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Desalination of Seawater from Veracruz Port Mex. By Means Of Chemical Reactives, Ultrasound, Flotation Cell and Reverse Osmosis

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ABSTRACT
On this research, the results show me that the best option for desalting any seawater is using the test No. 2013-3 because the chemical reactives are very cheap and I had good efficiency. The process may be excited a liter of seawater with chemical reactives with ultrasound and flotation cell and a last step using reverse osmosis.

Key Words:
Excitation with ultrasound and flotation cell, reverse osmosis, bacteria killed with ultrasound, ultrasonic break chemical bounds of sodium chloride.

I.- INTROCUCTION

All the Earth' s water, 97 percent is saltwater, only , 1 percent water-carrier is fresh water available for humans to drink, and 1 percent is frozen (1). The seawater from Veracruz, Port México, is extremely polluted because, all the products from hotels, rivers and houses across of drainage arrived to the seawater. In the event, the treated seawater is for drinking purposes. The ultrasound, chemical reactives, flotation cell and reverse osmosis desalination process is very hard, but also all around the world the absence of enough drinkable water is very hard. On this process, I had to research for about 5 years. I had to test with several kind of chemical reactives, some very expensive and another not. On this process the bacteria were killed 100. %.
The chemical elements reported for the original seawater from Veracruz, Port México was as follow:
Date: June 11th, 2009
Cl^- 19,650. mg/l
Na 11,009. "
$SO^=$ 2,730. "
Mg 1,760. "
Hardness as CaCO3 6,200. "
Ca 405. "
Ph 8.22
The chemical bacteriological report was 7.7×10^2 colonies per millimeter
The problem is that the chemical results at nature, are different from reported in chemical books. Because, on each research of chemical reactives, ultrasound and flotation cell I had the seawater clean with some solids residues I had to submitted the clean seawater of the first process to reverse osmosis. The first intend was the test No. 2012-8 and it was cleaned with reverse osmosis.
For the multiple problems on the research, I had to select and recommend the least expensive test such as No. 2013-3 and submitted to reverse osmosis as a final step.

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2.- MATERIALS FOR THE PROPOSED TEST.

Calcium oxide CaO, Potassium carbonate K_2CO_3, Tartaric acid C_4 O $_6H_6$, Piridine C_5H_5N and Zinc oxide ZnO.
Ultrasonic Cleaner Tank (Buehler Ultramet II, 117V, Ac 60H_z, 100.W, 55kH_z.
Flotation Cell (DENVER, D-1)
PENTEK RO 4 stage 50 GPD- 25504-REVERSE OSMOSIS.

3.- METHODS

The ultrasonic irradiation is widely used in wastewater treatment. On this study we are going to put emphasis on sodium chloride which is a hard molecule. Each Na^+ ion in NaCl is surrounded by six Cl^- ions, and vice versa;
Removing an ion from this compound therefore involves breaking at least six bonds. As a result, ionic compounds such as NaCl tend to have high melting point (801^oC) and boiling point (1413^oC) (2).
The salted seawater(NaCl with 24 grams per liter approximately) was excited with chemical reactives, for several intents. (See photo No.1).

FOTHO No.-1 .-EXPERIMENTAL ARRANGEMENT FOR EXCITATION

Because the clean seawater from this process had a lot of salts, it was necessary a pretreatment unit like chemical reactives with ultrasound and flotation cell, and then to continue with reverse osmosis. I think, the best test and cheap was, No. 2013-3.

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The chemical analysis after chemical reactives , ultrasonic excitation and flotation cell treatment was:
Date: February 27th, 2013
TEST No. 2013-3
Ca = 104. mg/l
K = 24,000. mg/l
Mg = 8.mg/l
Na = 7,000.mg/l
Zn = 112.mg/l
Ph = 8.9
Conductivity = 74.1 mS/cm
Cl = 18,500. mg/l
SO = 3,180.mg/l
Hardness = 410. mg/l

SECOND AND LAST STEP FOR TEST No. 2012-8
REVERSE OSMOSIS

As an intent for the second step, I submitted to reverse osmosis, the results of chemical reactives, ultrasound and flotation cell, of the test No.2012-8. The original data of chemical analysis after the first step were:
Date: September 17th 2012

TEST No. 2012-8	REVERSE OSMOSIS FOR TEST No.2012-8
Cl < 10. mg/l	90.5 mg/l
Na 9,230. mg/l	- . –
SO 26,300.mg/l	54. mg/l
Mg 14. mg/l	- . –
Ca 394. mg/l	360.mg/l
Ag 698. Mg/l	- . –
Zn 1.8 mg/l	- . –
Hardness 1,150. mg/l	262. mg/l
Conductivity 34.4 mS/cm	1,085.µ S/cm = 1.09 mS/cm
PH 8.05	8.57

REVERSE OSMOSIS PROCESS
It is the last step on desalting seawater process. The equipment was installed at home, using the faucet because the reverse osmosis equipment does not have pressure bomb (See Photo No. 2).
Reverse osmosis system offers the finest level of water filtration available, filtering particles as small as 1/1000. Of micron.
The quality of pure water, permeate is equal to the filtrated liquid by permeability. It's ideal for inmediate potable use (3).
The Pentair Water RO-25504-4Stage NSF Certified Reverse Osmosis System offers features a 50 gallon per day membrane, 2.8 gallon holding tank, and a long reach chrome air gap drinking water faucet.
For the amount of particulate matter, if the filter is deactivated, we can with an ultrasonic bath with water to excitate in order to activate.

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FOTHO No.-2.- EXPERIMENTAL ARRANGEMENT FOR REVERSE OSMOSIS.

4.- RESULTS AND DISCUSSION

The results of the test No. 2012-8 after reverse osmosis, may be were altered for the use of the potable water at home as a carrier of the test No. 2012-8, because the potable water had a hardness of 1,100. µS/cm = 1.1mS/cm. But I think that the combination of the excitation with ultrasound flotation, chemical reactives and reverse osmosis is good using the test No. 2013-3 is an industrial good test.

Finally this new technology for the total desalination process involves, ultrasonic and flotation cell excitation, chemical precipitation of minerals and reverse osmosis on one liter of salt seawater.

On the first intent, the total process was on approximately four hours, but it is possible to stablish a better time and less dose reactives.

This results in a robust high efficiency system can be readily scaled to a wide range of capacities because, the laboratory equipment used was made under standards.

I think that in general, my process can be applied almost at all seawater. But the problem is that the ocean, where distances are much greater compared to the movement of currents and diffusion in a few days time frame, can show significant variations in chemical composition as a function of depth and location (4).

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5.- CONCLUSION

For the industrial process of desalting seawater. In general, I recommend the process of using for the process excitation with ultrasound, flotation cell, chemical reactives and reverse osmosis, the test No 2013-3.
Because the chemical reactives are very cheap.

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