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Connotation of Iron Ore Tailings Comprehensive Utilization

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Abstract. This paper concludes what the comprehensive utilization of iron ore tailings is through analysis, and in order to develop and use the iron ore tailings, comprehensive utilization of iron ore tailings shall be the precondition of the iron ore tailing integrated utilization; comprehensive utilization means efficient, clean, and sustainable utilization; which can guiding the development and use of iron ore tailings.

Introduction

During the process that human continuously improve living conditions and living environment, they use their own labor, wisdom, transform and create nature continuously to meet their requirements of living environment. However, due to limitations of existing scientific and technological level and human cognitive abilities, in the transformation of improving human conditions, human survival environment were caused serious ecological damage and environmental pollution. Three global atmospheric environmental issues " ozone depletion ", " acid deposition " and " global warming" which related to human survive has been a threat to the survival and development of mankind , hindered sustained social and economic development , thus caused governments' and human's attention. "Ten pollution " incident happened, after transformation and conquest nature , "butterfly effect" arise, so people deeply appreciate that human behavior is not inconsistent with nature , begin to carefully consider their actions , and deeply conduct their reflection, thus "recycling economy" , "green economy" , "ecological economy", " low carbon economy" , "green technology", " green consumption " and so some of the concepts have emerged, for guide the practice of human transformation of nature , engineering and ethics, engineering ideas and nature are gradually infiltrated into the decision-making behavior of people .Therefore, under this background , new meaning will be given for the development of iron ore tailings resource using , only to find out the impact factors which affected to the development and utilization of iron ore tailings resources that the development and utilization of iron ore tailings resources could be effectively guided.

Iron Tailings Resource Utilization Status and Problems

China is the world's mining giants, with the total size of solid mineral development in the front rank of the world. "Extensive form" in the development and utilization gained access to valuable mineral resources for certain, nevertheless a lot of mine environmental problems occur, in particular, including overmuch solid waste, mine ecological destruction and mine geological environment problems. More than 80% of the national industrial solid waste is from mines, where mine tailings are generated over 600 million tons each year, with the grand total of mine tailings amounting to 4.5 billion tons now [1]. Along with the development and utilization of mineral resources, ore grade is increasingly depleted, and the resource is exhausting. Therefore iron tailings as the secondary resource has been brought to the attention of the world [2]. At present, the comprehensive utilization rate of tailings lags greatly, being only 14%. Especially, iron tailings utilization rate is lower, only about 7%, far below the iron tailings comprehensive utilization rate of 60% in the developed countries [3]. Because of the low rate of tailings comprehensive utilization, a large number of tailings are piled up in the middle of tailings dam, which not only takes up a lot of land, causing environment pollution and safety loophole, and at the same time will consume a large amount of money for the construction and maintenance of the tailings dam. Figure 1 shows the change of the iron tailings emissions of our country in recent years [4].

It can be seen from figure 1, in 1997-2009, iron tailings emissions load is low, and emission behaviors are basically the same. The basic causes are as follows: the technical level is low; the mining ore is mostly of the high grade; low grade ore utilization rate is extremely low. Since 2002, with the development of modern industry, demands for mineral resources and ore mines continue increasing. Besides, thanks to the improvement of mineral processing technology and mineral processing equipment, the utilization rate of low grade ore will greatly improve and the iron tailings emissions present significant growth.

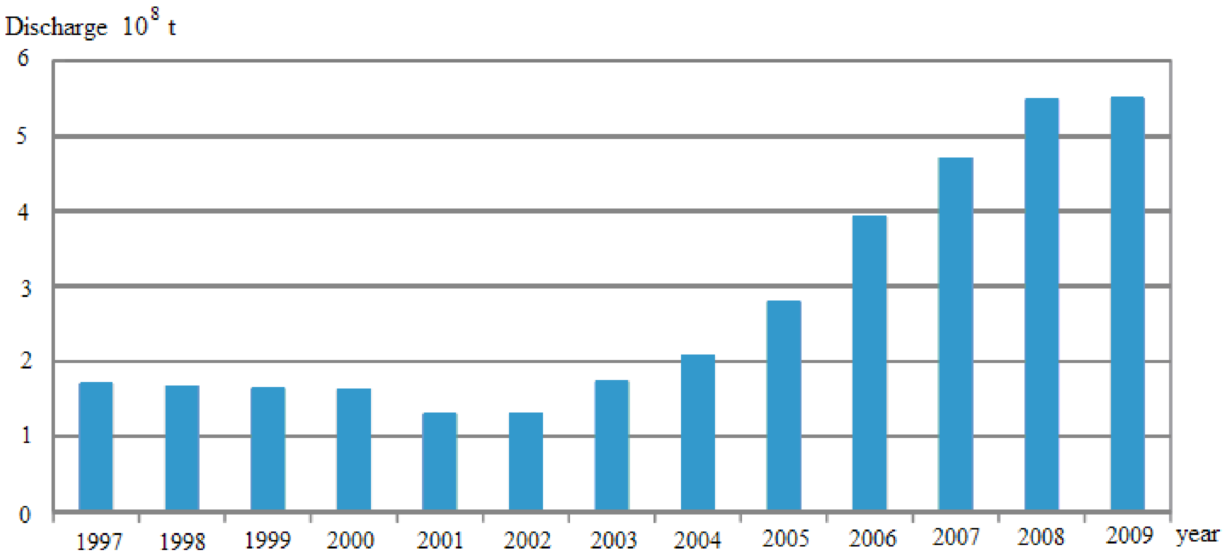

Fig.1 Iron tailings discharge conditions in recent years in our country

Connotation of iron ore tailings resources comprehensive utilization

According to Earth Science Dictionary, the description of “comprehensive utilization of iron tailings[4]” is that “Relevant units separated useful components from the iron tailings as much as possible through advanced processing technology and other effective means in order to get a various value of output of commercial mine; by turning waste into treasure, a multi-purposes, eliminating the pollution of "three wastes " and transforming the harm into benefits to make good use of the iron tailings. This comprehensive, full and rational use of the process is called iron tailings resource utilization. ”

Generally speaking, iron tailings refers to the solid wastes producing from ore crushing, screening, grinding, grading, and then re-election, magnetic separation (or add flotation) and sorting process of election and other processes under certain economic and technical conditions by the concentrator. The iron tailings are also the solid wastes from the recovery of the fine irons [5-6]. That is to say, the iron tailings are the solid wastes from the fines after grinding, selecting under certain economic and technical conditions. The iron tailings have the following characteristics, including big quantity, low cost, fine granularity, good use and dual characteristics with less environmental pollution and secondary resources. The secondary resources are referring to the recovery and reutilization of the useful components those cannot be produced or got during the past times but now with certain economic and technical conditions these resources can be gained in the iron tailings.

From the material flow direction, the industry formed the industrial chain shown in Figure 1. It is clear that the original source of raw material resources smelting industry is only the resource exploitation. With development and utilization of iron tailings resources, industrial chain can be formed as shown in Figure 2, which not only makes the resource exploitation stronger, but also increases the sources of fine resources, so that capacity of supply security for the raw materials can be strengthened; in the other hand, the iron tailings can also be used as the building materials, improvement materials for the earth or fertilizer and the process industry and other industrial chains depriving from iron tailings is also beneficial and practical. Therefore, it is meaningful and aware of the development and utilization of iron tailings.

Figure 1 Original Industrial Chain

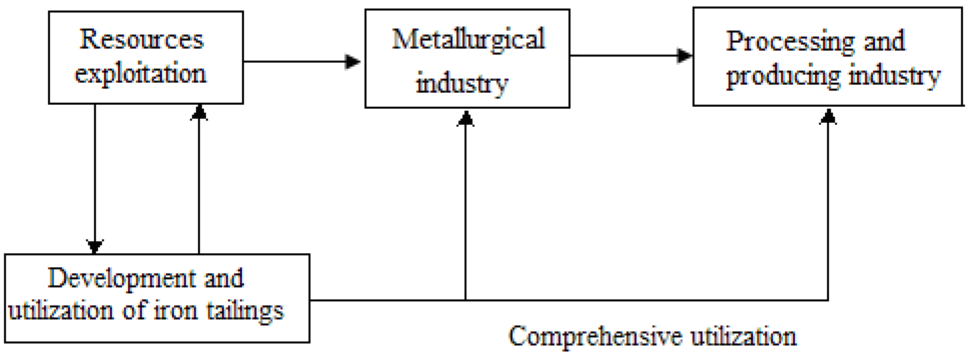

Fig. 2 The development and utilization of iron ore tailings resources after the formation of the industrial chain in industrial field

However, the deteriorating environment for people to live today make human beings should think more about their own behaviors. The former extensive mode of production with "High exploitation — low utilization — high emissions," is not suitable for the current resource development and utilization. While the sustainable development model with "low emission—low extraction — High use " which centered on the harmony between humans and nature which is also named as recycling economy has attracted more and more attentions. Therefore, as for the development and utilization of the iron tailings, it is thought that the “sustainable development model” should be the basement and the “recycling economy” should be the guidelines, focusing on the “comprehensive utilization” without reasonable aims and practices. Only if the scientific development can meet the demands for development and utilization of one kind of iron tailings, can the iron tailings get reasonable development and utilization. Or, the “secondary resources” can be developed and utilized instead of the comprehensive development and utilization if the scientific and technological conditions are not feasible. As for the suitable iron tailings, during the process of development and utilization, the “comprehensive utilization” should go first, that is to say, the “effective utilization, clean utilization and the sustainable utilization” should be combined with one another harmoniously, which is also called sustainable utilization, only with which can there be the four wins with “resources win, economical win, social win and environmental win” in the new industrial chains.

Conclusion

The comprehensive utilization of iron tailings is a systematic project with cross-subjects and multi effected elements. This project focuses on the efficient measurement on pushing forward the economic development and environmental protection through the utilization of the limited natural mine resources [9]. Nowadays, the mine resources are getting less and less while the life level of human being is getting higher and higher. The comprehensive utilization of iron tailings is a kind of public welfares that changes the wastes into usefulness so that all he human beings can benefits from it. Therefore, with the development and utilization of the iron tailings, there will become four-wins for “resources benefits, economic benefits, social benefits and environmental benefits.”

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