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The Research of Existing Problems and Countermeasures for Gypsum Exploitation and Usage in Tai'an

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Abstract: Gypsum is a kind of important nonmetallic mineral resources which is widely used in various sectors of the national economy, especially as the main and new raw material for building. The quantity of natural gypsum in Tai'an is very rich, and most of them are large deposit of recoverable ones with about 36 billion tons in total. The rich natural resources of Tai'an will undoubtedly play a decisive role in economic development for the city.

Based on the field survey for the development of Tai'an's gypsum industry, and from the angle of effectively utilizing natural resources, research was carried out to the development direction of the comprehensive utilization of gypsum resources there. This research will impact an important influence on raising comprehensive utilization level and value, improving the environment and increasing the economic benefit from gypsum resources, therefore showing the important significance for plaster industry in Tai'an and its sustainable development.

Keywords: gypsum, mineral resources, development, utilization

1. GENERAL SITUATION AND DEVELOPMENT PROSPECT OF GYPSUM RESOURCES IN TAI'AN CITY

Gypsum has become the main building materials in the world today, in addition to the use of cement, ceramics, chemical, pharmaceutical, food, and textile industry, all kinds of gypsum products including gypsum wall material and gypsum cementitious materials have been widely used in construction, especially the various gypsum decorative products has become the popular interior decoration materials [1] worldwide. Gypsum products with characters of non-toxic, odorless, easy processing, light, shock proof, insulation, waterproof and comprehensive industrial wastes' recycling, are natural green environmental protection materials for building.

Shandong province is rich in gypsum mine resources, reserves accounted for 65% of the country. Tai'an city is located in the central area of Shandong Province, and the quantity it reserves is the largest one in Shandong. Dawenkou area, Ningyang area and Tai'an-Laiwu area, which belong to the popedom of Tai'an, have quite rich natural gypsum mineral deposits. And most of them are large and have proven with the quantity of 360 tons. In recent years, with the development of industrial technology, of the mining and of the processing, Tai'an has sufficient technical level and strength. With the development of the construction industry technology for processing, a broad market has been provided for the so called "green building materials, safe building materials and comfortable building materials" of gypsum [2].

2. DEVELOPMENT AND UTILIZATION OF GYPSUM RESOURCES IN TAI'AN CITY

Nowadays, because Tai'an Dawenkou gypsum mine stopped production, in addition to Man Zhuang and Ma Zhuang, there is no mine in the city being formally put into mass production of gypsum. So, even the local

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gypsum resources are extremely rich, the gypsum products need to be purchased for factories and cement plants from other places. This phenomenon has attracted the attentions from the relevant departments of governments. At present, Tai'an city will have more than 100 million tons gypsum which could be exploited annually because of 4 established mines and 3 planning mines.

At present, Tai'an gypsum product varieties are: gypsum board, gypsum hollow lath, decorative ceiling, gypsum relief decoration products, gypsum powders and gypsum blocks. In addition to Taishan gypsum board plant with its size relatively large, equipments relatively good, quality excellent and performance versus price high, there are only some small plants with small scale, backward production technology and equipment as well as low efficiency of producing in Tai'an.

3. ANALYSIS OF PROBLEMS AND THE REASONS FOR THE DEVELOPMENT AND UTILIZATION OF GYPSUM RESOURCES IN TAI'AN CITY

3.1 Industry structure is not reasonable, and overall planning is absent

The industrial layout scattered and agglomeration effect is not obvious and the remote, thus leading to poor sales. The regional economic development in Tai'an is uneven. And the capital of mining and deep processing for the gypsum mine is not enough, either. And there is no competitive production and no long term planning for those small scale enterprises. Furthermore, exploiting large deposit as a small one is the other big problem. According to the survey, Tai'an gypsum mine is a large deposit, suitable for large, medium-sized enterprises mining. However, there are many small mines which divided the source separately, and leading to a serious problem to a possibility of large enterprises for scale of operation.

3.2 The reasonable mining method is lacking

3.2.1 Disordered mining, mining the rich and abandoning the poor

The advantage of Tai'an gypsum resources should be fully protection scientific exploited and comprehensive utilized. However, the vast majority of mining enterprises, driven by economic and immediate interests, select the thick layer, single character ore, better quality, easy exploiting, low investment and fast returning resources to exploit. Therefore, it causes serious waste of resources. In addition, according to the characteristics of plaster distribution of mineral resources in Tai'an, carrying out exploitation should be from top to bottom layer by layer. But the most mining enterprises don't care the layers and digging the resources at their convenience, which resulting impossible exploitation in a large number of gypsum mineral resources.

3.2.2 Mining blasting method is lack of scientific rationality, therefore resource recovery rate is not high

Gypsum mines in Tan'an characterize its body generally in small thickness, and therefore require a higher technology in the mining of blasting. And in the mining of blasting process, some of the mining enterprises can not scientifically distribute holes blasting connection and blasting dosage according to the occurrence of orebody, thickness and distribution, thus causing some gypsum crushing, unable to recovery and utilization. In addition, the wall rocks tend to be destroyed in some degree, since the blasting control technology is not taken appropriately.

3.2.3 Mine safety

Not standardized, unscientific mining lead to the roof fall. And at the same time, the deep mining in advance and shallow mining delay cause the floor heaving, ground subsidence, dislocation and some hidden troubles of safety. The historical legacy of the old holes location is also not clear, which brought great pressure to working safely.

3.2.4 Ecological and geological environment of mine deterioration, geological disasters have often occurred

Serious harm has been made to the ecological environment around the mining enterprises by the gypsum exploiting through so called "three wastes", waste solid, waste liquid and waste gas, in mining area, thus polluting the groundwater and soil, as well as inducing the settlement of ground subsidence in partial area.

3.3 The scale of this style of enterprises is not large enough to avoid fierce and homogeneous product competition

Based on the geological survey, in the area of southern Dongping County to Ningyang County and Wenshang, Qufu, Sishui as well as the area around east and north of Pingyi, Dawenkou and its surrounding area, there are three large deposits of gypsum with 36 billion tons reserves for the exploitation from Tai'an city to the east of Laiwu city, which also occupies an important position of its quantity with relatively good quality in China [3]. According to the actual mining and geological exploration data, in the Tai'an area, most storage gypsum have their calcium carbonate content between 50% to 85%, a part of them are above 95%, which can meet the quality requirement of various uses and deep processing products. But the above several large mineral deposits are in the state to be exploited in large scale.

In the competition of the products, there mainly exist the following problems. First of all, gypsum exploitation is relatively concentrated and the quantity of production is far greater than demand, therefore market competition is intense. So, in order to fight for the limited market, all the enterprises carried out low-price competition strategy, thus causing local gypsum market stagnant for a long time. This situation led directly to the gypsum products industry the slow development and low grade of gypsum products. The primary products occupy more proportion than the processing products, particularly high added value of final products. Secondly, gypsum products processing enterprises have only simple equipment, backward technology, thus leading to poor quality, serious environmental pollution and low prices. Thirdly, the market is not under standardized management, which make the market can not guide the circulation and consumption correctly. Particularly, a lot of private small businesses take full advantages of its low investment cost and low production cost to develop plants rapidly near the abundant raw materials, and process low level production, which greatly damaged the gypsum board reputation, and affected the healthy development of the industry.

3.4 The industry chain is short, low added value of products

At present, 70% of sales volume of gypsum is in form of ore in Tai'an city, which seriously affected the economic efficiency of enterprises. According to the users' feedback, except gypsum powder for building, no other local product of gypsum can be compared with those from other place. Generally speaking, the whole industry chain is short with its low level of development, and the added value of the products is low. At the same time, the vast majority of mining enterprises use paste for recovery backfill, rather than comprehensive utilization, hence the economic efficiency keeps down.

4. CONCLUSION

4.1 Enterprises should set up the consciousness of environmental protection, to achieve the orderly exploitation

4.1.1 To formulate the overall strategy, layout and development of gypsum resources

The relevant enterprises should formulate the overall strategy which is conducive to the overall development of gypsum industry in Tai'an as soon as possible, hence conducive to the economy development

and environment protection.

4.1.2 Legal, rational and scientific exploitation

Exploitation should be legal, scientific consciousness should be raised and technical action should be standardized. Rational and orderly exploitation should be implemented according to the design. Cleaner production technology should be adopted strictly to control the pollutant emissions.

4.1.3 Scientific assessment and planning should be strengthen for its development and the protection of mining area

Scientific evaluation and planning should be carried out for the safe producing and environmental protection, furthermore, for the steady and sustainable development of the enterprises. Mineral exploration efforts and investment should be increased, and overall structure as well as individual structure of mining industry should also be adjusted. Doing so can help increase the benefits from the industry scale of gypsum enterprises more significantly, therefore, helping Tai'an gypsum industry into the new development stage.

4.2 The direction of technology development of gypsum

From the analysis of the present situation of the Chinese gypsum comprehensive utilization, both theoretical researches and industrial applications are obviously valuable. In the cement production enterprise, amount of gypsum in cement output is about 3% to 5%. According to the total cement output, 500 million tons, in China, the annually demand of gypsum is about 15000000 tons. [4]. In fact, the application of gypsum for retarder of cement and building materials are practical. From the economic point of view, of building materials products enjoy the higher added value. Comparing with other kind of gypsum, which come from flue gas desulfurization is better, and has more advantages in the application. [5] Phosphorus gypsum can be made into beta hemi-hydrate gypsum for direct sales after washing, baking, grinding and powder refining [6]. And phosphorus gypsum products belong to the "three wastes" utilization project, greatly increasing the market competitiveness of products [7]. Although desulfurization gypsum is as better as natural one, it still needs to further strengthen relevant application technology research and incubate market.

4.3 To extend the industrial chain and increase added value of product

4.3.1 To strengthen the transformation of product technology.

At present in Tai'an, decorative gypsum board, gypsum hollow lath, gypsum block and gypsum relief decoration products are mostly made in a semi mechanical or manual production state. So low production and low economic efficiency is inevitable. In order to solve the problem mentioned above, gypsum products processing enterprises should increase the intensity of technological transformation, improve the level of equipment and product quality, as well as expand the scale of production, thus making better economic benefits from the products with good market prospect.

4.3.2 To actively develop new products, optimize the industrial structure

The fiber reinforced gypsum board should be actively developed in production and sales. With the progress of construction industry and gypsum producing technology, fiber reinforced gypsum board will gradually occupy the market and replace common gypsum board [8]. At present in those developed countries, fiber reinforced gypsum board has begun to dominate the market. China's Hubei province and Liaoning province have two companies which have undertaken the construction and installation of fiber reinforced gypsum board production lines. Therefore, Tai'an, as the base of gypsum exploitation and gypsum product, has to establish fiber reinforced gypsum board production line from now on. Looking into the future, the development of new products with strong vitality, high strength gypsum and gypsum powder should be done [9]. At present, Tai'an's gypsum powders are used in the manufacture of gypsum products and building putty. But rendering powder

used to paint the building interior wall as well as high-strength industrial powder could occupy a big market. And at present, only Ningxia has an introduced advanced production line for making rendering powder at home. Therefore, the development and production of gypsum powder for painting and high strength gypsum powder in Tai'an is a favorable opportunity.

4.4 Tai'an municipal government should increase the support for gypsum industry

The measures for supporting the industry should be as followed

4.4.1 Strengthen the management and save the resources

First of all, the government relevant departments should act with united strength, strengthen the mine management, strictly administer according to laws, and immediately stop the approval of establishing new exploitation enterprises. And meanwhile, prohibit disorderly open any unchecked excavation well, formulate the relevant indicators, and strengthen assessment. Secondly, establish the mining technology institutions in mines, train of technical personnel and perfect information as well as account of reserves.

4.4.2 Handling disordered mining and cutting digging behavior for exploitation.

The mine enterprises which randomly mine resource with consumptive waste or potential safety problems must be punished according to laws. The project which does not comply with the environmental policy shall be ordered to stop constructing and stop producing. Resolutely make the mining enterprise which is not accordance with standards rectify. After rectification, if it is still not meet the requirements of the rules, the license of mining should be revoked.

4.4.3 Build up gypsum comprehensive development base

The gypsum mine under Tai'an and its surrounding area is one of the few large mine area of its kind, with good quality, easy to exploit, suitable for establishing production base integrated selecting, exploiting, grinding and processing. The municipal government should break the traditional regional restriction, strengthen economic and technical cooperation and organize the cross-area development corporation, thus creating scale economy, rationally developing gypsum resources, grading and increasing the comprehensive utilization degree, solving the problems of ore processing, utilization of waste, industrial by-product gypsum and environmental pollution, hence saving resources, enhancing the competitiveness of products and improve the economic benefits [10].

4.4.4 Gypsum industry should establish self-discipline mechanism, self-restraint, and mutual development

Because Jiangsu and Shandong gypsum resource region across two provinces and their three cities. It is hard to coordinate the various relationships between mines. Federation should be established to coordinate all mines in this area. It can be responsible for market research, make production, make price adjustment timely, organize communion of mining technology, seek to share interests and realize common development. Besides, it can also formulate industry policies and perfect various kinds of technical standards, therefore make the gypsum industry has its regulation to obey from exploration, mining, processing, quality inspection and sales, which can gradually reach the world’s practice of gypsum industry.

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REFERENCE

[1] Zheng Tao. (2013).Present situation of gypsum mineral resources in China, Heilongjiang science and technology information, （23）:115.

[2] Zhang Zhan. (2013).Gypsum industry technology innovation and the construction of green ecological home -- written in "China summit of comprehensive utilization of gypsum resources ", China building materials, （2）:84-85.

[3] Yang Ronghua. (2007).The current situation of comprehensive utilization and development direction of gypsum resources of Tai'an . Ms D Thesis.Shandong: Taishan medical journal,

[4] Zhang Gengfu. (2013).Survey on industrial by-product gypsum and suggestions for comprehensive utilization . Anhui chemical industry, 2:29--32.

[5] Zhang Yi. Flue gas desulfurization gypsum - research of flying ash materials for wall, Ms D Thesis. Ningbo: Ningbo University,

[6] Li Chunhong, Qin Gang. (2011).Progress in the utilization of phosphorus gypsum as industrial resources . Sichuan building materials, 6: 1- 3.

[7] Han Qing, Luo Kangbi .(2012).Development and utilization status of phosphorus gypsum. Chemical technology, 2:53-58.

[8] Lu Hailin. Research on desulphurization gypsum for Portland cement producing. Ms D Thesis. Nanjing : Nanjing University of Science and Technology,

[9] Sun Zhenguo, Zhang Yao.(2013) .Fiber reinforced. desulfurization gypsum hollow slab in the application of building system New building materials, 6:36-39.

[10] Wang Qingrong, Li Jianjun, Pan Shuqin, Guo Wenjie. (2012).The characteristics and applications of industrial by-product gypsum in cement production, . China cement, 12:69-72.