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The Competitiveness Analysis of Tungsten Industry: A Case from China

Hongzhang Chen
The Collaborative Innovation Center, Jiangxi University of Finance, Jiangxi Nanchang 330013
Email: *chenliu3000@163.com*

Abstract: this paper review the history of tungsten industry development in China. Then we illustrate the distribution of tungsten allocation in China. After that, we analyze the competition of China tungsten industry. Based on the current competition, we provide suggestions. This paper focus on the China tungsten allocation, but it can offer general and meaningful policy for the other developing countries.
Key words: competitiveness analysis; Tungsten industry; China

1. INTRODUCTION

Tungsten has a history of hundreds of years in China. The development of tungsten industry can be roughly divided into three stages: First, tungsten industry forms a relatively complete system in thirty years from the founding of the People's Republic of China in 1949 to 1979. Second, over the period 1981 – 2000, the smelt and process of tungsten and hard alloy develops quickly, the product structure has undergone great changes such that the export reliance situation has been changed. Third, after entering into the 21st century, the industry development of tungsten has entered a new period.

As one of the most important rare mineral resources, tungsten is an irreplaceable strategic resource in the national economy and the modern national defense. It is characterized by the three high (high density, high hardness, high melting point). With the rapid development of China's industrialization and urbanization process, the application of tungsten has been expanded and the development speed is very fast. Meanwhile, a series of problems have exposed: the tungsten mineral resources has exploited excessively but the market price of tungsten mineral resources is over-high; the development of the industry chain, middle and downstream industries is not balanced; the whole industry is distributed widely such that the size is small and the concentration is low; the product is single and lack of innovative designs. The existence of these problems has seriously affected the healthy and orderly development of tungsten industry in China, which greatly reduces the overall international competitiveness of China's tungsten industry.

2. ANALYSIS OF TUNGSTEN RESOURCES

Tungsten belongs to the rare elements, in the earth's crust abundance of 1.1 * 10 4%, minerals are mainly for Wolframite and Scheelite, followed by Tungstite, Tungstenite etc[1]. According to the U.S. geological survey in 2011, the reserves of tungsten all around the world are 3100000 T, China has 1800000 T, reserves bases are 1900000 t, accounting for 61.3% of the world's total reserves, ranking first in the world. The tungsten resources in the whole world are mainly concentrated in China, Russia, the United States, Canada and Bolivia, the five countries together accounted for 85% of the world's total reserves. While Chinese production of tungsten is concentrated in Jiangxi, Hunan and Henan, these three provinces accounted for 84% of total production. In 2012, according to the Ministry of land and resources data show that the total reserves of tungsten resources (tungsten reserves, basic reserves, resources) reached 5526300 t.

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In southern Jiangxi Province is located in the Middle East section of Nanling nonferrous metal metallogenic belt, the advantage of rich mineral, non-ferrous metals, precious metals and rare earth metal mineral resources is obvious. The tungsten mineralization (especially in wolframite) concentrated high degree of rare in the world, the tungsten resources reserves ranked second in the country, which the main mineral resources of wolframite (WO3) ranked first, the reserves accounted for 39.62% of the national total. According to relevant statistics, static service life of tungsten resources reserves is 10 - 15 years. The Daji Mountain, Pangu Mountain, West Mountain, TieShanlong, Dang Ping, Xiaoping, Xialong, Piaotang and other more than 10 large and medium-sized tungsten tin deposits, which belongs to the Jiangxi Tungsten Industry Group Co. Ltd, their yield of wolframite once occupied the 70% of the black tungsten production, they have the pivotal states in the country and the world, they made a historic contribution to the country exports and through the difficult period of three years.

3. THE ANALYSIS OF TUNGSTEN COMPETITIVE POWER

3.1 THE ANALYSIS OF SCALECOMPETITION POWER

Tungsten is one of the superior resources of our country. Its scale is huge, distributed in 23 provinces (cities, autonomous regions). According to China Nonferrous Metals Industry Association statistics, in 2010, China's tungsten mining capacity (amount of tungsten metal) 56000 tons / year, mineral processing capacity (equivalent to tungsten metal volume) 75000 tons / year, compared with 2006 growth of 33.33% and 25%. According to preliminary statistics, there are 382 tungsten deposits in the country. Located in Hunan (scheelite mainly), Jiangxi (wolframite mainly).

By the end of 2011, the number of above scale of tungsten enterprise in Jiangxi Province is 94; annual main income is 30.51 billion yuan with an increase of 54.5% relative to the last year. The profit is 2.4 billion yuan with an increasing of 98%, the growth rate chain fell 24 percentage points. The tax is 1.21 billion yuan with an increase of 68.9%. Tungsten industry practitioners for 29348 people, compared with the same period last year increased by 7.7%.

Take Ganzhou as an example. Only in Ganzhou, the tungsten reserves accounted for 26% of the world. The main ore type of Ganzhou is quartz vein type wolframite deposit, black tungsten reserves accounted for more than 90% of tungsten resources, high-quality wolframite retain reserves accounted for about 70% of the same type of ore, 60% share of the world. And 106 of the reserves have been found and proven reserves, the cumulative proven reserves (WO3) 1.17 million tons. In 2012, the world class Super Large tungsten reserves up to 106 million T (Dahutang tungsten) has been found in Wuning County, Jiangxi Province. It has been assessed for world-class scale of large deposits, and expected to become the world's largest tungsten mine by the Provincial Bureau of Geology.

And, on January - November in 2012, the Gan County, which is under the jurisdiction of Ganzhou City, its tungsten industry output breakthrough 100 billion, up 108.2 billion yuan, compared with the same period last year increased by 12.5%. It is occupied 55% of the total amount of industrial, which is still maintained a double-digit growth under the current downward economic pressure. With the development of tungsten and rare earth industry, the relevant supporting industries, supporting industries and product application development has gradually been developed, and the aggregation effect was significantly enhanced. At present, there are 3 enterprises of county tungsten, rare earth industry

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which the annual sales income exceed 1 billion yuan, there are 10 enterprises that the taxes exceed over 10 million yuan. In recent years, the county formed the world Ruixin material as the leading tungsten industry clusters as the tungsten industry chain, becomes the longest one of the counties and cities.

3.2 THE ANALYSIS OF PROFIT COMPETITIVE POWER

From the overall supply and demand point of view, in 2013, Chinese consumes 31000 ton tungsten, decrease slightly of 3%; but the demand for foreign markets continued to shrink, the total exports of tungsten products fell by 20%, the output and import volatility is not big, Thus lead to excess 23120t directly. Continued to rise in the price of ore, the downstream demand is not affected, the surplus products transfer to large enterprises.

From September 18 in 2013, the Pan Asian exchanges will be "adjusted to" commodity bar "APT" transaction. Trading enterprises involved in lots of apt vendors in Ganzhou area, including Gan County Ruixin Material Co., Ltd., Ganzhou Haisheng tungsten and molybdenum Group Co., Ltd., AXA Tungsten Industry Co., Ltd. In Yudu County, Zhongxin mining industry Co., Ltd. in Nankang City, Zhangyuan tungsten Industry Co., Ltd. in Chongyi. It is understood that the role of trading platform mainly concentrated in the corporate finance services, based on the special situation in 2013, the enterprises in Ganzhou region, especially apt smelting enterprise funds are very tight, the Pan Asian exchange fast into the tungsten city provides an opportunity. As of November 8 in 2013, the Pan Asian inventory: APT 1450t, bars 431.950t. If the exchange continues to intervene, it may be a supporting role in the price of smelting products, but the current situation is that the impact on the market is limited. In December 2013, the whole of the city is still trading light, low price.

Overall, the operating characteristics of 2013 tungsten industry perform in the following areas: ①the prices of tungsten fell, tungsten mine concentrate prices up to 160000 - 158000 yuan per ton, followed by a quick callback; ②the supply and demand excess, exports fell 20% year on year-on-year basis, the supply is excess of 23000 t. For enterprises, first is that the operating conditions are different. Since 2013, the average operating rate of corporation of tungsten mine products is about 70%. Among them, under the impact of ore prices continued high, most of the mines started rate is good; for the corporate that have no tungsten mines, cost of upside down, the operating rate in second quarter is obviously insufficient, semi of them are shutdown; but for the corporate that have tungsten mines, the operating rate is up about 90%. According to different types of products, tungsten products enterprises vary the operating conditions, affected by the decline in exports, part of the production cut 15%. The second is the decline in profits. According to the statistical data of China Tungsten Industry Association, 97 member companies in 2013 in the first half of the main business income of the same growth increase 15%, the profit decreased 25%, 17 companies are deficit. The enterprise involving smelting products obtain greater profit.

3.3 THE ANALYSIS OF EXTERNAL TRADE COMPETITIVE POWER

Foreign trade competitiveness refers to the ability to develop, occupy the market and gain profit that the domestic product、industry and enterprises in the foreign market which open up our country[2]. The competitiveness power of foreign trade is reflected in the foreign trade competitiveness power of the product, the foreign trade competitiveness power of the industry and foreign trade competitiveness of the enterprises.

The foreign trade competitiveness power of the product,

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which is the competitiveness power of export products, refers to the ability that a country's goods meet consumer demand in the international market, occupy the international market and obtains profits.

Annual export volume: in 2013, China's exports of tungsten products is 18323.6t (metal content, not hard alloy, the same below) [3], decreasing with 15.76%, exports 0.92 billion dollars, decreasing with 22.47%. Among them, with the Free Trade Zone export quota of 77.34%, down 3953.3t, down 24.92%. Excluding the amount of tungsten products for export in Free Trade Zone, it finishes 70% of the annual target. It exports hard alloy 4656.9t (tungsten metal), increase 22.44%, accounting for 17.77% of the total amount of hard alloy, exportsreach 0.382 billion dollars, increase 8.23% (shown in Table 1):

Table 1: categories of tungsten export during 2009-2013 (unit: t)

Year	Exports	Quota tungsten	Ferrotungsten	Tungsten material	Un-sintered metallic carbide	cemented carbide	Others	Exports excluding cemented carbide (EECC)	Dollar for EECC (0.1 billion)
2009	18408.70	9422.30	881.60	2051.60	2833.90	2777.60	441.70	15631.1	4.07
2010	29995.54	17029.30	970.60	2057.40	3578.20	3986.20	2373.84	26009.3	8.43
2011	31621.60	20199.10	748.10	1909.50	4420.60	4084.40	259.90	27537.2	15.44
2012	25861.67	15863.06	349.07	1387.10	3433.78	4109.08	719.58	21752.59	11.86
2013	22980.50	11909.70	55.02	1280.32	4331.35	4656.88	747.23	18323.62	9.20

Source: compiled with custom data.

The tungsten exports to Europe have increased with percentage of 26.19%, accounting for 10.76% of total exports, increases 6.27 percentage points; the amount exports to other countries and regions of tungsten products have varying degrees of decline. Which exports to Japan, South Korea, the United States and Asia (including Japan and South Korea) of tungsten, the products volume of the same period last year decreased 28.29%, 28.13%, 7.9% and 26.37% respectively, accounting for the proportion of total exports were 18.94%, 18.90% and 23.02% and 47.07%, the American proportion increase 1.97%, Japan, South Korea and Asia (including Japan and South Korea) proportion were reduced 3.31%, 3.25% and 6.78%. As shown in Tables 2-3.

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Table 2: the comparison analysis of tungsten export during in 2013				
Country/area	Exports (tons)	Account (%)	Exports(dollars)	Average price(dollars per t)[1]
Japan	3 469.92	18.94	183 437 790	52 865.06
Korea	3 464.07	18.90	171 891 703	49 621.35
Other Asian countries	1 690.95	9.23	66 942 950	39 588.99
Asian	8 624.94	47.07	422 272 443	48 959.46
Europe	4 798.05	26.19	247 083 859	51 496.76
USA	4 217.76	23.02	220 159 842	52 198.34
Other countries	682.87	3.72	30 319 591	44 400.24
Total	18 323.62	100.00	919 835 735	50 199.46

Source：compiled with custom data.

Table 3: the distribution of tungsten export during 2009—2013 (%)					
Country/area	2009	2010	2011	2012	2013
Japan	18.90	26.80	24.10	22.24	18.94
Korea	8.60	13.30	17.00	22.16	18.90
Other Asian countries	15.10	9.60	7.90	9.45	9.23
Asian	42.60	49.70	49.00	53.85	47.07
Europe	26.20	25.30	28.10	19.91	26.19
USA	27.00	20.00	19.10	21.05	23.02
Other countries	4.20	5.10	3.80	5.18	3.72

Source：compiled with custom data.

Export prices: in 2013, the British "Metal Bulletin" APT (alpha technology) offer (on average) in 290-420 $/t interval running. In general it rose after the first down trend. In January it operates smooth in 297.5 $/t degrees; from the end

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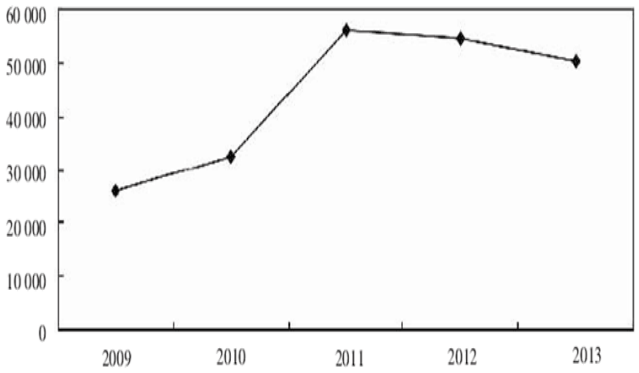
of February to mid of May, operates in the level of 351.5 $/t; from mid of May to the end of July, it was a rising trend, the price rose from 417.5 $/t to 351.5$/t degrees; from the end of August to the end of December, it showed a decline trend, the price from 417.5 $/t to 377 $/t degree.

China's average annual price that exports of tungsten products (total amount of exports / total exports, excluding hard alloy) was 50199.5 $/t, down 7.96% compared with 2012. As shown in Figure 1:



source：compiled with custom data.

Figure 1: the average annual price of tungsten exports during 1998-2013

In 2013, the average price that imports of tungsten products (including imported tungsten concentrate) was $35232.2 $/t, down 15.92%. Among them, the annual average price of imported tungsten concentrate is 25859.1 $/t, down 20.74%. Excluding tungsten concentrate, the average price of imports of tungsten products is 109039.6 $/t, an increase 6.46%, the annual average price of imports of tungsten products is 2.17 times the annual comprehensive price of tungsten products.

The foreign trade competitiveness power of the industry and,refers to the ability to competition of a country's industry and the combination in the international market. On the industrial structure, although the province tungsten industry has achieved great development, the conversion rate of mineral products has been greatly improved. But mainly rely on the development of mineral resources, the situation has not changed, the tungsten products mainly in primary products, lack of deep processing of products with high added value; in terms of talents, it has not build a platform to attract talented people of Jiangxi tungsten industry; in terms of technology, only imitate and learn to the existing technology, seriously lack of the ability of independent innovation technology, the tungsten enterprises mostly do not have their own R & D institutions and R & D funds, and, it is not closely contact with the universities and research institutions. The development direction between enterprises and production structure is almost the same, and it has not formed the labor situation that carries out the professional division of labor with their own advantage.

The foreign trade competitiveness of the enterprises;it refers to the ability to survive and develop in the international market, when enterprises compare with the competitor in the product development, production, marketing and after-sales service in the international market. In mineral processing, mining, smelting process and so on, our country has reached a high level, to meet the basic needs of tungsten products at home and abroad.

According to the statistics of China Tungsten Industry Association, the country has more than 170 kinds of tungsten smelting factory, capacity of production of ammonium paratungstate (APT) is 180000 tons, which the enterprises that can product 1000 tons or more have about 20, mainly concentrated in the Ganzhou, Zhuzhou, Xiamen and Zigong, which the apt production capacity of an enterprise in Ganzhou City is more than 3000 tons / year. More than 70 tungsten powder production capacity reached 0.0616 million tons, the

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production of tungsten powder and tungsten carbide powder mainly concentrated in Xiamen tungsten Co., Ltd., Zhuzhou Cemented Carbide, Zigong hard alloy and Nanchang hard alloy enterprises.

3.4 THE ANALYSIS OF COLLECTION COMPETITION POWER

The development of China's tungsten ore is mainly reflected in 14 provinces (autonomous regions, municipalities directly under the central government), the yield mainly concentrated in the central region. In 2011, in the eastern, central and western regions, the mining (processing) amount of tungsten ore respectively is 1.5885 million T, 1.2287 million T and 0.7802 million T, ratio of 2: 14: 1. The resource exploration in the central area is obviously concentrated. Among them, Jiangxi is the main producing areas in China, the annual mining (processing) tungsten ore accounted for 60.88% of the country.

"Tungsten industry is a resource of raw materials industry"[4], Jiangxi's current development and industry aggregation mainly rely on natural resources, the market threshold is low, and there is a certain comparative advantage. But the comprehensive utilization of resources is in a low level, new technology、new product development of tungsten deep processing and the capacity of production is still relatively low, it cannot produce ultra pure compounds、high performance cemented carbide and other products. Although the conversion rate of primary mineral product has increased, but it is still the primary intermediate products. Jiangxi tungsten industry is far from the environment that format capital, technical elements of aggregation and promote the industrial development of the as a whole.

But in order to implement the national tungsten industry policy, the provincial government focus on cultivating ten strategic emerging industry development strategy, and make full use of resource advantages and industrial base, and build cooperation and exchange platform with foreign countries actively, to promote the strategic cooperation in the higher level of tungsten industry, and strive to build Jiangxi into the world's leading tungsten hard alloy and knife tools industry base.

3.5 THE ANALYSIS OF TECHNOLOGY (R & D) AND TALENTS COMPETITIVE POWER

With the advent of the new century, China's tungsten industry presents a leap forward development, it gets into a new stage that includes the integration of resources, structural optimization, technological innovation and product upgrades. The layout of the tungsten industry is more reasonable; the structure of the product is further improved; the smelting technology in tungsten leads global; the tungsten smelting equipment constant innovation, the economic strength and the international competitiveness of the tungsten industry have been greatly improved. The independent innovation of the short process, low emissions, high efficiency of tungsten extraction of metallurgical processes continue to emerge, some of the new process have begun to apply to industrial production. The following describes the technology and talent competitive power, respectively.

First, over the past ten years, the technology innovation field of tungsten smelting has entered in a new era, new process technology continues to emerge, and this innovation is mainly concentrated in China. At present, the main technology used in the field of tungsten extraction and metallurgy in China is alkaline and alkaline ion exchange and acid extraction process. The basic ion exchange process initiates first in our country and used in more than 90% enterprises. It has a great influence in the field of tungsten smelting, and has made a historic contribution to the development of China's tungsten industry.

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But when people pay more attention to the environment, a series of environmental problems appears. For example: ion exchange process with large amount of water, wastewater emissions, emissions of large, heavy metals, etc.. Therefore, the research on the new technology of saving water and reducing the process of shortening the process flow has became the focus of scientific research in recent years. 4 kinds of representative tungsten extraction techniques have been developed through the efforts of the majority of scientific research workers.

（1） Zhangguiqing, et al in Central South University research on soda ash and alkaline extraction process, this process has reduced a lot of salt emissions, it has obvious advantages compared with the traditional ion exchange process and acid extraction process, it has been completed in the domestic industrial expansion and run for more than 2 years, and the technology has matured.

（2）The new technology of ion exchange (Zhaozhongwei, et al.), this process can be used to reduce the dilution of water, and it's easy to use to reduce chemical raw material NaOHd consumption and environmental pollution.

（3）Zhaozongwei et al in Central South University research phosphoric and sulphuric acid decomposition of scheelite apt production process, this method can recover tungsten over 98.5%, the leaching liquor of tungsten and after extraction, ion exchange or ammonium salt precipitation method apt production. And the solution of the extraction of the solution is to add phosphoric acid and sulfuric acid, and can return to the leaching, can greatly reduce the amount of sewage discharge. This process and enterprise cooperation have entered the stage of industrialization.

（4） Wanlinsheng in Jiangxi science and University of technology and Zhangyuan tungsten industry cooperate and develop a new technology that ammonium salt decomposition of scheelite direct production of ammonium paratungstate. This technology can achieve near zero discharge of wastewater, according to the published patent introduction apt production process in energy consumption and auxiliary agent can be reduced by 30% compared with the traditional process, water consumption also dropped 90% lower, and this technology has entered the stage of industrial test.

Also for high molybdenum and tungsten mineral raw materials, separation technology development of tungsten and molybdenum, secondary resources recycling of tungsten, category expansion of tungsten chemical products, quality improvement of tungsten chemical product, Xiamen tungsten, Central South University, Jiangxi science and Technology University etc. Enterprises and universities play their own advantage, and constantly improve the refining technology of China's tungsten through technological innovation,. With the high degree of automation and high automation equipment used in tungsten smelting enterprises, the level of tungsten extraction metallurgical technology and equipment has been close to the international advanced level.

With the perspective of talents competitive power, Jiangxi University of Science and Technology in 2013 established the academician workstation which is the first academician workstation in Jiangxi Province through layers of approval; it specialized in tungsten field research. To strengthen the cultivation of innovative talents、key technologies and major achievements in the field of nonferrous metals such as tungsten, copper, rare earth, and promote the construction of high-level scientific and technological innovation platform, the Jiangxi University of Science and Technology hired a group of academicians as a working platform for cooperation.

After many years of construction, Jiangxi province has formed a series of talents from the exploration, mining, smelting, processing, testing and scientific research. In terms of talent

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echelon construction, give full play to the performance evaluation mechanism, do whatever they can to keep people and make the best use of them. Developing the base of industry and rational distribution of industry, formed a complete industrial chain, and fostering the growth of a group with a certain scale tungsten processing enterprises, the tungsten industry in domestic paid outcrop angle.

3.6 MARKET COMPETITIVENESS ANALYSIS (TRADE, PRICE, CONSUMER)

In the field of trade, China is the country of tungsten products, before 2008, the annual export volume of tungsten products in China are more than 26000 t [5]. But influence by the financial crisis, in 2009-2013, the industry has been optimistic estimates year by year that China's exports of tungsten may be achieved, but the world economy continues to slump, exports continued to weaken, the recovery may require a more lengthy process.

The import of tungsten products in China is basically stable, the annual import volume is 5000t metal, and more than 90% of them are tungsten concentrates, and the imported tungsten concentrate from January to September in 2013 is 3865t, which is mainly a long single import. According to customs statistics, the annual import of tungsten is 5587t in 2013, an increase of 5%.

From the history of price, the highest price of tungsten concentrate appears in 2011 when once the price reached 0.158 million yuan per ton. Subsequently, the tungsten price all the way is affected by the domestic economic weakness. In 2013, if only from the point of view of demand for tungsten, tungsten concentrate prices real hard to get out of a rising trend, but the surprise is that the tungsten prices surged to 158000 yuan/ T, shot up to the highest level in history influenced by various factors (supply and demand, the State purchasing and storage, large enterprises procurement, intermediaries Price Guide), Before and after 10 months, part of the enterprise funds withdrawal from circulation and signs that China Minmetals Nonferrous Metals Co., Ltd. will continue to receive the goods, and other enterprises also think about 11 million yuan per ton price has been close to callback lows and to the low-cost supplementary part of the raw materials. Prices began to stabilize. However, it is disappointing that in mid November, the domestic and international market demand is still no improvement, the acquisition of the event did not continue again, the company once again lost confidence, prices continue to decline.

From the perspective of the consumption of tungsten, tungsten steel、tungsten carbide、tungsten materials and chemical industry are the main field of consumption. Among them, the cemented carbide industry accounted for 45% of total consumption, tungsten steel、tungsten and tungsten material chemical industry accounted for 26%, 23% and 6%. 2012 domestic tungsten consumption fell to 32000 T, down 16%. 2013 domestic consumption is still not optimistic. Including: hard alloy first quarter production was flat, but significantly lower than that in 2012 the fourth quarter level, it did not reach the expected recovery; more substantial growth comes in the second quarter, yield 7000t, growth of 38%; the third quarter consumer pressure increases, the situation deteriorates; the same year declined slightly. In the aspect of high speed tool steel, the output of first half was 46000 T, an increase of 4.5%; 1-9 month domestic production of alloy steel was 19797000 T, an increase of 6.4%, which the large amount of tungsten steel output was 64000 T, an increase of 10%. Consumption in several major areas of the field, tungsten consumption in 2013 was 31000 T, down 3%.

The reason is that: (1) Jiangxi, Hunan and other provinces have not yet formed tungsten deep processing of large-scale

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production system, and lack of corresponding innovation and development research, the proportion of raw material products is too large. Taking Ganzhou Jiangxi as an example, the output value of mineral products to smelting intermediate products accounted for more than 90% of Ganzhou tungsten industry, but the high technology、 high added value products and tungsten products output value is less than 10%, the ability of innovation and development of high added value is not enough. (2) The level of technical equipment is low. The level of the overall technology and equipment of the tungsten industry is low. There is still a big gap between the domestic advanced enterprises and the developed countries, the level of intelligence, information technology is low, lack of a world advanced level of hard alloy production technology and equipment.

To sum up, the advantages of tungsten resources in China is obvious, the scale is large, tungsten industry development has a long history, but through the case of domestic and foreign data comparison, analysis of tungsten industry development in Jiangxi Province, it can reflect many problems in the development process of the tungsten industry: The whole industry is wide distribution, small scale, low concentration, unreasonable structure the integration of regional resources, it has not formed the advantage; The single product, low grade of products, the development of deep processing is weak. The high、 sharp、 deep、 fine product are not enough, the consciousness of innovation is not strong; The tungsten mineral resources is over explicated, the smelting capacity needs to be improved; The processing exists problems of blind expansion, excess capacity and redundant construction in China; The prices fluctuate of international tungsten products is large, foreign trade competitiveness is weak, there is no price right to speak; The ability of scientific research is weak, ability of enterprise independent innovation is low, lack of an effective mechanism for the construction of talent team.

4. STRATEGIES TO ENHANCE THE COMPETITIVENESS

We suggest the following strategies to enhance the competitiveness. First, to accelerate the transformation of tungsten industry and realize the industry great-leap-forward development. To use mineral resources rationally, promote the development of mineral resources industry. To enhance the enterprise scale、extend the industrial chain、accelerate the pace of development, to regulate the development and utilization of the total of mineral resources, to protect scarce mineral resources, to optimize the structure and layout of the region, to establish the mineral resources development and utilization system and mineral products supply security system of a reasonable layout, orderly management, the use of efficient, to take the lead in new round of competition in the industry .

4.1 ACCELERATE THE ADJUSTMENT OF PRODUCT STRUCTURE AND INDUSTRIAL STRUCTURE, PROMOTE INDUSTRIAL OPTIMIZATION AND UPGRADING

We promote scientific and technological innovation of enterprises through enterprise restructuring and cooperation, technical cooperation and other ways. Strengthen the technology and management of international investment and cooperation through the enterprise "go out" with the relevant risk fund as the basis. To build and improve the preferential policies for investment and financing of enterprises, encourage enterprises to increase R & D investment, research and development with independent intellectual property rights of the brand products, to achieve the healthy development

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model of " promote the technology with funds, technology for resources,". To promote the strategic adjustment of the structure of tungsten industry actively, focus on relying on existing foundation, build a global market of tungsten enterprises or enterprise groups, format the influence of control and power of Chinese tungsten industry in the international market; On the integration of industry, through industry strategic reorganization and integration, to realize the optimal allocation of production factors in the center of mineral resources development.

4.2 "FOUR WHEEL DRIVE", FOCUS ON THE EXTENSION OF THE DEEP PROCESSING CHAIN OF TUNGSTEN INDUSTRY

To format the group, make bigger and stronger in driving the tungsten industry cluster. Based on the existing tungsten leading enterprises for the team, take joint venture cooperation, integrate the upstream and downstream enterprises effectively, form a group of deep processing of tungsten and form a tungsten deep processing industry chainTo subsidize energetically and drive it to enhance competitiveness. To allow enterprises to adopt a more flexible way in the financing pledge, the amount of financing guarantees for Credit Guarantee Corporation focused on tungsten deep processing enterprises tilt. The local income section of the deep processed products of tungsten enterprises (excluding the increase in the amount of the upper part of the product) is five years.

To attract investment associated and driven the introduction of tungsten deep processing project. Increase invested intensity of tungsten deep processing projects, to use the primary products production advantages of tungsten, take the way of inline lead, and introduce tungsten deep processing enterprises actively, to promote local enterprises to develop the direction of tungsten deep processing.

To encourage innovation and drive the development of new technology of tungsten. Increase the introduction of new technologies, new technology, and encourage enterprises to relate research institutions, large and deep processing enterprises, such as communication and exchange. For the purchase of tungsten product enterprises that introduce new technologies, new technology development and the formation of large-scale production, the finance need to reward one-time through the proportion of the amount of funds to the enterprises that bought new technology, new technology.

4.3 TO CONSTRUCT THE PROVINCE'S KEY ENTERPRISES, DOMESTIC WELL-KNOWN TUNGSTEN DEEP PROCESSING AND TRADING CENTER

The first is to accelerate the integration of resources and eliminate backward production capacity. Adhere to the thinking of "integration of the two focus", which is the integration of small mines into large mining area, promote the dispersion of mineral mining enterprises to focus; integration of mining enterprises and processing enterprises into large group [6], promote the resources to focus on the core of deep-processing enterprises, to achieve the scale of resources、intensive development, and strive to create a central purchasing dressing、smelting、 processing and application integration of tungsten industry group[7], to introduce strategic investors develop the tungsten deep processing by taking joint venture、partnership and cooperation.

The second is to speed up industry support, build industrial clusters. In accordance with the principle of "scientific planning, rational layout, deep processing, environmental protection, big industry", to encourage a number of powerful

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enterprises through the optimization and adjustment of the ownership structure gradually concentrated as the core enterprise facilities through the policy guidance, promote the tungsten enterprises to strengthen cooperation, built a group of professional production equipments and facilities of enterprises relatively complete business groups, radiating polymerization industry cluster development.

4.4 TO INNOVATE THE MECHANISM IN INTRODUCTION, TRAINING, INCENTIVE OF TALENT, TO CREATE A HIGH LEVEL OF TUNGSTEN INDUSTRY SERVICE TEAM

In line with the principle of "not for all, but to the use", according to demand of the enterprise overall development of talent structure, based on a high starting point、facing a high level, broaden the channels to the society, recruit talent, paid the introduction of leading talent. Adhere to the key personnel training, the first training of outstanding talents, the shortage of personnel to pay close attention to training, comprehensive training of young talents. To take a variety of forms to create learning oriented enterprises, and strive to transform human resources into talent resources, and thus create a beneficial effect for the enterprise. At the same time pay attention to talent introduction and training, according to personnel at all levels of professional skills, the enterprise pay attention to incentive and maximize the potential talent, stimulate the vitality, highlight the charm.

4.5 TO DEVELOP THE MECHANISM OF MARKET ALLOCATION, PROMOTE THE CONSTRUCTION OF THE SYSTEM THAT PAID USE OF MINERAL RESOURCES

To construct and specification earnestly of tungsten resources market, to promote the tungsten mining in strokes, shooting, hanging in the market further, to improve market system, to reflect the ecological cost in the development, to reflect the principles of "who develops the protection, who pollution who governance", to promote the construction of the system that paid use of mineral resources, to avoid the situation of paying attention to development, look down on environmental protection, and form the development mode of ecological cycle.

4.6 TO CONSTRUCT THE PATTERN OF DIVERSIFIED TUNGSTEN RESOURCES RESERVES, ESTABLISH AND PERFECT THE PROTECTION AND SUPERVISION SYSTEM OF TUNGSTEN RESOURCES

To promote the work of tungsten resources reserves, subdivide the ways of reserves. In the form of reserve substance, it's better to use the combination mode including reserves of mineral land、ore 、raw materials and product. In the subject of reserve, it's better to use the combination mode including reserves of government and reserves of commercial. To construct a management system of reasonable mineral reserves, to become one of the means to protect tungsten resources through reserves of tungsten resources, so as to achieve sustainable development and utilization of tungsten resources. To establish the legal supervision 、 policy supervision and administrative supervision system related to tungsten mine. To play the role of the government's macroeconomic regulation and control, focus on strengthening the coordination between departments, control the total production strictly, and supervise strictly the implementation of mining enterprises control. To publish the corresponding management policies and focus on supporting the tungsten resources protection demonstration zone construction and development, format management experience in a mature application mechanism.

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