

NEW TECHNOLOGY OF PRODUCING REFINED SALT BY ADDING SALT FIELD SATURATED BRINE INTO EVAPORATOR DIRECTLY

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Abstract: After Making saline saturated brine flow in evaporating pot, the sodium chloride is obtained by evaporative crystallization. Calcium and magnesium ions can be removed by washing salt three times in order to get the sodium chloride that the purity is over 99.1 percent and the mother liquor that have high concentration.

Key words: saline saturated brine, vacuum, refine salt

1 BRIEF INTRODUCTION

At present, the materials of making vacuum salt are using the well and rock salt in most of the well and rock salt corporations and the saturated brine got by dissolving crude salt. Along with the rapid development of caustic alkali and sodium carbonate and the growth in the people's living standard, the contradiction of crude salt in supply and require is more and more stood out.

Particularly in the sea salt areas, producing refine salt with saturated brine that is got by dissolving crude salt can increase the consumption of raw salt, reduce the availability factor of salt field, add investment and production cost. This will influence the economic efficiency of edible salt manufacturing enterprises, make them reduce output and affect people's live.

However, using the method of making saline saturated brine flow in evaporating pot and then obtaining sodium chloride by evaporative crystallization can saving crystal area. Furthermore, the mother liquor can be used as material to produce chemically products such as potassium chloride, magnesium chloride etc. in order to make use of all kinds of effective constituents in the brine and achieve the objects of no

discharge, no pollution and circulating economy.

2. INDICATION OF THE PROCESS FLOW

After being solarized to saturation in beach field brine was inducted to brine tank and stored. On the one hand brine tank can store some saturated brine that is used to produce vacuum salt. On the other hand, brine have some residence time here so some impurities can be deposited in order to make the brine be purified. After being drawout from brine tank the cleaned saturated brine was pumped to fine brine tank in the manufacture salt plant. And production can be gone on by using the methods of preheating brine, transferring stuff in parallel flow, discharging salt slurry in the last effect and exporting mother liquor concentratedly. The salt in the first effect tank is discharged to the circulation pipe of the second effect, The salt in the second effect tank is discharged to the circulation pipe of the third effect, The salt in the third effect tank is discharged to the circulation pipe of the fourth effect. At last the salt is collected in the fourth effect tank where the salt slurry and the mother liquor are discharged. Fig. 1 is the diagram of the process flow.

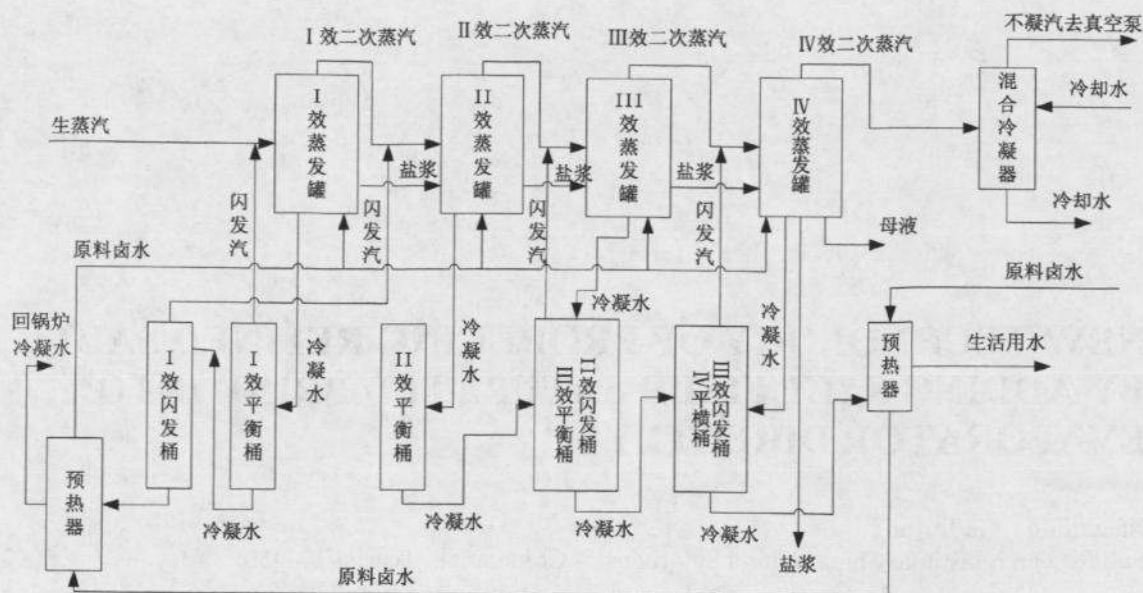


Figure.1 Diagram of the process flow

3. RELATIVE MERITS OF THE PROCESS

In the north of China a production line has been built with this process, which can produce 1.5 million tons salt per year. Comparing with rework salt production process, the effect of this process is as follows:

- 1) The saturated brine is used in this process take the place of dissolving crude salt with fresh water. Such can reduce the consumption of fresh water and save the resource. According to the produce conditions, producing 1 ton salt will consume 1.4-0.2 m³ fresh water. And that if use the reworking salt process 3.5-4.53 m³ fresh water will be used. That is to say 2.1-4.3 m³ fresh water can be saved corresponding to 1 ton salt.
- 2) Saving the solar salt field, reduce the consumption of crude salt, increase the availability of the salt field.

For the reworking salt production line, as a general rule producing 1 ton refine salt will consume 1.2 tons solar salt. Producing 1.5 million ton refine salt needs 1.8 million tons crude salt and 136.36 hectare crystal area (According to the experience that one hectare can produce 1650 ton crystal and the effective area is 80 percent). Using the process that the saturated brine is pumped to evaporating tank directly the brine need not evaporate in crystal pond but for a saturated brine storeroom of about 2 hectare. Such can save surface area of 134.36 hectare and this area can be used to increase 8547 ton output

of solar salt. Hence the productive value of solar salt will increase 136.8 ten thousand yuan according to the market price of solar salt which is 160 yuan/t. And land value of 60 million yuan can be saved if the land is 30,000 yuan per mou.

3) Adopting the method of washing salt three times in order to get rid of calcium and magnesium ions, make the purity of sodium chloride exceed 99.4% and make the refine salt reach first quality. In the process of evaporative crystallization much mother liquor will exist in salt slurry. The mother liquor contains a lot of impurity of calcium and magnesium. So salt slurry is washed in three different ways in order to improve the quality of refine salt.

4) Using the saturated brine to produce refine salt can reduce the consume of mother liquors, enhance it's availability and realize the production of salt and chemicals together.

The process that producing excellent vacuum salt with salina saturated brine directly can get 1.7 m³ mother liquor in relation to 1t refine salt. On the base of 150,000 ton refine salt, we can get 255,000 m³ evaporation mother liquor. In bitter brine whose concentration is 29 ~ 340Be the content of potassium chloride is 24 ~ 30g/l and the ratio of sodium and magnesium is 1.4 ~ 0.6. And 6589t potassium chloride, 36540t magnesium chloride, 18900t magnesium sulfate, 37600t sodium chloride and 510t bromine are contained in the bitter brine.

The bitter brine is about 180,000 m³ in relation to 180,000t crude salt. After being solarized repeatedly and consuming for filter the brine is left 45% when it is pumped to chemical plant. That is to say there are 81,000 m³ brine. By now there are 2036t potassium chloride, 15280t magnesium chloride, 7727.4t magnesium sulfate, 11128t sodium chloride and 162t bromine. So the process can provide more material for salt and chemicals plants, heighten production efficiency, reduce all kinds of consumption and save energy. The temperature of the mother liquor got from this process is over 55.04°C. So it can be pumped to the potassium chloride process with pipe to produce potassium chloride. Such will save the heat quantity in the process of producing potassium chloride. And the heat quantity is equal to 11578t/y standard coal.

5) Because the content of sodium chloride in the beach saturated brine is lower than the content in the brine that is got by dissolving salt, the evaporated water of unit produce is higher, the electricity and steam consumption are more. That is to say the energy consumption is higher.

6) The heat exchange area is a littler bigger than the process of dissolving salt, so the equipment investment is higher. But because

of saving a lot of salina crystal area the total investment is lower.

4. COMPARE THE ECONOMIC INDICATORS WITH THE PROCESS OF DISSOLVING CRUDE SALT AND THEN REMAKING SALT

In China There are two main methods to producing vacuum salt in sea salt area. One is pumping the beach saturated brine into evaporating pot. The other is using the saturated brine got by dissolving crude salt. Comparing the second method with the first method the relative merits of the second method is as follows: (1) need to build crystal pond and the total investment is higher. (2) The evaporated water of unit product is smaller and the equipment investment is lower. (3) The consuming of electricity and steam is lower. (4) The consuming of water is more and 2.4 m³ water will be consumed in relation to 1 ton salt. (5) The loss of mother liquor is bigger. The economic indicators of the two methods are as follows:

Item	The process by dissolving salt	The process by the saturated brine being pumped into evaporating pot directly
Investment		Evaporating pot
Crystal pond	5,500,000yuan	0
Evaporating equipment	970	1080
Unit product	335 yuan/t	306yuan/t
Consuming indicator	Target	
Crude fuel	0.23t	0.21t
crude salt	1.25t—1.15t	0.00t
Brine	0.00	7.5m ³
Fresh water	3.5-4.5 m ³	1.4-0.2 m ³
Electricity	50-70degree	50-70 degree

Comparison of the main economic and technical norms

Between the two processes there is bigger difference in the investment and production cost of the unit product. The total investment of the unit product is lower and the cost of unit product is lower 30% than the method of dissolving crude salt.

For the plant that producing refine salt in the sea salt area in north using the method of pumping beach saturated brine into evaporating pot and producing salt is a good production process. It can save investment and land. Particularly dissolving crude salt into saturated salt and then making salt is a kind of waste to land resource. Moreover, the production cost is lower. And corporations will get more profit. The mother liquor can be used to product potassium, bromine and magnesium etc. Brine will be utilized completely. No waste be discharged and it will reduce environment pollution. This is in favor of the sustainable development.