Energy Saving and Carbon Reduction of Alumina Production under the Dual Carbon Strategy

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Abstract

With the rapid development of the economy in recent years, the Chinese national "double carbon" goal has been put forward. For the alumina production industry with high energy consumption, how to effectively reduce the energy consumption of alumina production and achieve energy saving and carbon reduction is not only the national and environmental development strategy needs, but also the green and high-quality development needs of enterprises. In this paper, the concepts of "systematization" and "integrality" are introduced. From the source of alumina production to the production process and emission, the ways of energy saving and carbon reduction are discussed.

Keywords: Dual Carbon Strategy, Alumina production, Energy saving, Carbon reduction, Emission reduction.

1. Introduction

In September 2020, China clearly proposed the goals of "carbon peaking" by 2030 and "carbon neutrality" by 2060. The launch of the "Dual Carbon Strategy" is conducive to promoting the efficient promotion of energy conservation and consumption reduction work, and guiding the rapid implementation of green innovative technologies. As a high energy consuming industry, alumina production's carbon emissions are also an important influencing factor in promoting the "Dual Carbon" standard in the future. Up to now, there is no clear way to reduce carbon in this industry. Today, when a Low-carbon economy is advocated, the industry only has to change its ideas, establish a systematic awareness of energy conservation, actively adopt effective energy-saving technologies and measures, and effectively achieve the goal of sustainable carbon reduction by introducing green energy.

2. Alumina Production and Energy Consumption Situation

In the past decade, China's alumina production has been increasing year by year. As of 2022, the annual alumina production was 81.5 million tonnes. From January to April 2023, the cumulative production was 26.7 million tonnes, an increase of 5.0 % year-on-year. The specific data is Shown in Figure 1 [1].

Bauxite resources in China are mainly diaspore, and the production process is high-temperature and high-pressure digestion. Its energy consumption is 407-814 kWh/t alumina higher than that of foreign Gibbsite production process. With the increasing emphasis on energy conservation, consumption reduction, and cost control of alumina, through measures such as process optimization and equipment upgrading and renovation, the energy consumption of alumina can be significantly reduced. According to the alumina energy consumption limit released in 2023, the overall limit has been reduced by 325.6 kWh/t alumina (40 kgce/t alumina) compared to before the revision. Due to the high production capacity of alumina, its total energy consumption is also considerable. Energy consumption quota of alumina is given in Table 1.

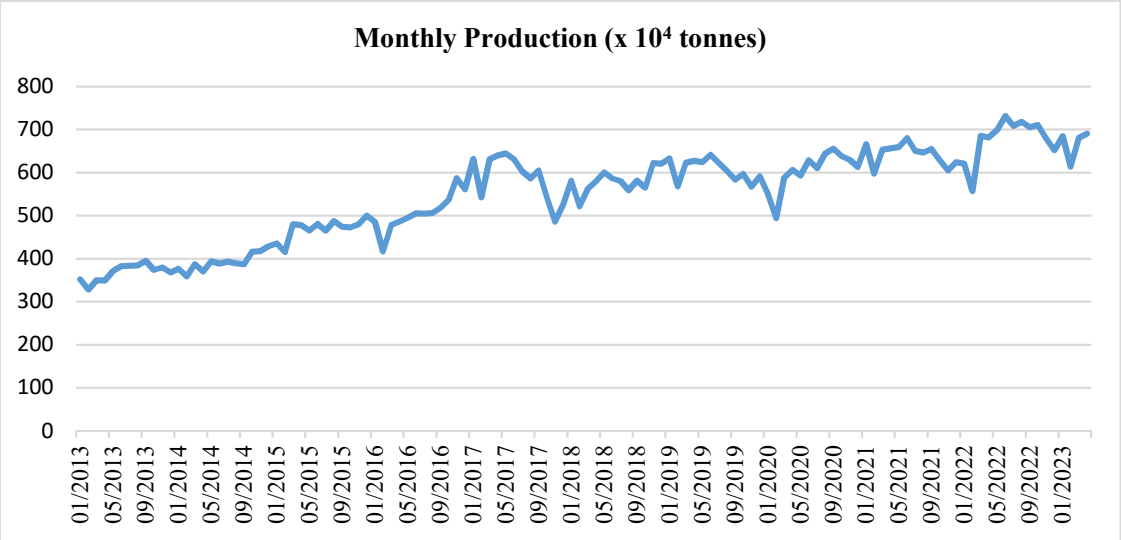

Figure 1. Alumina production in China in the past decade.

Table 1. Energy consumption quota of alumina, released in 2017 and 2023 (per tonne of alumina).

		Released in 2017		Released in 2023	
		kgce*	kWh	kgce*	kWh
Level 1	Process energy consumption	≤ 370	≤ 3022	≤ 330	2695
	Comprehensive energy consumption	≤ 400	≤ 3267	≤ 360	2940
Level 2	process energy consumption	≤ 400	≤ 3267	≤ 360	2940
	Comprehensive energy consumption	≤ 430	≤ 3512	≤ 390	3185
Level 3	Process energy consumption	≤ 470	≤ 3838	≤ 430	3512
	Comprehensive energy consumption	≤ 500	≤ 4084	≤ 460	3757

*kgce = kilogram coal equivalent. 1 kgce = 29.3 MJ = 8.167 kWh.

Based on the above situation, energy conservation and consumption reduction in the alumina industry have certain significance for the national "Dual Carbon Strategy.

3. System Energy-Saving and Carbon Reduction Thinking

The development process of the alumina industry in China is a process in which "energy consumption" is continuously optimized, such as the continuous enlargement of equipment, the continuous rationalization of process layout, and the continuous upgrading of energy-saving equipment. However, many optimizations are "dot" distribution, which is not fully considered according to the theory of "Carbon footprint". At the same time, the energy saving contribution of ancillary systems is also ignored. It should be emphasized here that the introduction of system energy conservation theory and global thinking is inevitably a revolutionary change. This requires comprehensive consideration of energy consumption and carbon emissions from the source mineral resource endowment, geographical location, resource matching, process investment, etc. In addition, utilizing exploitable resources such as land and mines in the system to implement green energy production and carbon sequestration is also an important measure for system energy conservation and carbon reduction. It should be said that the implementation of the "Carbon footprint" assessment in the alumina industry will promote the development of systematic and overall energy conservation and consumption reduction, which is also the concept that should be adhered to in the high-quality promotion of energy conservation and consumption reduction.

6. Conclusion

In response to the high-energy consumption production industry of alumina, transforming production and management concepts, utilizing technological progress and systematic energy-saving thinking to comprehensively plan and optimize layout, reduce losses from large-scale raw fuel procurement, maximize production process equipment, and efficiently utilize heat, achieving low-carbon and green development is the only way for enterprises to enhance their competitiveness. In this process, "energy conservation", "consumption reduction", "green", and "sustainable" must be deeply rooted in the hearts of every alumina production operator, allowing "I want low-carbon" to replace "I want low-carbon", to truly make the necessary contributions to the national "Dual Carbon Strategy".

7. References

1. The data is sourced from the National Bureau of Statistics (China).
2. According to the calculation formula for deep forest carbon sink.