

PRELIMINARY DISCUSSION ON THE FUTURE OF SALT IN BRINE

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Abstract: In this paper, the current situation of salt industry in our country is briefly introduced; the cost of various salts are analyzed and compared; and the necessity, feasibility and importance of brine production are also summarized. In the end some measures are brought about to solve the present problem of salt shortage.

Keywords: salt in brine; developing direction; measure

STATUS AND TRENDS OF SALT INDUSTRY OF CHINA

Influenced by the development of macroeconomy and soda industry, salt consumption of China increases greatly in recent years, with a annual increase of over 3 million tons (see Table 1), which brings along the quick expansion of salt productivity. In recent years, expansion rate of productivity and the increas-

ing rate of production are basically accordance with the increasing rate of gross economy, therefore the economy development of our country is not restricted and the increasing rate of productivity is not out of control. At the present time, China has become the biggest country of the salt production and consumption in the world, with the total salt productivity of 70.42 million tons in 2007. (130 salt making enterprises with salt production of over 100 thousand tons accounted for 25% of all, whose output accounted for 80%, however; 313 salt

making enterprises with salt production of less than 100 thousand tons accounted for 75%, whose output accounted for only less than 20%; despite the surplus of the total productivity those small-scale enterprises need to reduce production or be eliminated;) (37.51 million tons Sea-salts, 26.76 million tons well and rock salts, 6.15 million tons lake-salts;) The total production of crude salt of 2007 was 62,110,000 tons, but the actual salt used was 61,100,000 tons, with the surplus of only 1 million tons and stock of more than 14,000,000 tons; all the statistics are in the normal range. In the first half of the year 2008, the amount of salt consumption was further increased, with the quick increase of stock (only 9,500,000 tons) and the price of salt quickly raised. Until June, 2008, the price of industrial salt was up to 300 Yuan/t; the majority of enterprises had no stock of salt in July and August; the price of well and rock salt was also up to 350 Yuan/t and continues closing to 400 Yuan/t, which was the highest point of the market. After

October, the price began to decline; and with the advent of the economy crisis, dull sale and different levels of stopping production began to arise. One reason of this abnormal phenomenon is the production cost. The quick rise of the price of raw materials such as coal, oil and packaging materials, the increase of the cost of transportation and labor all result in the quick rise of the production cost; the second reason is the changes of the relationship between demand and supply. Influenced by the ice damage and earthquake, the productions of the well and rock salt and sea-salt have to be reduced; the third reason is that Regional Linkage Market-ing Mechanism of salt making companies began to be formed. Until now, this expansion of salt making scale due to the increase of gross economy ended, while how to adjust the structure of salt making according to the demand of scientific thought of development in the next

step to make sure the stability of salt industry market is still worth our further researching.

The consumption of salt in our country basically is used for 78% Two Alkalis (NaOH and Na_2CO_3 , 14% Eating, 6% other industries and 2% others. Among of them, the amount of Two Alkalis salt is the largest and most changeable, and also has the quickest increasing rate (Increasing rate per year is more than 10%). Other aspects are relevantly stable; so if Two Alkalis industry fluctuates a little, the whole salt industry will be caused a big fluctuation; in order to stabilize the salt industry market, a Guarantee System for salt making that is suit for the Two Alkalis salt ought to be sought, which makes the Two Alkalis industry adjusted internally, without fluctuating the whole salt industry as much as possible. The development of salt in brine is a reasonable tendency to solve this problem.

Table 1 Data of the Production and Consumption of Salt from 2003 to 2006

Time/Year	2003	2004	2005	2006	2007
Demand of salt / 10^4t	4042	4525	4940	5193	6110
Productivity / 10^4t	4289	4740	5627	6685	7042
Difference of productivity / 10^4t	247	215	435	1029	831
Production (10^4t)	3707	4040	5192	5656	6211
Difference between production and demand / 10^4t	335	-485	252	463	101
Inventory / 10^4t	1212	750	1000	1500	1426

Table 2 Annual average increasing rate of NaOH Productivity of China from the year 2001 to 2007

2001	2002	2003	2004	2005	2006	2007
5. 6%	16%	9. 2%	11. 2%	23. 6%	23%	16. 3%

Table 3 Productivity and Production of NaOH in China from 2005 to 2007

The Year	Productivity/ 10^4t	Production/ 10^4t	Increasing rate/%
2005	1539	1411	
2006	1706	1543	9. 36
2007	1885	1772	14. 8

THE PRODUCTION COST OF SALT

Currently, the varieties of salt in our country include sea-salt, lake-salt, well and rock salt, salt in brine.

Sea Salt

The production cost of sea salt in our country is usually between 50 Yuan/t and 90 Yuan/t, with the full cost from 120 Yuan/t to 200 Yuan/t; the transportation cost of sea salt is 40 Yuan/t higher than that of well and rock salt in Henan Province. Without peculiar requirement to the quality of salt, sea salt has relevantly big advantage among all the solid salt.

Lake Salt

The production cost of lake salt in our country is usually between 20 Yuan/t and 50 Yuan/t, and the full cost is from 30 Yuan/t to 80 Yuan/t, with a relevantly high transportation cost.

The Production Cost of salt in brine

The buried depth of well and rock salt in China is generally 600 m-3000 m underground. Calculated by the depth of 1500 m, the costs are as follows:

1. Cost of brine mining workshop
Brine per standard cubic meter: 1.50 Yuan/m³; brine per cubic meter: 4.5 Yuan/m³; cost of salt per ton: 15 Yuan.
2. Additional fees of brine
 - (1) Resource tax: brine converted into salt 12 Yuan/t
 - (2) Value added tax: brine converted into salt 15.45 Yuan/t
 - (3) Sales tax: brine converted into salt 1.54 Yuan/t
3. Costs of transportation (taking the length of the pipe as 100 km)
 - (1) Pipe depreciation cost for investing 1 ton salt (two pipes): 7.2 Yuan/t
 - (2) Electricity cost for operation: 3.3 Yuan/t
 - (3) Cost of labor and maintenance: 1.1 Yuan/t
4. Management fees of salt industry

Well and Rock Salt

The production cost of well and rock salt in our country is usually between 110 Yuan/t and 180 Yuan/t, with the full cost from 200 Yuan/t to 250 Yuan/t.

Some places have management fee, while some places do not. The calculation takes the present local management fee as 23 Yuan/t.

All in all, with the length of the pipe of 100 km, the full cost of brine for one ton salt is 58.09 Yuan; with the length of the pipe of 200 km, the full cost of brine for one ton salt is 67.19 Yuan; with the length of the pipe of 300 km, the full cost of brine for one ton salt is 76.79 Yuan; with the length of the pipe of 500 km, the full cost of brine for one ton salt is 85.99 Yuan.

From the above mentioned, salt in brine is more advantageous, whose incoming price of is 120 Yuan/t lower than that of sea salt and 150 Yuan/t lower than that of well and rock salt.

THE INFLUENCE OF SALT PRICE ON OTHER INDUSTRIES

Salt, as well as hydrochloric acid and sulfuric acid are called the "mother of chemical industry". Salt is one of the inorganic chemical raw materials that has the biggest usage quantity and is also a raw material mainly for soda ash and caustic soda for industrial purpose. The cost of salt used in soda ash production accounts for about fifteen percent of the total cost. The cost of salt used in caustic soda production accounts for about ten percent of the total cost. So the price of salt has a profound influence on the most basic industrial raw materials, and is one of the factors that affect the sustainable development of the economy of China.

POSITION AND ROLE OF SALT IN NATIONAL ECONOMY

Though salt does not have such big influence as coal and electricity do in national economy, it does have important roles. Salt is not only an essential material for people's lives but also an indispensable raw material for chemical industry. Especially, the production of hydrochloric acid, caustic soda and soda ash among "three acids and two alkalis" as the base of chemical industry all take salt as the raw material. The annual consumption of salt is nearly 60 percent of the production of the world. So salt not only closely links with people's lives but also is an essential raw material for the rapid development of industry.

NECESSITY FOR THE DEVELOPMENT OF SALT IN BRINE

Urgent need for improving utilization rate of energy sources in China

In 2003, the total consumption of the energy sources of China was 1.68 billion tons standard coal, among which coal accounted for 67.1%, crude oil 22.7%, natural gas 2.8%, and renewable energy 7.3%. 0.4 Billion tons standard coal of all the 1.68 billion tons were wasted.

A recent research report of the Development Research Center of the State Council showed that in 2001 the expenditure of energy resource consumption of the end users of China is 1.25 trillion Yuan, accounting for thirteen percent of the total GDP, which in the United States only accounts for seven percent. Experts said according to the current exchange rate, the output of unit resources of China is 1/10 of that of the United States, 1/20 of Japan and 1/6 of Germany.

Some experts pointed out that the output efficiency of the energy resources of China is far lower than the level of developed countries. It seriously limits the sustainable development of China. But if the salt used for caustic soda is salt in brine, 3 million tons crude coal can be saved per year.

The demand of salt in brine in caustic soda industry

Caustic soda is produced by the electrolysis of salt solution. When using solid salt, the salt must be dissolved in solution and then go through production procedures. Therefore, it will be more beneficial to production if salt in brine are provided from caustic soda producers. Fairly amount of salt in brine are used in developed countries. It can be a reference for us.

Energy consumption and cost of the transformation of salt in brine into solid salt

At present, the energy consumption of vacuum salt of China is between 150-250 kg standard coal/t. If the 24 million tons salt used for caustic soda is salt in brine, 5 million tons crude coal will be saved. The production cost of salt in brine is about 15 Yuan/t; the cost of laying pipes is about 40 Yuan per ton per hundred kilometers, and the maintenance fee is about 1.1 Yuan per ton per hundred kilometers; therefore salt in brine has great advantages within 300 km, and has big competitive power within 500 km. It is essential to develop salt in brine.

Feasibility of the development of salt in brine

1. Provinces that produce well salt are mainly Sichuan, Hubei, Hunan, Jiangsu, Jiangxi, Yunnan and Henan. Well salt has wide distribution, high purity and high concentration. The transportation of salt in brine to chemical enterprises within 300 km taking salt wells of each province as the center has been completed.

2. Digging Wells and laying pipes need less investment and has quicker speed than establishing a salt plant, which can quickly adjust the demand for salt.

3. The low cost of salt in brine can efficiently reduce the cost of downstream products, strengthen the competitive strength of chemical enterprises, and be beneficial to the sustainable, healthy development of the economy of China.

The establishment of large-scale salt plants is not beneficial to the sustainable and healthy development of the economy of China

1. It is a waste of resource to use well and rock salt as industrial salt. Well and rock salt should be firstly used for food, and secondly for other special purposes. It's not economic to replace industrial salt by sea salt.

2. Currently surplus well and rock are all transformed into industrial salt. When the salt is surplus, well and rock salt will be first impacted and well salt enterprises will also be seriously influenced. Ultimately the survival and development of the whole industry will be impacted.

MEASURES TO DEAL WITH THE SHORTAGE OF SALT

Under the condition of constant rapid development for several years, inconsistent phenomena may possible appear in one industry. So a kind of scientific attitude should be kept to such industry.

1. Make out salt production industrial planning and structure adjustment with scientific attitude; ensure the collaborative development of chemical industry, aquaculture, biology and salt chemical industry.

2. Make full use of the present resources to ensure the efficient function of social productivity. Extend the capability of transferring lake salt to other places and keep appropriate storage.

3. Make up for the imbalance of supply and demand by import.

4. Develop salt and alkali altogether. Long-term collaborative brine transportation and distribution system should be established between the big-scale salt using chemical enterprises and well mine areas nearby. It will benefit the development of salt industry as well as alkali industry.