

ANALYSIS ON THE TECHNOLOGY IMPROVEMENT OF BRINE PURIFICATION

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Abstract: The process of purging Brine with caustic soda and soda ash substituting lime-soda ash was investigated in this work, which was shared with counterparts for reference.

Key words: brine purification, caustic soda and soda ash method, lime soda ash, caustic soda

1. INTRODUCTION

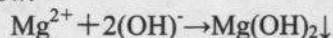
Jiangxi Salt Mine Co., Ltd is the national large scale salt production enterprises, which imported the Co-production technology of salt and Galuber's salt and key equipment from the Sulzer Company of Switzerland in May 1996. The project with annual production capacity of 300,000 tons of salt went into operation successfully and met the production standards. In May 2005, the new expansion project with salt production capacity of 300,000 tons also had been put into operation. From 1996 to 2005, the raw Brine has been purged with lime and soda. Since 2006, the company had decided to do it with caustic soda and soda ash. The technical Improvement assures the quality of the refined brine. Furthermore, it lower the cost. Both of them improve competitiveness of enterprise.

2. PRODUCTION OVERVIEW

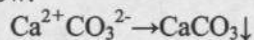
Jiangxi Salt Mine is sodium sulfate oral deposit, its original brine containing NaCl, Na₂SO₄, CaSO₄, MgSO₄, and some other

impurities. The impurities in raw brine will inevitably affect the quality of the final salt and Galuber's salt products, be prone to deposit on the equipment, and shorten the production time. Several domestic enterprises imported Switzerland Sulzer equipment has not equipped with brine purification devices. Brine purification is a production process of removing impurities in brine with chemical and physical method to obtain qualified refined halogen, so as to enhance the quality of salt and Galuber's salt and extend the production time effectively.

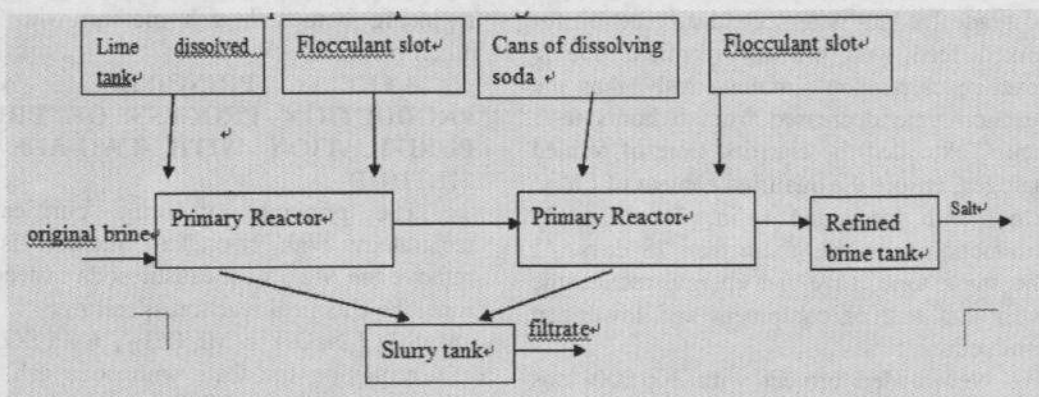
The original process of brine purification adopted by Jiangxi Salt Mine Co., Ltd is lime soda method. Remove the Mg²⁺ in original halogen with lime, the chemical reaction as follow:



Remove the Ca²⁺ in original halogen with soda ash, the chemical reaction as follow:



The production process diagram as follow:



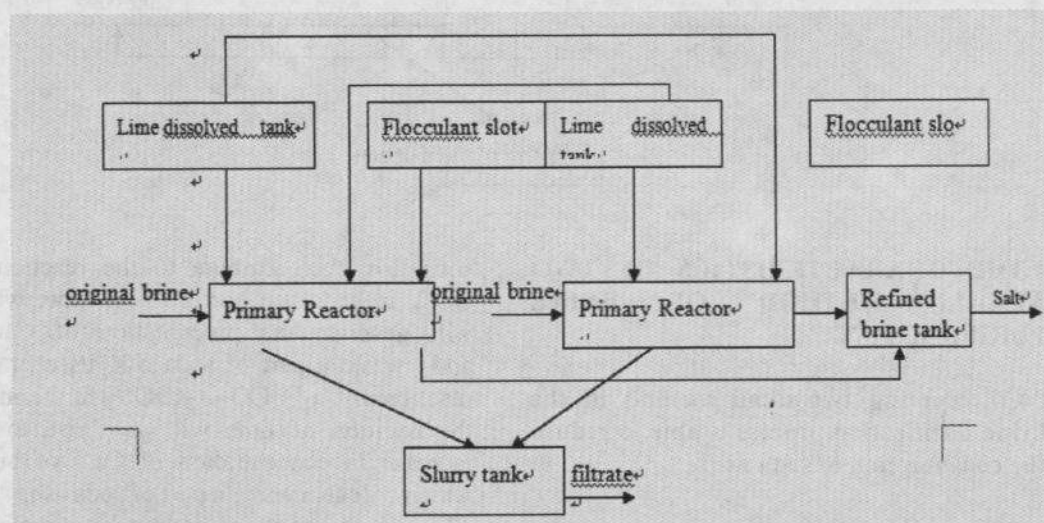
Since the salt and Galuber's salt co-production project with annual production capacity of 300,000 tons has been put into operation in 1996, brine purification operated in accordance with the process and process parameters to ensure that the quality of refined halogen meet the requirement of $\text{NaCl} \geq 280\text{g/L}$, $\text{NaSO}_4 = 22 \pm 3 \text{ g/L}$, $\text{Ca}^{2+} \leq 20\text{ppm}$, $\text{Mg}^{2+} \leq 10\text{ppm}$. Solid suspended substance $\leq 25\text{PPM}$, the regular monthly Salt production time for more than 25 days.

In order to improve the product quality, extend the production cycles, lower

production costs, our company have carried out technology improvement of brine purification process, made some adjustments about the quality parameters of refined halogen in 2000, after several years of production practice.

First of all, brine purification process adopted lime soda ash method substitute original method of grade feeding with secondary reaction for mixed feed with primary reaction.

Its production process diagram is as follows:



Comparison table of the adjusted quality parameters of refined halogen with the

original quality parameters of refined halogen

Halogen quality	$\text{NaCl} \geq$	$\text{NaSO}_4 =$	$\text{Ca}^{2+} \leq$	$\text{Mg}^{2+} \leq$	Suspended solid \leq
Original process	280g/l	22±3g/l	20ppm	10ppm	25ppm
Adjusted process	290g/l	22±3g/l	6ppm	5ppm	10ppm

Brine purification process adopted lime soda ash method substituted original method

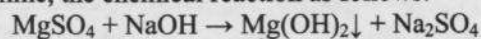
of grade feeding with secondary reaction for mixed feed with primary reaction, double reaction carried on simultaneously, thus the reaction time decreased from 6 hours to 3 hours, extended the clarified time of refined halogen, ensure the qualified content of Ca^{2+} , Mg^{2+} and suspended solid. The monthly production time was more than 28 days. At the same time, save the energy, reduce the wear and tear of equipment and lower the production costs.

New added project with 300,000 tons annual production capacity of River Salt company had been gone into operation in 2006, the brine consumption was increased, so a decision was made that the brine purification process was improved by

replacing lime soda ash method with two alkali method.

3.THE PRINCIPLE AND PRODUCTION PROCESS OF BRINE PURIFICATION WITH TWO-ALKALI METHOD

The principle of brine purification technology with two-alkali method is to remove the Mg^{2+} with caustic soda instead of lime, the chemical reaction as follows:



removing the Ca^{2+} with soda ash, the chemical reaction as follows:

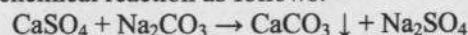
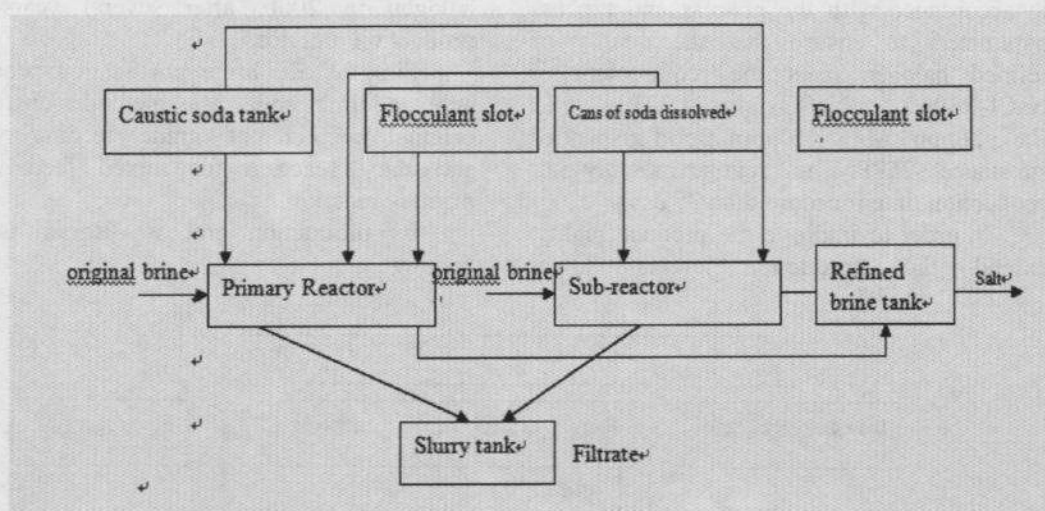


Figure 2 alkali production process is as follows:



4.THE CHARACTERISTICS OF TWO ALKALI METHOD OF BRINE PURIFICATION.

4.1 Adopting two-alkali method in the brine purification process is able to reduce the consumption of soda ash.

In the mixed feeding process of brine purification with lime-soda ash, the mixture of lime and soda ash will consume part of

soda ash, that attribute to the reaction of CO_3^{2-} in soda ash and Ca^{2+} in lime, which will generate the precipitation of CaCO_3 and waste a part of soda ash, its chemical reaction as $\text{Ca}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3$ furthermore, the addition of lime will give rise to the increase in concentration of Ca^{2+} of brine, which will also waste a part of soda ash.

The consumption of soda ash in different method

Purification Process	two alkali method	Soda lime method
Soda consumption	4200kg	5600kg

4.2 Purging brine with caustic soda and soda ash give rise to the decrease in generation of waste solid such as calcium and magnesium sludge

Due to the high content of impurities in lime, the active ingredient-CaO less than 50%. On the process of brine purification with lime and soda, producing one tank(2800m³) of refined halogen will generate 4500kg of calcium, magnesium sludge. Substituting the

lime and soda with caustic soda and soda ash on the process of brine purification, the mass of the generated calcium and magnesium sludge will decrease to 4500kg. Which can be determined by the height of the calcium, magnesium sludge deposition.

Comparison list of the height line of calcium and magnesium deposition in and the production of batches of refined brine and mud pumping three times of Table.

Purification Process	Soda lime method	two alkali method
production batch	5 (Batch)	11 (Batch)
Height of calcium and magnesium soil	1.2 (m)	1.2 (m)
Time of Pumping mud	1	1

5.CONCLUSIONS

To save energy and lower energy consumption is the main way to reduce costs and improve competitiveness of enterprises. Science and technology are primary productive forces, and the salt chemical engineering advance with each passing day, what discussed above is just our superficial

understanding of brine purification, we want to discuss about it with craft brother of salt production.

Author: Chen Jun-hua (1969 -) Male, a man of Jiangxi Zhangshu, assistant engineers, who are engaged in mining production technology and management.