve
11. Valve to send produced water to the storage tank
12. Flowmeter
13. Demineralized water storage tank
14. Demineralized discharge
15. Alkaline solution tank
16. Acid solution tank
17.Demineralized water tank/use cut-off valve
18. Demineralized water storage tank discharge valve
19. Raw water inlet filter
20. Raw water inlet

To produce demineralized water, proceed as follows:

• three ways ball-valve (Fig. 1 no.9) open to discharge the first water produced (in case of any cycle beginning after regeneration operations)

• little handwheel for manual valve control: at position "1" (Fig. 1 no. 21)

• three-position commutator at "production" (Fig. 1 no. 1)

The plant will produce water which will go to discharge.
Vertical scale of right leds of programmer will indicate purity values expressed in megaohms/microsiemens.
When purity value is sactisfactory, send water produced to utilization (tank 13), closing ball valve (Fig. 1 no. 9).
On request demineralizer can be provided with a supplementary automatism o signal the end of productive cycle by means of an alarm and eventually to stop automatically production.
In this case the electric board will have, instead of a switch already discribed for “manual mixing”,a commutator with three position “manual production-0-manual mixing”.
At the beginning of each productive cycle (after operations of regeneration) put said commutator at “Manual production” to produce water even if not sufficiently pure, cancelling alarm signal.
The same will be put at rest position, as soon as values of water purity will be superior to the min. prefixed with the little knob no. 4 (Fig. 2).
The apparatus will produce water which can be send to utilization.
At the end of the cycle, supplementary automatism will go in prealarm and with a delay of about 60” will operate an alarm signal.
It will be possible then to stop production positioning the switch located back the board at “Alarm and stop of production”.

4. Result

Substances found in the final product

Process used	Electric resistance Ohms/cm/cmq	Substances found in the final product	Saline residue p.p.m	pH
thermic distillation	100.000 200.000	CO_2, SiO_2,Fe, Cu,Pb	5	5-6
thermic bidistillation	400.000 800.000	CO_2, SiO_2, unremarkable remaining	1.25 0.63	5-6
Ion exchange demineralization	5.000.000 10.000.000	unremarkable, none	0.2 0.1	6.5 7.5

5. Conclusions

Getting demineralised water by this method has the following advantages:
- Medern process that ensures a high degree of purity
- Applied to obtain large quantities of water
- Installation easy to handle
- High purity water is obtained
- PH and conductivity presents herself well articulated values

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