BLUE FIN

WATER DESALINIZATION

1. APRIORI

Instead of fighting a natural occurrence phenomena.....why not accept it? , why not use it to our advantage?, why not increase it?

2. ABSTRACT

Fouling is the natural occurrence phenomena of accumulation of unwanted material on solid surfaces to the detriment of function. Fouling is usually distinguished from other surface-growth phenomena in that it occurs on a surface of a component. Fouling include: deposit formation, encrustation, deposition, scaling, scale formation, slagging, and sludge formation. Fouling phenomena is common on heat transfer components through ingredients contained in the water.

If fouling could be easily, economically and periodically removed from the holding or hosting surface, so it can be used again and again; this natural occurrence phenomena could be useful in water desalinization.

Plate heat exchangers major enemy and biggest operational cost is the removal of fouling. Therefore, the validity of this design or approach rests on the effective and automated method to cleanse the active surface for reuse, before it completely clogs the passageways and reduces ion or salt deposit efficiency.

Additionally, the efficiency of the system might also rest in the geometry and surface treatment of the hosting surface to provide a bed for ion salts.

In the area of water desalinization, the very same principle of salt ions, offers the possibility of solving the desalinization problem.

Electromagnetic removal of salt ions offers the possibility of an efficient method of desalinization. Today's plate heat exchangers, used for pasteurization in the beverage industry, combined with strong magnetic fields offers the solution of water desalinization. Basically the natural scale or fouling process that is so frequently disdained in this equipment are being evaluated as functional processes for water desalinization.

Plate ion capture, performed in the same old plate heat exchangers, reveals better results than other techniques used in water treatment, because of its high surface area (surface/volume ratio). It is suggested that these may be used in the future at large scale water desalinization purification.

It is also found that the absence of membranes in this process, requires far less electrical energy to pass the water thru the magnetized labyrinth, than the traditional R.O. method. Additionally the discharge or concentrate water can be as low as 2%, if the regeneration of the already fouled plates is performed with a combination of high velocity air or vacuum and pure sand as in an enclosed sand blasting operation.

High velocity vacuum generation or air suction, performed in opposite directions, removes plate deposits in an efficient manner that leaves the plates ready for another desalinization batch.

The alternating method from water processing, to cleansing or plate regeneration, makes magnetic labyrinth desalinization a batch process, unless a second unit is placed in parallel, to provide service while the first one is in down time.

Basically, water is passed at low speed and low Reynold numbers, as thin laminar flow in a magnetized labyrinth. The plate's surface is treated to a given roughness and cross current orientation, in order to exacerbate fouling, increasing the attachment of salt ions to its surface.

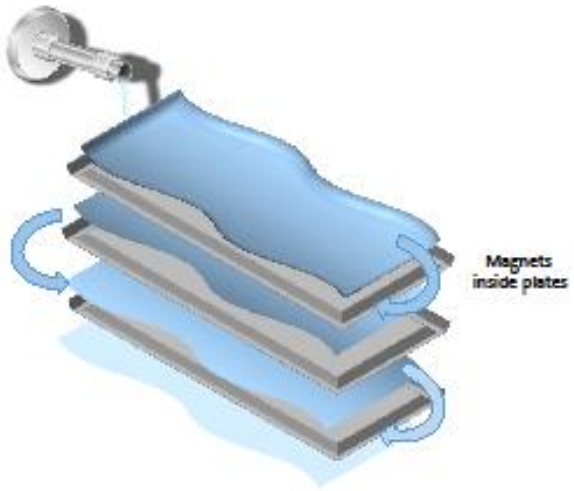
The plate cleansing is the most delicate part of the process, since fouling or ion deposits on the plates is a natural process.

3. ADVANTAGES

The new method for water desalinization has the following advantages:

1. Consumes less electricity, since ion removal is treated, for what it is, an electromagnetic issue, and not a filtration issue. Reverse Osmosis, RO, is a filtration system at the atomic level. Therefore less energy is needed since water is not forced thru tight membranes. Instead water is guided thru a magnetized labyrinth. Not micro or ultrafiltration is needed to protect Blue Fin System. Remember that Microfiltration and ultrafiltration are there to protect the membranes, not the water quality output.
2. Minimal water discharge: The system is regenerated with low cost air, instead of water, the energy cost of providing high velocity vacuum is far less than that of water. Additionally, ion salts are captured as solids in the dust filter bags of the vortex cleansing system. 98% of the water treated can be fully utilized, no discharge.
3. Disposal of salts as solids, no discharge of large amounts of water.

4. PROCESS DESCRIPTION



1. The flow is flattened in a narrow film, between two plates.
2. The flow speed is lowered to have laminar flow, with low Reynolds numbers.
3. Laminar flow between successive positive magnetic charges, holds anodic salts.
4. Laminar flow between successive magnetic negative charges, holds cathodic salts.

Counter Intuitive: Fouling is the natural agglomeration of solids in a surface. This process is encouraged instead of being suppressed. For years, fouling was considered a negative thing; now it is desired; on the water desalinization process

The proper surface finishes, measured on RMS, and encourages fouling, since there are micro depressions providing a nest to the very first salt crystals.

Plate Cleansing: Once the plates are saturated with salts, the system has to be regularly cleansed. The cleansing mode requires the following steps: 1. the closing of the water valves, and drain of the system; 2. The opening of the air valves; and start of the high velocity low pressure air vacuum. 3. closing of air valves and opening of water circulation.

A deeper cleansing is needed once a year; were dismantling of the system is required. Alternative methods are being studied as, circulation of micro metallic particles' and nitrogen gas, used to freeze and remove calcification.

The previous pictures, show plates with ions deposited on its surface, after long exposure without cleansing.

All natural waters contain, in various concentrations, dissolved salts which dissociate in water to form charged ions. Positively charged ions are called cations; negatively charged ions are called anions. Ionic impurities can seriously affect the reliability and operating efficiency of a boiler or process system, or the ability of water to be potable.

Magnetism causes the buildup of scale or deposits formed by these impurities and leads to build up inside the magnetized plate labyrinth, and the removing of salts from the flow.

Hardness ions, such as calcium and magnesium, must be removed from the water supply before it can be used as drinking water. For potable drinking water, partial removal of all ions, including carbon dioxide and silica, is required. Ion exchange systems are used for efficient removal of dissolved ions from water.

Magnetic Plate Ion Exchangers encourage the natural growth pf crystal salts, producing the fouling and scaling phenomena; holds it temporarily, and then release it to a regenerating cycle. In an ion exchange system, undesirable ions in the water supply are removed with large scaling and fouling deposited formations or molecules.

Scaling occurs when a mineral film coats the entire surface of a heat exchanger. The most common forms of scale are usually from calcium-based salts such as calcium sulfate or calcium carbonate.

Clarification. The following methods are used, either alone or in combination, to reduce organic fouling, usually as a pre-treatment before the magnetized plate ion labyrinth:

Pre chlorination and clarification. Water is pre chlorinated at the source, and then clarified with an organic removal aid.

Filtration through activated carbon. It should be noted that a carbon filter has a finite capacity for removal of organic material and that the removal performance of the carbon should be monitored frequently.

Macro porous and weak base resin ahead of strong base resin. The weak base or macro porous resin absorbs the organic material and is eluted during regeneration.

Specialty resins. Acrylic and other specialty resins that are less susceptible to organic fouling have been developed.

Blue Fin Technology, is still an stage I the water process system, it runs accompanied with additional pre-filtration, hardness removal systems, or clarification methods.

5. SIZES AND SCALABILITY

Since there are different sizes of plate ion deposits, the system can be scaled to any flow speed, from smaller industrial application to large municipal systems.

Not only the size of the plates are used to increase flow demand; also several systems in parallel can be used to reach the desired output.

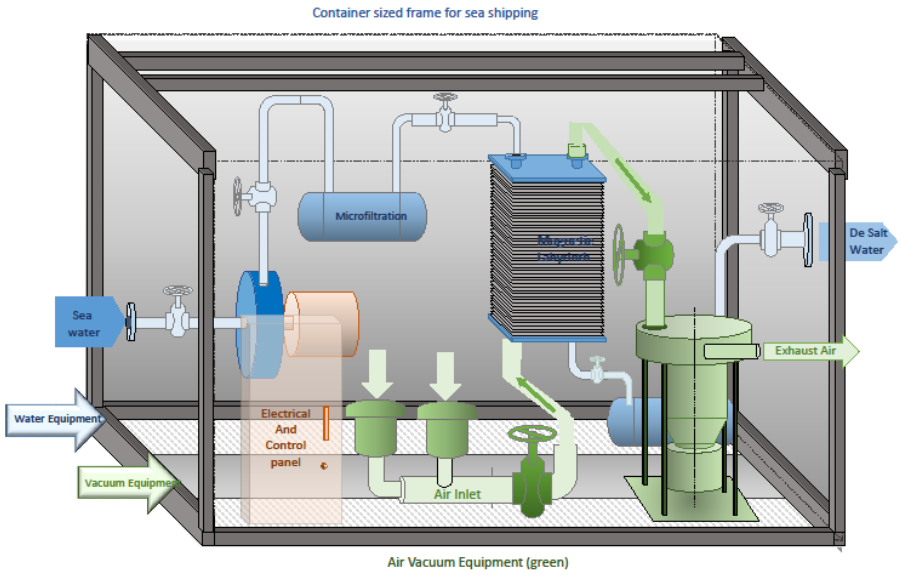
None the less, since a system has to be in cleansing mode once a day, it is recommendable to have a parallel system available to provide service, when the other is in regeneration mode.

Additionally, water quality or reduction of conductivity can be reached by adding more plates in the labyrinth flow.

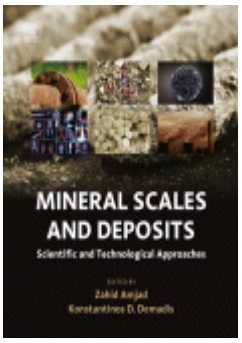
Anion and cation discrimination can also be reached, if a plate ion capture set is provided only for positive ions, and a different unit is provided for negative ions only.

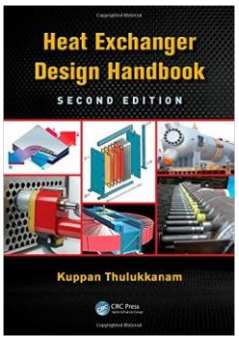
6. SYSTEM COMPONENTS

Blue Fin components begin with the specific design of the plates for ion captures, later the arrangement of the plates in successive order of magnetic polarity, magnetized positive and magnetized negative, to optimize ion salt deposits. The following stage is the vacuum cleansing system, which has to be designed at a specific speed to promote deposits removal. Additionally an automatically controlled valve arrangement provides counter directional vacuum flow, or vortex effect on the face of the plate. Finally, the whole system is integrated for a seamless automatic operation, together with the pretreatment and post treatment stages.



7. MORE TECHNICAL INFORMATION





More technical information on the process can be found in the following literature.

Fouling of Heat Exchangers (Chemical Engineering Monographs) 1st Edition, by T.R. Bott

Mineral Scales and Deposits, Scientific and Technological Approaches.

Heat Exchanger Design Handbook, 2nd Edition , (Mechanical Engineering) 2nd Edition, by Kuppan Thulukkanam.

General Design of Heat Exchangers for Fouling Conditions, By: James M. Chenoweth

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