



TECHNOLOGIES FOR REMOVAL OF BORON FROM SEAWATER

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Abstract

The paper highlight the technologies that are in frequent use for the elimination of boron from aqueous solutions (seawater). Further the paper have enlightened some useful information about desalination plant which could help developing countries to save natural resource (water).

Membrane Technology

Membrane technology for removal of boron is widely used. As they are mostly functional for purification of saline water. Yet, this process is sometimes not able to reduce the amount of boron in water and then it is essential to add other processes with it. For the removal of residual boron and boric acid in most of the membrane procedures pH must be elevated to the value of 10 to 11. Under such conditions, boric acid converts to borates and then processed further. Though enhancement of alkalinity of the water allows the exclusion of borates with the efficiency of 97-98%, raised value of pH allows the precipitation of the magnesium and calcium hydroxides on the surface of the membrane and such process is named as "scaling". Therefore, rising of pH is not subjected typically to fresh water but to infuse 1st stage of Reverse Osmosis treatment.

Infuse can be alkalized and can be exposed to the 2nd stage of purification and treatment of water through Reverse Osmosis by B-reduction. Occasionally, electro dialysis process is used at this phase. (Wolska)

Hybrid system

The aim of functioning of hybrid scheme is to confer borate to soluble water structures that is having huge sufficient diameter that can be simply parted by filters. Excluding little molecular weight mannitol or gluconate, surfactants or polymers that are water soluble can also be used even solid particles. These systems are named as Micelle Enhanced Ultrafiltration, MEUF Polymer Enhanced Ultrafiltration, PEUF or Adsorption Membrane Filtration and AMF. This set of methods of separation remove even very small amounts of destructive materials from water. It has been observed that the usage of AMF technique prepared with micro circular sorbents and nano-filtration, microfiltration membranes that are the

best approaches for configuration of hybrid system. Microfiltration do not need high pressure for operation. (Wolska)

Electrocoagulation (EC)

This technique work on the process of electrochemical generation of some elements that eliminate contaminants by process of neutralization. Electrocoagulation comprises of a battery or cell setup with metal anode that is most of the times of iron and aluminum which uses direct current. This method has three phases (BRYJAK)

1. Formation of Coagulants by electrical oxidation at anode,
2. Disruption of contaminants and constituents by breaking of emulsion.
3. Combining of uneven particles for flocs formation.

Donnan dialysis method.

Donnan Dialysis is an ion exchange process that is beneficial for the cleaning and purification of dilute solutions. It basically works on and find out variation in two compartments that are separated by an exchange of ions sheath and difference between their chemical potential. In the method, exchange of anion membranes is focused to eliminate borate ions from seawater. Occasionally the membranes are modified with plasma to advance its efficiency. (Kabay) (Wolska)

Capacitive deionization method

In the classical capacitive deionization method, the contaminated water is nourished through activated electrodes of carbon. The elimination of the salt in this technique is gained by electrostatic adsorption of ions after maintaining potential difference between two carbon electrodes. (BRYJAK). In this technique

removal boron and extraction of clean water takes place in two steps:

1. Detachment of boric acid on a cathode electrode because of the creation of a common basic pH on splitting and polarizing the cell
2. Adsorption of ions of boron in positively excited and charged electrode.

Comparison Analysis

Table 1 comparison developed by researchers

Parameters	Maintena nce costs	Chemi cal costs	Operati ng costs
Membrane Technology	High	Low	Moderate
Hybrid System (AMP/ PEUF)	Low	Moderate	Moderate
Donnan dialysis method.	Moderate	High	Low
Electrocoagula tion (EC)	Moderate	Low	Low

With the increased potential and adverse impacts on agricultural land, human working, and health conditions, WHO presented the standards that govern allowable boron's concentration in water. According to them

chelating mastics containing ligands and comprising of –OH groups are proficient for the creation of complexes with borates. Hybrid system is considered as cheap method for separation. In this techniques sorbent material after interaction of boron, are eliminated from the system by using filtration sheaths. Membrane emulsification technique can also be beneficial. Cost estimation allied with the exclusion of borates from water by using hybrid system is effective and less expensive. The technique like PEUF and AMF are commercially not viable, whereas, polymer sorbents prepared that are to be used in some column systems are also not preferred. EC is one of the cheapest and simplest technique as it need cheap tools and is easy to function with enough operative latitude. (Wolska)

Solution to a Problem

Installation of Desalination plant

The desalination plant to be installed need to be operated with its operating administration management. It is being assumed that the plant will run continuously for more than two years to ensure its working and reliability. Yet, it permits the desalination plant to be cut off when the reservoirs are full or are expected to spill. Several functioning regimes are functional where drought occurs and emergency is created whereas the desalination plant is switched on when water level of dam approaches to 25-30% when a severe drought condition is not more exists it runs until it is increased to 35-40% then approaches to 80/90 regime. The shield or buffer zone exists where the plant starts its functioning and operation and then it ends distinguishes that the starting and shutting down of plant are not sudden and are expensive too. It may not function or will remain well-organized if even small variations in dam levels exists for example dam levels changing around 65-70%

for a time of few months triggered continuous halts and twitches for this sake, The WATHNET model of hydrology is to be used to inspect the impact on reservoirs storages. Functioning the plant at advanced dam levels needs more renewable source of energy but at the same time it reduces the need of expensive infrastructure it lessen the time that community devotes in the drought, Moreover, it reduces the probability of additional investments. The desalination plant also decreases the proportion at which storing levels reduce through a period of drought which illustrate that storing of water are less expected to influence serious levels where additional increase of supply of water is essential. Competent usage of the desalination plant laterally with water recycling structures and competence programs of water can move to water saving. Pakistan should adopt such technologies to use seawater for drinking and other purposes, and should try to install desalination plant to save water for future generation.

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