

## Development of China's Aluminum Industry and NFC/NEUI Aluminum Smelting Technology Development and Applications

Junman Qin<sup>1</sup>, Dingxiong Lv<sup>2</sup>, Qingchen Yang<sup>3</sup>, Jian Zhang<sup>4</sup> and Yungang Ban<sup>5</sup>

1. Junior Project Manager

4. Project Manager

China Nonferrous Metal Industry's Foreign Engineering & Construction Co., Ltd., Beijing, China

2. Chief Engineer

3. Project Manager

5. Project Manager

Northeastern University Engineering & Research Institute Co., Ltd., Shenyang, China

Corresponding author: banyungang@126.com

### Abstract



As of the end of December 2022, China's alumina production capacity has reached 99.55 million tonnes/year, an increase of 9.2 million tonnes/year compared to the previous year. Among them, 10 million tonnes/year of new production capacity has been added, and 0.8 million tonnes/year of outdated production capacity has been phased out, accounting for 57.3 % of the global market. In 2022, China's alumina production reached 79.76 million tonnes, an increase of 6.1 % compared to the previous year, with 57 % using imported bauxite. The average operating rate of alumina production capacity in 2022 is 80.1 %. In 2023, China's alumina production is still showing an increasing trend, expected to reach around 82.2 million tonnes, with an annual surplus of 0.52 million tonnes. As of the end of December 2022, China's primary aluminum production capacity has reached 44.3 million tonnes per year, with an operating capacity of 40.64 million tonnes/year. In 2022, China's production capacity reached 40.33 million tonnes, an increase of 3.7 %, accounting for 58.5 % of global primary aluminum production. In 2022, China's consumption of primary aluminum reached 41.09 million tonnes, an increase of 1.8 % compared to the previous year.

In the past two years, with the gradual deepening and implementation of China's new development concept and dual carbon policy, China's aluminum industry is also facing enormous pressure and tasks of energy conservation and carbon reduction. The government strictly controls the production capacity scale of high energy consumption and high emission industries, and vigorously develops energy-saving and environmental protection industries; NFC/NEUI, as an important technology supplier and service provider in China's aluminum industry, closely revolves around national macro policy requirements to carry out the development and industrial application of green and low-carbon aluminum smelting technology, helping the sustainable and healthy development of China's aluminum industry.

**Keywords:** China's aluminum industry, NFC/NEUI aluminum smelting technology, Development and application of NFC/NEUI aluminum smelting technology.

### 1. Development of China's Aluminum Industry

After years of construction and development, China's aluminum industry has accounted for more than half of the global industrial scale, continuously improving technology and equipment levels, and continuously enhancing the international competitiveness of aluminum products. It has now become an important industry with certain comparative advantages [1]. In the rapid development process, it is increasingly constrained by factors such as resources, energy, and environmental protection. In the new situation of national macroeconomic regulation, China's aluminum

industry will adhere to the scientific development concept of “green, low-carbon, and high-quality development”, based on domestic demand, optimize and strengthen, and enhance international competitiveness [2].

## 2. China’s Alumina Technology Development

### 2.1 Development History of Chinese Alumina Production Technology

The alumina refinery with single line capacity of 1000 kt/a based on diaspora of China has been successfully put into operation in April 2016. The alumina refinery with single line capacity of 1200 kt/a based on imported gibbsite has been successfully put into operation in Dec. 2021. The basic design of the alumina refinery with single line capacity of 1500-2000 kt/a based on imported gibbsite has been completed.

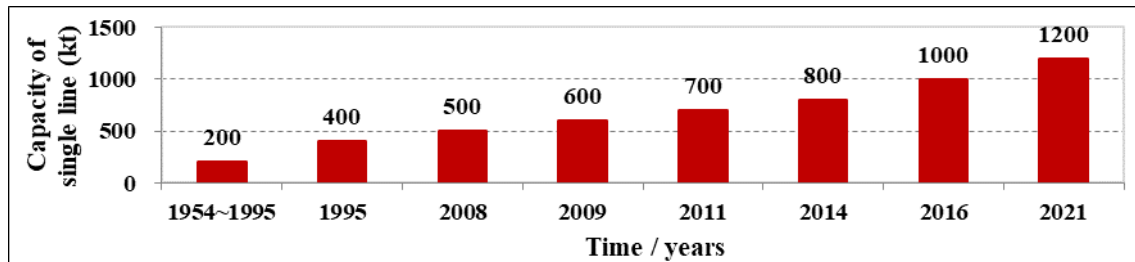


Figure 1. Development history of Chinese alumina production technology.

Table 1. Development history of Chinese alumina production technology with core technologies.

Years	1954~1995	1995	2008	2009	2011	2014	2016	2021
Single line capacity kt/a)	~200	400	500	600	700	800	1000	1200
Core Technologies	Sintering process, Combination process	Autoclave digestion Bayer process technology	Large-scale tube + holding tank digestion Bayer process technology	Large-scale tube + holding tank digestion Bayer process technology	Full tubular digestion Bayer process technology	Full tubular digestion Bayer process technology	Full tubular digestion Bayer process technology	Ful tubular digestion Bayer process technology

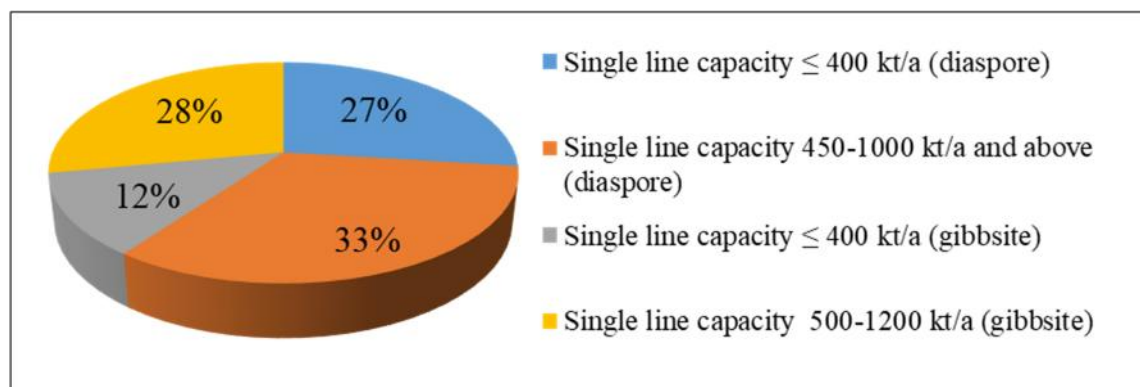


Figure 2. Alumina production capacity vs technologies.

Alumina production with Chinese diaspora: 1954 to 2008, alumina production series technologies with single line capacity  $\leq 400$  kt/a were mainly used in China’s aluminum industry, which even now still occupies about 27 % of total alumina production capacity of China; 2008 till now,

#### 4.3.2 Development and Application of NEUI500 & NEUI600 Aluminum Reduction Pot Technologies

Based on the same “numerical simulation” development mode, NEUI500 & NEUI600 aluminum reduction potline technologies were developed in 2009 following more strict technical development standards.

In December, 2014, the world first 600 kA potline was put into operation in Shandong Weiqiao Aluminum & Power Co., Ltd, with annual production capacity of 600 kt (300 kt×2). As of December, 2022, NEUI has completed the design of 15 potlines of NEUI600kA, with a total design capacity of 6180 kt/a. Among them: 11 potlines with a capacity of 4250 kt/a has been put into operation, 4 potlines with a total capacity of 1930 kt/a are under construction. As of December, 2022, NEUI has completed the design of 8 potlines of NEUI500 kA, with a total design capacity of 2620 kt/a. Among them: 7 potlines with a capacity of 2170 kt/a have been put into operation, and 1 potline with a capacity of 450 kt/a are under construction.

### 5. Conclusions

In the past decade, the industrial scale and core technology level of China’s aluminum industry have developed rapidly, making important contributions to the development and technological progress of the world’s aluminum industry. In recent years, China’s aluminum industry has paid more attention to optimizing the industrial layout, promoting structural adjustment, innovating and developing green low-carbon technology, optimizing process technology, improving system energy efficiency, promoting the construction of green manufacturing system, establishing a standard system for the non-ferrous metal industry with the goal of carbon peaking and carbon neutrality, and promoting the emissions trading of electrolytic aluminum carbon. NFC/NEUI has developed and applied a series of advanced energy-saving and low-carbon innovative technologies, contributing an important force to the healthy and green development of China’s aluminum industry.

### 6. References

1. Zhang Bo, Discussing the development plan of China's aluminum industry together [J]. *China Non-ferrous Metals*, 2021 (22): 1.
2. Jiang Yujing. Development of China's aluminum industry under the new policy [J], *Light metal (in Chinese)*, 2017 (11): 4.