

THE PRACTICE AND EXPLORATION OF THE DEVELOPMENT OF ROCK SALT RESOURCES OF YE COUNTY IN HENAN PROVINCE

People's Government of Ye County

Abstract: Making full use of the rock salt resources and the brand effect of "Capital of Salt in China", Ye County takes the whole situation into account by the scientific concept of development, transforms the resources superiority into the economy superiority, tries to construct the Powerful Capital of Salt, Green Capital of Salt, Cultural Capital of Salt, promotes the maximization of economic benefits, social benefits and environment benefit, and impels the healthy, fast and sustainable development of county economy.

Keywords: Rock salt development, practice, exploration

INTRODUCTION

The mineral resource is the main source of production goods and subsistence means that is dispensable for the existence and development of human society, which is nonrenewable. How to use these limited resources effectively and reasonably is an important question concerning the sustainable development of national economy. As the "Capital of Rock Salt of China", Ye County has big reserves of the rock salt resources, which is high qualified, easy to mine and has broad market development prospect and advantaged superiority. How to activate this huge superiority, enlarge the resource characteristics, develop salt-making and salt chemical industry and make effort to construct the Powerful Capital of Salt, Green Capital of Salt, Cultural Capital of Salt, are an important topic in front of us. In the past

20 years, utilizing the successful experiences of domestic and abroad, Ye County has carried on a series of beneficial practice and exploration, and established a set of rock salt development pattern that conforms to the local reality for developing and utilizing the salt resource better.

DISCOVERY OF ROCK SALT RESOURCES AND SUPERIORITY OF DEVELOPMENT

In 1981, when Henan Petroleum Prospecting Bureau explored oil in Ye County, it was the first time to discover that the Ye County has rich salt mine resources. Afterwards, it was verified that Ye County contains a supergiant, high-quality salt ore deposit in approximately 1500 meters underground through the exploration and

analysis of Potash Salt Geology Production Brigade and Chemical Minerals and Geology Research Institute of National Ministry of Chemical Industry. Comparing with many salt mines in our country, this salt mine has many advantageous superiority:

1. The reserves are big. Salt field spreads an area of 400 square kilometers (one part in Wuyang County). Future resource reserves of the entire salt-bearing basin are 330,000,000,000 tons, occupying 75% of the entire salt mine resources, which ranks the first of the total counties in our country.

2. The quality is high. The content of sodium chloride is between 85~95% and the quality is the best of the entire well and rock salt in China. For example, sodium chloride content of salt mine in Sichuan Zigong is 80~95%; Yunnan Province's salt mine quality is 35~60% generally; the sodium chloride content of salt mine in other provinces is medium, generally about 70%~80%.

3. The buried depth of salt mine is moderate and convenient for mining. Rock salt layers are all in the position of 1100--1800 meters underground; the structure of mineral resource layers is stable, and burial depth is suitable. So long as salt mine is exploited according to design, the earth's surface will not be polluted, and also there will not be the phenomenon of ground subsidence after mining.

4. The salt layer is not complex and the thickness of single-layer is big. Taking Ye County Hetaoyuan Group mine as an example, this mine has 63 salt layers, with the accumulation thickness of salt deposit of about 290 meters, and the single-layer thickness amounts to 27 meters, even there are some salt mines whose single-layer thickness is bigger than 27 meters. This kind of mineral resource can reduce the production cost and enhance the mining benefit greatly.

5. The prospect of finding new mines is good. During the exploration it is discovered that salt ore deposit is very possible to have extensions. At the same time, besides the advantageous rock salt resources, accompaniments also have the sylvite, coal,

petroleum and many fruitful resources. All of these fully show that salt field of Ye County has a good prospect of finding new mines and a big resources potential.

ASSORTED CONDITIONS OF THE DEVELOPMENT OF ROCK SALT RESOURCES

The development and construction of Ye County rock salt resources has very advantageous conditions:

1. The water resource is abundant. Within the county's borders, there are 29 big-and-middle-sized reservoirs, 5 throughtraffic rivers; the total amount of water resources is 434,000,000 cubic meters on average, with surface self-produced run off of 335,000,000 cubic meters and amount of underground resources in shallow layers (comprehensive supplies) of 199,000,000 cubic meters.

2. The electric power resources can be guaranteed. Ye County have the biggest coal gangue environmental protection power plant in Asia -- blue light power plant. At present installed capacity is 2×135 megawatt, and the second phase of the project with 2×300 megawatt will start up soon, which is adjacent to many large-scale thermoelectricity enterprises, such as the Pingdingshan Yaomeng Power Plant, San He Power Plant, Hongxiang Power Plant and Pingdingshan Coal Group- Kengkou Power Plant and so on. Now there are one transformer station of 220 kilovolt and three transformer stations of 110 kilovolt, and in the final stage of "11th Five-year Plan", a transformer station of 550 kilovolt is planed to be completed. Until then, Ye County will become the biggest dispatching hinge of electric power in Pingdingshan, which can satisfy the demand of electricity for salt-making and salt chemical enterprises.

3. Coal resources are fruitful. Close to the biggest Pingdingshan Coal Field with the total reserves of 15,400,000,000 tons in Central South China, coal and salt are transformed on

site and rise in value, with the low cost, high added value and big market potential.

4. The superiority of transportation and geography is prominent. Ye County is close to the Xinzheng International Airport, Luoyang Airport and Nanyang Airport. The Pingwu railroad passes through Ye County and Ye County Section of Dengfu railway and private line of salt transportation are being constructed. Now Ye County has 2 highways with 6 domestic exits, and 7 main-line highways including national highway--G311 line, provincial road Yu S103 the line and so on, located in national highway 107 line to the east, national highway 107 line to the west, national highway 312 line to the south; the total traffic mileage of Ye County amounts to 1822.86 kilometers.

TAKING THE PROJECT DRIVE AS BREAKTHROUGH AND CULTIVATING SALT CHEMICAL INDUSTRY ACTIVELY

After discovering the salt mine, Ye County Government emphasizes highly and exert this advantageous resource superiority, and insists that the development of salt industry should be the key breakthrough of the great-leap-forward development of economy to impulse the transformation from big county of resources to strong county of resources. In recent 20 years, based on the practice, Ye County has explored a set of effective development model of salt industry.

1. Conduct rolling development, accumulate capital and technology unceasingly, and realize the transformation from small to big. At that time, the development of rock salt resources is quite new for Ye County. Most important and most essential question is lacking of the mining technology, fund and talented person. Therefore, the traditional and primitive pan salt-making process was very popular because of the less investment, quick effect and easy to promote and popularize. After the experiments and explorations for a period of time, based on the previous experience, the provincial government

convened a forum about the development and plan of Ye County salt field, and established 16-Character Guideline for the development of salt industry in Ye County, which is "Combine prospecting and mining, Prospect primarily, Mining promotes prospecting, rolling development". Ye County also formulated related policy for widely publicizing and mobilizing, stimulating the enthusiasm of investment and exploration enormously.

As the number of salt-making enterprises by pan increases, contradictions sometimes occur to compete for the resources and market. Therefore, the county government decides decisively to ban all the pan-salt-making enterprises and to start the large-scale development of salt field of Ye County, by depending on own strength to put up factories and attracting investments with local enterprise's demonstration effect. In August, 1991, the first modern salt plant in Henan Province - - Ye County Yu Kun Salt Plant put into production officially, which is constructed by the contribution of all the staffs. After the detection of authoritative department, the product's quality conforms to the national standard completely, more than 99% for the superior grade products. Afterwards, salt-making enterprises like Ye County Tianhe Salt Plant, Pingdingshan Salt Plant, Pingdingshan Shenyang Salt Plant and Pingdingshan Nutrition and Health Care Salt Plant are completed one after another, enabling the practical production capacity of refined salt of Ye County to amount to 530,000 tons.

2. Ye County Government takes many measures to cultivate salt chemical industry to achieve the transformation from weak to strong.

Depending on science and technology to expand the management of salt products and increase the benefit. Facing the situation that supply exceeds demand seriously and the enhancement of salt product standard, the way to develop sole salt product is more and more narrow. Therefore, on the basis of analyzing fully the market of salt industry, Ye County perfects the idea of salt development timely, guides salt-making enterprises to carry on

intensive processing to the table salt and expands management to obtain benefits from science and technology. Various new products such as the balanced fitness salt, strengthened zinc-salt, strengthened calcium-salt, low-sodium salt and so on, are promoted one after another, which has filled in many blank of salt industry markets in Henan and even in our whole country. Among them, balance fitness salt is one kind of nutrient salt that is added many kinds of trace elements and also is the earliest beneficial exploration in terms of intensive processing of salt and improving the added value. It is called "the third revolution in the history of edible salt" by Yu Ruomu, renowned nutritionist, following the discovery of edible table salt and the addition of iodine. At the same time, with the refined salt as main ingredient, supplemented by high-quality materials, such as mushroom, chicken, beef, seafood and hot pepper, various spices are developed. Especially, aiming at the situation that certain place is esophagus-cancer centralized, the scientific researchers and medical experts in Ye County collaborate to develop riboflavin salt as an important way of auxiliary treatment to esophagus-cancer patients.

Drive the development of salt-making and salt chemical industry and promote the increase of comprehensive economic strength of Ye County. Depended on resources superiorities of salt, coal, water, electricity, the county government proposes a strategic conception of constructing the salt capital and constructing the salt chemical industry base. The county government draws up the rational development plan, tries to create a good economic environment, and formulates favorable policy of attracting investments. Because the government introduces the foreign capitals and supports the salt-making and salt chemical enterprises vigorously, these enterprises develop very fast and a good situation has been formed, where the salt-making and salt chemical industry and allocation circulation system of modern salt industry develop and promote mutually. After only 3 years, seven listed companies and large-scale enterprises

moved into Ye County to construct a batch of modern industrial projects with the investment exceeding a hundred million or ten billion, including Pingdingshan Coal Co., Ltd., Shenma Group, China Salt, Zhengda Group and Xinlong Group and so on. The project of 1,200,000 ton refined salt with the investment of 310,000,000 Yuan in China Salt Haolong Company not only has the biggest yield capacity per unit in China Salt system, but also possesses the biggest productivity among all the refined salt enterprises in China. With the total investment of 18,500,000,000 Yuan, the Circulation Economical Industry Garden of Shenma Group will have sales income per year of 24,000,000,000 Yuan after being completed. The total investment of Coal-Salt Chemical Industry Garden in Pingdingshan Coal Co., Ltd is 24,800,000,000 Yuan; when completed, the sales revenue will amount to 21,600,000,000 Yuan per year; the profit per year will amount to 4,820,000,000 Yuan and the tax will amount to 1,958,000,000 Yuan. It is equal to be an enterprise cluster of Pingdingshan Coal Co., Ltd. With the total investment of 133,000,000 Yuan, the salt dispatching center of Henan Salt Distribution and Dispatching Co., Ltd is one of 19 salt dispatching centers in China; meanwhile, it is also the most advanced dispatching center in Asia, with the highest degree of automation and the largest scale and output. At the same time, many projects, such as Chemical Industry City Project in Central China with the total investment of 48,800,000,000 Yuan as well as the second phase of 1,200,000 ton salt-making project in Pingdingshan Coal Co., Ltd, the new-built production line of 1,000,000 tons in Tianyuan, 250,000-ton caustic soda project in Pingdingshan Coal Co., Ltd, 300,000-ton PVC resins, 500,000-ton methyl alcohol, Methane Chloride Project of Hong Kong Fuming Group, are being constructed or prepared. The scale of salt-making and salt chemical industry of Ye County will be further expanded; it is estimated that the output of salt in the whole county can amount to above 5,000,000 tons at the end of "the 11th five-year plan". Moreover, when the 220 kilovolt Project of Transformer

Substation of Blue Light Power Plant and Datang Yanshan 2,000,000 kilowatt project of electricity generation are put into production, Ye County will become an emerging thermoelectricity base, which can continuously provide sufficient energy for the salt-making and salt chemical industry.

Now, the development model of salt resources in Ye County has developed into the industrial chain gradually with salt-making, salt chemical industry and coal-salt chemical industry from the sole salt-making pattern. In 2006, the salt output of Ye County amounted to 3,040,000 tons and the output value was 3,690,000,000 Yuan, accounting for 54.4% of the whole county; the tax revenue of salt industry was 189,000,000 Yuan, with the contribution rate to the county's finance of 60.2%. Salt-making and salt chemical industry has become the pillar industry of Ye County to become rich. At the same time, the development and utilization of salt resources has also led to the rapid development of private enterprises of Ye County. At present, Ye County has become the second big production base of motor tricycle in China, the biggest production base of leather shoes and processing base of Islamic red meat in Henan Province. The comprehensive economic power rose to the 58th in 2005 from the 102nd in 2001. It is chosen twice continuously to be one of the ten counties or cities in Henan province that have the most rapid development and the best benefit. It also enjoyed the treatment of Empowerment County. In September, 2007, Ye County was evaluated to be "The Capital of Salt in China" by national specialized agencies because of the big rock salt reserves, high grade and good development prospect and so on. It not only has realized the promotion from "The Capital of Salt in Central Plain" to "The Capital of Salt in China", but also has stridden into the list of the famous mining cities in China.

PERSISTING THE SUSTAINABLE
DEVELOPMENT AND TRYING TO
BUILDING THE GREEN SALT CAPITAL

During the process of developing the salt mines in the last 20 years, there have been some deep-seated contradictions and questions. For example, the organizational structure of salt-making enterprises is in a backward status of "small, disperse, weak, chaotic" for a long time as a whole; the management is extensive; the processing technology and equipments are backward; the variety of products is quite few. The profession admittance threshold is low. The availability of resources is low; the pollution is serious, and so on. How to transform the way of economic growth, realize the frugal, highly effective and circulation utilization of resources and taking the road of sustainable development to build "the Green Capital of Salt", are absolutely the most urgent duty. Therefore, the county party committee and county government attach much importance to the development of salt industry and the prompt adjustment of development mentality. Ye County government also invites well-known expert from domestic and foreign countries to carry on the revision of the salt industry development, taking the energy-saving and emission-reduction and the strategic development of ecology civilization as an eternal subject of salt industry.

1. Implementing the deep-development and lengthening the industrial chain unceasingly. After Ye County salt field was officially developed for several years, some salt-making enterprises have been completed one after another, including Yu Kun, Tian He, Shen Ying, Bao Jian, etc. But they are always in the stage of vacuum salt-making and liquid industrial salt production, without exerting fully the resources superiority. Therefore, after analyzing the market situation earnestly, the thinking of development has been adjusted into develop greatly salt chemical industry by extending the chain link of rock salt resources. The point is to take the salt chemical industry, coal chemical industry, nylon chemical industry, comprehensive utilization etc as the main line to produce polyvinyl-chloride, methyl alcohol as well as their downstream products like alkali, soda ash, tar intensive

processing products and so on and to try to construct diligently the important salt chemical industry base. After completing 1,200,000 tons salt-making project of Haolong Group, provincial salt industry distribution and dispatching center, Ye County has become an important refined salt production base and the biggest salt industry distribution base in our country. Simultaneously it succeeds introducing many big projects with big investment and long industrial chain, such as the Pingdingshan Coal Co., Ltd Coal-Salt Industry Garden. After the completion of these projects, the industrial chain of the salt-coal chemical industry will be further lengthened and Ye County will become the biggest base of salt chemical industry in China.

2. Strengthening the technological innovation and realizing the high-efficiency production. In the initial period of developing rock salt resources, the salt-making by pan was popular in the entire county, which not only can not guarantee the quality of product, but also causes the resource waste and pollution to the environment. Therefore, the county party committee and county government have banned this kind of salt-making method. In recent years, the key point is to introduce large-scale salt-making and salt chemical enterprises and do the scale-development and high efficiency production. 35 pairs of production wells that have been completed at present all use the reliable well-cementation technology and surface casing and technology casing with proper materials, and also use the ultrasonic wave oil well logging technology to examine strictly to the quality of the building wells. The international leading deep-level fracturing connection dissolving mining technology and the most advanced directional well group mining technology are utilized, with the recovery ratio above 23%, and these technologies have the advantages such as high density, large output, no pollution, long service life and higher recovery ratio of ore, etc. The fracturing connection technology of China Salt Haolong Company won the award "Hundreds of Staff Technology Cooperation Achievements in Henan Province", the second

prize of provincial technological progress. The Shenma Group invested more than 8 million Yuan for the chlorine alkali project to save energy, changing the previous traditional diaphragm electric tank into the ionic membrane electric tank. Only this item of technology makes consumption of the standard coal per ton product drop above 20%. The China Salt Henan Salt Industry Distribution and Dispatching Center uses the most advanced automated assembly line to enhance production efficiency. From the choosing and matching, packing to code-spurting, every step is automatically completely by robots.

3. Constructing industrial garden and taking the way of the intensification development. The construction of salt-making and salt chemical industrial garden is advantageous to the optimized disposition of resources and display industrial accumulation benefit, and is also beneficial for the construction of public facilities and the uniform management of "three wastes", which can also help to realize the coordinated development and sustainable development of industrial park. Therefore, five big industrial gardens are planned with the high starting point, such as Yancheng Industry Garden, Pingdingshan Coal Co., Ltd. Coal-Salt Chemical Industry Garden, Shenma Group Recycling Economy Industry Garden, Keddy Industry Garden, and Chemical Industry City in central China and so on. Moreover, when Pingdingshan Coal Co., Ltd Coal-Salt Chemical Industry Garden is completed, it will possess these productivities, including the annual output of 1,000,000 tons for polyvinyl-chloride, 1,000,000 tons for ionic membranes caustic soda, 1,000,000 tons for ammonium chloride, 1,000,000 tons for methyl alcohol and 3,000,000 ton for cement clinker. After Shenma Group Recycling Economy Industry Garden is completed, it will have produce 2,000,000 tons ionic membranes caustic soda, 2,000,000 tons PVC resins and 4,000,000 ton cement every year.

4. Trying to develop the recycling economy to realize the permanent utilization of resources. During the process of the

development and utilization of rock salt, not only the gold and silver mountains but also the blue water and sky should be guaranteed, and the "three wastes" should also be utilized completely comprehensively. The waste water should firstly be input into the main pipe line, and then poured into the underground salt deposit through the water-injection well, dissolving into bittern for extraction. As the rock salt accompaniment, gypsum should be dehydrated by the centrifuge and air-dried for sale as the side product. The waste residue and waste ash of thermal power plant are both used in producing the new building materials; Pingdingshan Coal Group 1,000,000-ton Cement Plant and the 3000-ton silicon carbide submicron powder project of Yisheng Company were completed when beginning the construction work, which utilize the wastes of the salt chemical industry and thermoelectricity industry. The cavity of underground salt wells are made full use of, in the meantime the recycling use of "three wastes" is achieved. At present, China Petroleum Group is cooperating with China Salt Haolong Company to carry out the project of gas storage inside the salt well cavity, investing 5,000,000,000 Yuan. This is not only one kind of professional innovation, but also the innovation of scientific development.

CONSTRUCTING THE CULTURAL CAPITAL OF SALT BY DEVELOPING THE SALT CULTURE

Ye County has a long history and glorious culture. It is also one of ten oldest cities in Henan Province, with abundant human landscapes, natural landscapes and cultural tourism resources. The construction of "the Capital of Salt in China" is the combination of material civilization and spiritual civilization, which not only reflect the intrinsic integration of industrial chamber of commerce and historical city, but also embody the industrialization, urbanization and agricultural modernization of Ye County. Along with the vigorous development of salt-making and salt

chemical industry', Ye County has become an important base of salt-making and salt chemical industry and salt industry physical distribution center in the middle of China. The practices at home and abroad also fully prove that modern industry projects with some typical meaning may become one part of the industry of culture and tourism, such as France's Citroen, Germany's Volkswagen, US coin-making and the distinctive travelling of Beijing Steel Corporation and Haier industry. Therefore, Ye County salt-making and salt chemical industry not only drives the industrialization and urbanization of Ye County, but also stimulates the travelling industry of natural landscapes with the characteristic of culture, which is becoming the important component of distinctive cultural travelling of Ye County.

1. Planning the construction of all kinds of projects; cultivating the bright point of industrial tourism. According to the expert's advice to the planning, five characteristic industrial parks including Pingdingshan Coal Co., Ltd. Coal-Salt Chemical Industry Garden, Shenma Group Recycling Economy Industry Garden, Keddy Industry Garden, is being constructed; ecology, environmental protection and sustainable development are also underlined. Giving prominence to Greening, beatification, and openness, forward-looking, the sightseeing corridors are constructed in each important industry garden to enable each enterprise and each industry garden to have the luminescent spot.

2. Developing projects and products with the salty characteristic; enriching the connotation of salt culture traveling. Unifying the construction of Henan Salt Industry Dispatching Center, aiming to the salt-making by robot and producing a series of salt products including each kind of nutrition and health care salt, beauty treatment salt products, fruits and vegetables washing salt, eco-tourism projects of salt industry are about to be formed to meet the diverse shopping need of tourists. With the total investment of 200,000,000 Yuan, taking "floating in saline lakes and keeping youth by salt bath" as the characteristic, the biggest

inland "dead sea" in central China will be completed soon. After the completion, it will promote the service of characteristic projects of leisure and physical therapy, such as floating bath, salt bath, salt sauna, salt massage, for creating the high-quality goods with fashion and traveling including ecology, scouring bath, keeping healthy, hairdressing, entertainment, conference, board and lodging, etc. Salt culture garden and salt museum which is being constructed will demonstrate the mineral resource distribution, development history, production technique, widespread utilization as well as the interesting things related to salt through the picture, writing, model, illustration and multimedia demonstration and so on. This lets the tourist thoroughly understand the colorful salt culture.

3. Construct Kunyang new town of the salt culture characteristic with high standard. It will be and planned and constructed by using the market mechanism, according to the overall layout of western old city, business area in the middle, eastern cultural and leisure area. In the next step, the Yashu culture, Yegong culture and salt culture should be integrated closely. While cultivating these historical places like Ming Dynasty County Administration, Jin Dynasty Confucian Temple, Yegong Cemetery into the historical culture landscapes, the Kunyang ancient tower and ancient city wall should be reconstructed; human landscapes should also be protected and developed, such as Ye line of Kung Tzu tourism, Chu Great Wall Ruins and so on. The Key task is to implement the city projects including the road, green ground, park touring, and urban river

system and to develop these buildings with the characteristic of Salt Capital to demonstrate the unique urban style. Meanwhile, speed up the construction of small towns and try to make the population of the whole county over 230,000 at the end of "the 11th five-year plan" to enable the Kunyang old city to become a rich, harmonious and civilized new town in central plain of China.

4. Realizing the perfect fusion of the old city history civilization, the modern industry civilization and the ecological natural landscape diligently. The great poet Li Bai once wrote the poem to praise the exquisite natural landscape of Ye County. Situated at the suburb, the good transportation superiority is more advantageous for Ye County to develop each kind of leisure traveling and sightseeing trip. Therefore, Sha He Park is being planned with a high standard to make it become the beautiful color stripe as soon as possible. At the same time, based on the construction of Yanshan reservoir, constructing the influential convention center and water sports base. Further develop the natural landscape including the Wangfushi Mountain, Gushitan Reservoir, Shimen Mountain, Jiang Wu Tai and so on; unify the new rural construction to develop agricultural tourism projects to try to develop Ye County into the "hawk city garden" of Pingdingshan residents for rest and recreation.

SEA /LAKE SALT AND BIOLOGY