

# DISCUSSION ABOUT THE SALT MINE RESOURCE DEVELOPMENT AND CONSTRUCTION IN HENAN PROVINCE

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**Abstract:** This article first introduced the basic situation of salt mine and salt chemical industry in Henan. Through analyzing the disadvantages and advantages of salt and salt chemical industry, salt mine resources development goal and relevant measures are concluded.

**Key words:** Salt mine, Salt chemical industry, Development

## INTRODUCTION

Salt is not only fundamental raw material of chemical industry but also the necessities of people's daily life. It concerns the national economy and people's livelihood, which has the very vital role in the national economy and the social development. Henan Province is rich in rock salt resources, and possesses obvious geographical superiority. This article discussed some development and construction questions in order to develop the salt mine resources more reasonably and promote the rapid, coordinated development of salt-making and salty chemical industry. Finally, it may promote the Henan economy and the development in Mid China.

## BASIC SITUATION OF SALT MINE RESOURCES AND MINING

### Plentiful rock salt reserves

Locating at the central plains in China, Henan Province didn't produce the salt in the history. But in the late-1980s, through the national geology investigation the sodium salt mine----Pingdingshan salt field was discovered, which lies in the west of Wuyang Basin. Measuring 40 kilometers from east to west and 10 kilometers from north, it covers an area of 400 square kilometers; including 3/4 of all within Ye County's borders and 1/4 within Wuyang County's the borders. Pingdingshan salt field has a buried depth of 900--2000 meters and more than 120 salt layers. With geological reserves of 230,000,000,000 tons and average grade of 89%, it ranks the second and the first of the whole country in terms of reserves and average grade, respectively.

In recent years, a large-scale salt field was discovered again in Puyang City, Henan Province. Belonging to the depressed area of eastern Puyang, this salt field mainly distributes in Puyang, Qingfeng and Fan

County. The spreading area of salt layer is 500 square kilometers, with the preliminary proven reserves up to 47,850,000,000 tons. The geology prospective reserves amount to more than 120,000,000,000 tons.

#### **Resource developments win initial success**

After the Pingdingshan salt field was discovered, Henan Salt Administration Bureau insists rational development and scientific guide. Investing 350,000,000 Yuan from 1990 to 1994, Henan province completed 6 salt production enterprises whose designed productivity is 590,000 tons. Because the oversupply of salt products is transformed into the balance between supply and demand, the price of Industrial salt rises all the way. Therefore, the technological transformation and extension scale of Henan salt-making enterprise enlarges. From 2005 to 2008, the Pingdingshan Haolong Salt Chemical Co., Ltd started by stages two 600,000 ton/year salt-making production lines, and the Wuyang Jindadi Salt Chemical Group completed 600,000 ton/year industrial salt plant, and also Pingmei Shenma Group has completed 600,000 ton/year industrial salt plant. At present, the annual salt productivity in Henan amounts to 3,200,000 tons.

Because Puyang salt mine was discovered a bit late, the large-scale development has not already implemented. Only No.2 oil production factory of Zhongyuan Oil Field is trying exploiting brine, which is specially used as raw materials for Puyang Keliwei Chemical Industry Limited Company.

#### **The technological characteristic of brine extraction**

The Henan brine well (brine well) mining process mostly employs single-well circulation. That is to say, with a technological casing pipe outsides and a steel pipe in the center, water is injected from the central tube into the salt formation soluble salt. Then the soluble waterbrines, is pressed out using the hydraulic pressure method from the interlayer between the two pipes. It is called the normal

circulation brine mining; otherwise, it is called the reverse-circulation. Along with the unceasing exploration practice, the mining technology progresses day by day, and even two wells (a pair, appropriate distance) start to be drilled. With water injected from one well and brine extracted from the other well, the output and the stability enhance to a large extent. It is called the double well convection. Now the China Salt Haolong Salt Chemicals Co., Ltd in Pringdingshan has had three pairs of six counter-flow wells, which have the high brine extraction rate, low accident rate and good economic benefit.

### **THE DEVELOPMENT SITUATION ABOUT SALT-MAKING AND SALT CHEMICAL INDUSTRY**

#### **The basic situation about salt-making Industry**

Now, there are 6 salt-making enterprises in Henan, which are Pingdingshan China Salt Haolong Salt Chemical Co., Ltd, Salt Chemical Industrial Park of Pingmei Shenma Group, Pingdingshan Shenying Salt Plant, Pingdingshan Nutrition Health Care Salt Industry, Wuyang Central Plain Salt-making Co., Ltd, Wuyang Jindadi Salt Chemical Co., Ltd, respectively. There are 2 liquid-salt production enterprises, which respectively are the Pingdingshan Salt Industry Administrative Bureau Liquid Salt Distribution Station and the North China Petroleum Geology Bureau Huayang Brine-well Station. The multi-variety salt company is only Henan Weiqun Multi-variety Salt Co., Ltd. The in-service staff of all these salt-making enterprises is more than 3700; the total fixed asset amount approximately to 1,300,000,000 Yuan. The productivity of fine-salt, liquid-salt, multivariety salt is 3,000,000, 200,000, 3000 tons/years respectively.

Although the Henan Salt Industry starts late, the starting point is high. During the developing process, some new technologies, new crafts, new equipments and new materials are researched and introduced. The



salt-making product conforms to the environmental protection standard due to the high quality and entire varieties. Therefore, the salt-making technology in Henan Province maintains an advanced level in our country.

#### **The basic situation about salt chemical industry**

After more than 40 years construction, Henan salt chemical industry has formed one of resource-based dominant industries with complete kinds and matching varieties. According to the preliminary statistics, there are 23 salt chemical enterprises in Henan Province in 2008. Among them, there are 17 sodium hydroxide-producing enterprises (3 enterprises are being constructed), including 3 enterprises with productivity of above 100,000 tons/years, 4 enterprises with productivity of 50,000-100,000 tons/year and 10 enterprises with productivity

of below 50,000 ton/year. The productivity in 2008 amounts to 1,350,000 tons. Jiaozuo Haohua Yuhang Chemical Co., Ltd and Pingmei Shenma Chlor-alkali industry Co., Ltd unceasingly increase the funding investment, purchasing Chlor-alkali apparatus and expand the productivity in the recent two years. Their late-development advantage is very prominent. Among the nine soda ash making enterprises, there are 4 enterprises in Tongbai County which produce the natural alkali; among the rest 5 soda ash enterprises, Wuyang Jindadi Chemical Co., Ltd has the biggest scale, with the annual productivity 300,000 tons. It produced 850,000 tons soda ashes (except natural soda) in 2008. With the profit and tax of 450,000,000 Yuan, sales income of two alkalis in the whole year is approximate 6,800,000,000 Yuan.

#### **The basic situation about technology transition and energy-conserving and environment-protective**

Government functional agencies at all levels and salt chemical enterprises striving, a set of technological innovation achievements with proprietary intellectual property rights have been completed, and one batch of

equipments with big pollution and high energy-consumption have been eliminated. In the practice, the salt chemical enterprises insist on transforming traditional technology with the advanced technology and have developed 3 kinds of new products consuming alkalis and chlorine fine chemical products. The level of technology and the equipment in this industry has been greatly enhanced. For example, Haohua Yuhang Chemical Co., Ltd cooperated with Japan Asahi Kasei Group to establish the first ionic membrane test base in China, which promoted the technology progress of salt chemical industry. At the same time, the salt chemical industry enterprises insist on the sustainable development strategy, which improves ecological environment, enhances resources usage efficiency evidently; thereby, the resource utilization is able to comport with the environmental bearing capacity via coordination. What's more, the resource-saving and environment-protecting have a distinct improvement, and the comprehensive energy consumption of products further declines, and resource utilization efficiency enhances gradually.

#### **MAIN PROBLEMS EXISTING AND REASON ANALYSIS**

##### **Resource superiority is not displayed insufficiently, which still doesn't get rid of weak, small, dispersive, slow pattern**

Rich in rock salt resources, Henan Province provides the basic conditions to develop the salt and salt chemicals industry. In recent years, Henan has achieved some progress about the development and construction, but still has a relatively big gap with other provinces and cities and the national strategic target of helping the Mid China achieve development. This may be because of following several reasons: firstly, the idea of the reform and open policy is not renewed, and the speed of scientific progress is too slow; secondly, the idea of people-oriented is not very firm, and many development opportunities are not held

promptly. Accordingly, the current salt chemical industry hasn't got rid of the small, disperse, disordered, weak and slow pattern, not to mention realizing unexpected appearance of a new talent or factor and scale-development.

#### **The low degree of resource development and utilization and excessive primary products**

The Pingdingshan salt field is the double salt layer deposit, and the current mining district is industrial first mining area within 1300-1700 meters, with only 1-4 layers mined. Because a series of technical questions have not been solved yet, the closed roof stability is bad after mining. It is not only bad for the mining of second section, but also cause some resource waste, and doesn't conform to scientific development concept. In the salt-making and salt chemical enterprises, there are many primary products like the table salt, industrial salt, caustic soda and soda ash, etc. The products with intensive process and high addition value are quite few. It hasn't already formed the product chain, and doesn't also extend the industrial chain.

#### **Salt mine are exploited irregularly and the plan isn't carried out well**

When exploiting salt mine, some local governments lack of the global view and strong scientific development consciousness, and even make recycling economy idea clear. So salt mine resources are exploited irregularly, and the projects started can not be generally developed and used fully. Also, some places and enterprises (especially enterprise with newly-built two alkali appliances) don't comply with Ore Resource Law and national regulations, and lack comprehensive analysis to the up/downstream market and environment of competition (e.g. as for the liquid caustic soda, the problem of market radius and regional characteristic is quite obvious); the speed of capacity expansion is excessively rapid; local enterprises develop with some blindness.

#### **The influence of production factors is big; technological innovation is slow**

Two alkalis production and sale rely greatly on the production factors like energy and raw materials. The crude salt is the primary raw material of two alkalis, which accounts for 17% of the cost. Although Henan is a big province which is rich in salts mine resources, because of the low degree of development and utilization of liquid salt, the industrial salt price is not very stable in recent years, which influences the production of two alkalis directly. Meanwhile, the supply and price tendency of electric power, raw coal and the crude salt affect the production and sale of salt chemicals greatly, which make the cost of two alkalis unsteady. The small and medium-sized enterprise technological transformations are short in fund and the top-level technicians so that the technological innovation development is slow.

#### **Bad industry management and small degree of new product development**

As a result of the historical reasons, the salt-making and salt chemical industry are attached to the different departments in charge. The industrial management was not always stepping into regular. After the provincial department in charge of chemical industry was cancelled, the salt chemical industry enterprises have always been at the condition of lacking management departments and unordered development. In 2005, the provincial government requests the Salt Administration Bureau to work out the 10<sup>th</sup> Five Year Development Plan of salt and the salt chemical industry, but didn't manage salt chemical enterprises definitely. At present, the provincial salt industry development doesn't match with two alkali development; the superiority of resources is not made full use of; and the overall benefit of this industry is bad. The variety of new products developed in the provincial salt chemical enterprises is too few (about 30 kinds), including only alkali, soda ash, hydrochloric acid, liquid chlorine, polyvinyl-chloride, calcium hypochlorite and the chlorobenzene and so on. However, the



variety number of domestic and foreign countries has reached up to 150 and 1000 respectively, with the majority being fine chemical products.

## THE ADVANTAGEOUS CONDITIONS OF SALT AND SALT CHEMICAL INDUSTRY DEVELOPMENT

### **The Mid China is developing; the opportunity is proper**

From the macroscopic policy, China is trying to develop the middle region positively; especially in terms of the policy fund and construction of important projects, the development of competitive industry in the middle China is supported; the assistance to agriculture and the basic industry, infrastructure facilities is enlarged. All these measures are good for helping Henan Province exert the comparative advantage and late-development advantage and realize the great-leap-forward development. All in all, implementing economic great-leap-forward development in Henan and Development Strategy of Mid China can promote the development of salt and salt chemical industry.

### **Abundant Rock Salt**

Henan has very good salt resources and calcium carbide resources. With good salty quality, shallow buries depth, simple mine structure and stable ore deposit, the salt mine is easy to exploit. The supporting function of salt resources in Henan Province is very prominent, which provides the reliable resources support to develop the salt and salt chemical industry. In addition, the fruitful coal resource and predominant water force conditions are also good for the development of salt-making and salt chemical industry.

### **Moderate geography advantage and convenient transportation**

Henan locates in the backland of our country, which has broad physical distribution

scope and big product transportation radius. Therefore, Henan is playing the core role in the geographic division of labor as a bridge between the far and near of the whole country. The major salt chemical enterprises lie in the urban agglomeration of central plains of China and Puyang Petroleum Chemical Base, which have the obvious geographical superiority.

### **Broad market of basic industry**

Henan has the relatively developed manufacturing industry and processing industry. The metallurgy, automobile, non-ferrous metal and agricultural products processing industry hold the pivotal status in our country as the pillar industry. Some influential enterprise groups and major industries conduct the self-engagement business in both import and export positively. Their products can be stably produced and provided uninterruptedly, which are welcomed by market. The salt-making enterprise and two alkali enterprise have relatively good situation of production and marketing, which has the market competitiveness in the middle area; the price of salt and salt chemicals of international markets is steady and rising; Hong Kong market also has a big demand. The high technology and new technology industry development has provided the new market demand. Therefore, as the basic chemical raw materials, the salt chemical products have a wide market prospect.

## THE THINKING OF DEVELOPMENT ABOUT SALT-MAKING AND SALT CHEMICAL INDUSTRY

### **Thinking of development**

Scientific thinking of development should be insisted. Taking salt mine resource as foundation; Looking technology and system innovation as power; Emphasizing the industry optimization and resource integration; with developing bigger/stronger salt-making and salt chemical industry as main line; the salt mine resource should be developed reasonably and employed efficiently, and the

comparative advantages of the comprehensive resources in Henan should be exerted fully. In conclusion, the main aim is to develop the Henan Province to be an important salt-making and salt chemical production base of China.

### **Development targets**

The overall development target of Henan salt-making and salt chemical industry should become bigger, specialized, stronger according to "12245" mode. Specifically speaking, taking developing salt and salt chemical industry as a mainline, combining saline and alkaline, thermoelectricity, constructing two bases (one old and one new salt chemical industry base), developing four big series (salt, sodium hydroxide, soda ash, chlorine consuming), supporting five big groups (China Salt Group—Pingdingshan Haolong Salt Chemical Co., Ltd, Pingdingshan Shenma Group coal-salt industrial garden, Henan Coal Chemical Co., Ltd, Henan Jinshan Chemical Co., Ltd, Jiaozuo Haohua Yuhang Chemical Industry Co., Ltd).

## **SUGGESTIONS AND THE MEASURES FOR SPEEDING UP DEVELOPMENT AND CONSTRUCTION OF THE SALT MINE RESOURCE IN HENAN PROVINCE**

### **The development and protection of the salt mine resources**

Due to the insufficient exploitation of salt mine resource in Henan, the government is suggested that one part of funds for exploiting salt industry should be arranged and mining should be organized by the salt industry department and the geology and mining department together. In order to protect the salt mine resources, "Henan Province Salt mine Resources Mining Area Exploration, Mining Design and Production Technology Management Regulations" should be worked out as soon as possible, which should be able to instruct production and make management standard to let the salt-making and salt

chemical enterprises have regulations to abide by. Government at all levels must carry out "Mineral Resource Law", and deal with the relationship between the mineral resource and the urban planning, and also protect the salt mine resources, and finally provide reliable guarantee for the development of salt and salt chemical industry.

### **Enhancing the trade management and perfecting the services system**

Salt and the salt chemical industry have close relation. The speed of salt development is decided by the speed of development of salt chemical industry; meanwhile, the development of salt chemical industry also relies on the guarantee of salt resources. It is suggested that the salt & salt chemical industry development leading group (headquarter office should be in Salt Service Administration Agency), which can help to strengthen the management of salt mine, establish the medium and long range development program, supervise and guide the implementation of this program, and coordinate the outstanding problems of salt and salt chemical industry. Moreover, some cities and counties should also set up relevant leading groups and working institutes to be responsible for organization and implementation. Through powerful measures of the government, the salt mine resources are used effectively. At the same time, the function served as bridge of salt and chemical industry is exerted to conduct communication, consultation appraisal and enterprise cooperation.

Two alkali enterprises should consider fully the market, raw material and the technology conditions, develop reasonably alkali, chlorine and hydrogen derivative product, and try to realize the equipment generalization, production seriation and business pluralism. Finally enterprises should strive to complete "the resources--product--renewable resource" Industrial chain to take road of the circulation economy.



**Enhancing the industrial concentration ratio; strength the professional competitive power**

Market Access and Filing System of salt and salt chemical industry should be established. According to the environmental protection standard, energy consumption standard and product technology quality standard, and "the State Council Decision about Investment System Reform" as well as "Government Standard and Investment Project Contents", as for some projects which is being building or planned to build, the related departments should try to prevent the low-level building of redundant project and blindness building. The newly-built salt-making enterprise must achieve saline and alkaline matching and balance. The new project should not be constructed until the downstream product is found. The beginning scale of salt-making enterprises is 600,000 tons/year. The newly built chlorine alkali enterprise must be the chlorine alkali is balanced. The newlybuilt chlorine alkali project must make the chlorine and alkali balanced; otherwise, the construction project can not be arranged. When building and extending projects, the balance restriction of chlorine-consuming or alkali-consuming products should be taken into account. The quality of salt and salt chemical product must conform to the national standard, and the environmental protection and safety must conform to the national regulation.

**Speeding up the step of reorganization and remanufacture; Cultivating and developing large-scale enterprise groups**

Starting from the policy guidance, according to the market operating laws, it is necessary to further regulate the organization and structure of enterprises and speed up the reform and development of large-scale salt chemical enterprise groups by administrative and legal measures. Taking Henan Salt Industry Central Company as the core, with the integral productionsupply-sale and science-industry-trade, Henan Salt Industry Group begins to build the rapidly operating

network system of salt production and circulation, and display the leading effect of Henan Salt Industry Central Company fully during the process of salt-making industry reform and development. Through combination among the strong ones or between production and marketing, many regional or interregional large-scale salt chemical industry enterprises or groups have been integrated and restructured and achieve the collaborative development. The combo of production and marketing of large-scale salt-making enterprises and large-scale two alkali enterprises should be established and entirely planned in order to realize the reciprocity and mutual benefit and coordinated development of Salt and Alkali Industry. What is more, the existing salt-making enterprises should be encouraged to carry on the development and construction of downstream salt product to extend the industrial chain.

**Opening multi-dimensional financing channels**

Guiding various circles of society to increase positively investment to salt and salt chemical enterprise, the new financing system will be formed gradually to promote the effective investment and virtuous cycle of funds, which takes the governmental investment as guidance, the enterprise investment as main body, and attracts the widespread participation of social funds. With the capital in cash infusion, discount-interest loans and financing guarantee as the main form, it should be able to support the significant salt and salt chemical projects and also raise funds through many kinds of channels (sharinghold reform, introducing strategic partners, striving for policy-type loans, commercial loans, loans from foreign banks and international finance organizations and so on). Furthermore, enterprises need take the projects as ligament to strive for the support from bank bonds and funds to promote industrial development.

### **Strengthening the energy conservation and environmental protection; guaranteeing the sustainable development**

The salt chemical industry needs large energy consumption and can generate big pollution. Therefore, when developing and employing the salt mine resources, the supporting function of energy and the environment must be coordinated. The following three aspects should be paid more attention: First, in the stage of mining resources, the resource comprehensive development and recycling utilization ratio should be enhanced; Second, mine resources need integrated planning to enhance the comprehensive use of intergrowth and concomitance resources; Third, mining

techniques should be improved to suit the characteristic of salt mines in Henan, and the recovery and general recycling ratio need be increased. In the process of resource utilization and production, utilization ratio of resources should be enhanced greatly; Fourth, strength the energy-consumption management of energy, raw materials and water and achieve graded use of energy, highly efficient utilization and cyclic utilization. Fifth, in terms of waste production stage, the enterprise should carry out environmental improvement and comprehensive utilization of resources; Increase the comprehensive utilization ratio of waste residue, waste water, and waste gas, and promote the salt chemical industry to realize the recycling utilization of waste by extending and coupling industrial chains.