

Development Achievements and Future Outlook of China's Aluminium Industry

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Abstract

Over the past 70 years, China's aluminium industry has achieved remarkable success. It has transformed from a nation with aluminium shortages to the world's largest producer and consumer of aluminium. Technological innovation has driven comprehensive industrial transformation and upgrading; significant progress has been made in green and low-carbon development; and international capacity cooperation has delivered notable results.

The next 5 to 10 years will be a critical period for the development of China's aluminium industry. Efforts must be made to strengthen original and collaborative innovation, achieve self-reliance and strength in scientific and technological innovation, further promote domestic mineral exploration to increase bauxite reserves, pursue green, low-carbon, and sustainable development, comprehensively upgrade digital and intelligent infrastructure, and deepen international capacity cooperation – contributing Chinese wisdom and strength to the high-quality development of the global aluminium industry.

Keywords: China aluminium industry, Technological innovation, Low-carbon development, China bauxite reserves.

1. Summary of the conference presentation document

(Note from ICSOBA's Editor: The following text was prepared from the Chinese PowerPoint file provided by the author, using M365 CoPilot. Please note that the quality of the English may not meet the usual editorial standards, and some concepts may remain vague.)

This year marks the 76th anniversary of the founding of New China. Over the past 76 years, the aluminium industry has worked hard and forged ahead, building a modern industrial system with complete categories, a sound structure, huge capacity, and advanced technology. From a backward situation, it has risen to become the world's largest aluminium producer, making positive contributions to China's economic and social development and the progress of the global aluminium industry.

1.1 Development Achievements

Overall strength of the aluminium industry has made historic leaps.
Technological innovation drives comprehensive industrial transformation and upgrading.
Significant achievements in green and low-carbon development.
International capacity cooperation for mutual benefit.
Substantial improvement in overall corporate strength.

1.2 Key Data Highlights

China has ranked first in primary aluminium production for 24 consecutive years.

Table 1. Share of Global Bauxite Production by Major Producing Countries in 2024.

Country	World production share (%)
Guinea	30.7 %
Australia	25.3 %
China	18.9 %
Brazil	7.6 %
India	6.6 %
Others	10.9 %

Table2. Share of Global Alumina Production by Major Producing Countries in 2024

Country	World production share (%)
China	58.9 %
Australia	11.9 %
Brazil	7.3 %
India	5.8 %
Indonesia	3.0 %
Russia	2.1 %
UAE	1.6 %
Saudi Arabia	1.3 %
Ireland	1.2 %
Jamaica	1.0 %
Others	5.9 %

Table 3. Share of Global Primary Aluminium Production by Major Producing Countries in 2024.

Country	World production share (%)
China	60.3%
India	5.8%
Russia	5.2%
Canada	4.5%
UAE	3.7%
Bahrain	2.2%
Australia	2.1%
Norway	1.8%
Brazil	1.5%
Malaysia	1.2%
Others	11.8%

Table 4. Historical Production Growth in China (kt)

Year	Alumina	Primary Aluminium	Recycled Aluminium	Aluminium Products
1954	27	2		5.5 (1956)
1978	780	300	4	110
2000	4 330	2 790	750	2 170
2012	40 720	23 530	4 830	25 940
2020	72 850	37 250	7 250	44 520
2023	82 440	41 590	9 500	46 950
2024	88 520	44 010	10 550	49 000

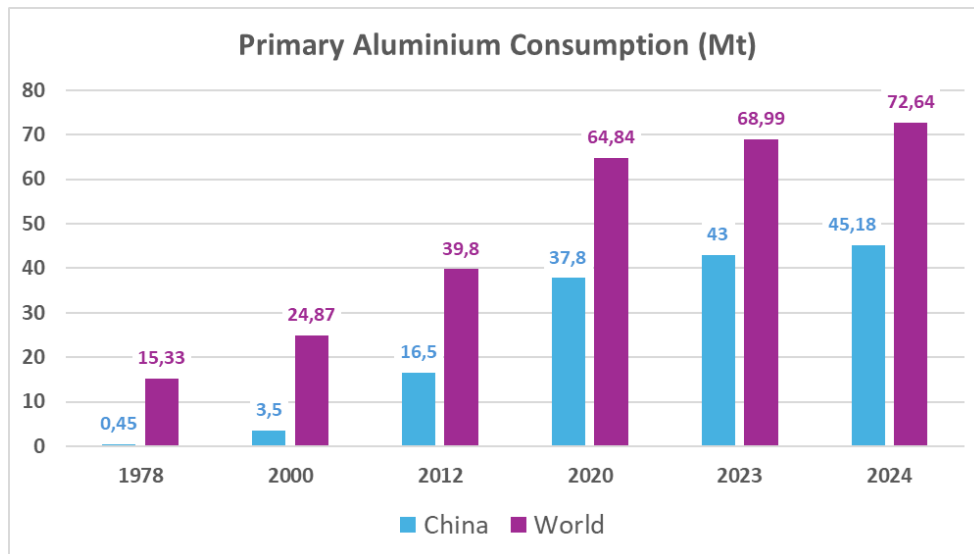


Figure 1. China’s Share of Global Primary Aluminium Consumption.

Table 5. 2024 Import/Export China’s Position (Mt)

Material	Imports	Exports	Net
Bauxite	-158.767	0.024	-158.743
Alumina	-1.419	1.786	0.367
Primary Aluminium	-2.137	0.121	-2.016
Aluminium Products	-0.398	6.301	5.903
Aluminium Fabricated Products	-0.029	3.244	3.215
Aluminium Scrap	-1.782		-1.782

Source: General Administration of Customs

1.3 Technological Innovation

Breakthroughs in key technologies across alumina, electrolytic aluminium, aluminium processing, and advanced materials. Examples:

- Development and industrialisation of a 1.6 Mt/y alumina production line.
- World’s first 600 kA large-scale electrolytic aluminium technology widely applied (Figure 2).
- High-performance aluminium alloys used in high-speed rail, aerospace, and new energy vehicles; supporting C919 aircraft and heavy-lift rockets.



Figure 2. Shandong Weiqiao’s 600 kA Aluminium Electrolysis Potline.

1.4 Green and Low-Carbon Achievements

Alumina Production - Red mud: the utilization rate exceeds 12 %.

Primary Aluminium: 2024 average electricity consumption: 13 262 kWh/t Al (565 kWh/t Al lower than 2012).

Clean energy share in electrolytic aluminium consumption exceeds 26.2 %, thanks to the relocation of more than 13 Mt Al/y capacity to hydropower-rich regions.

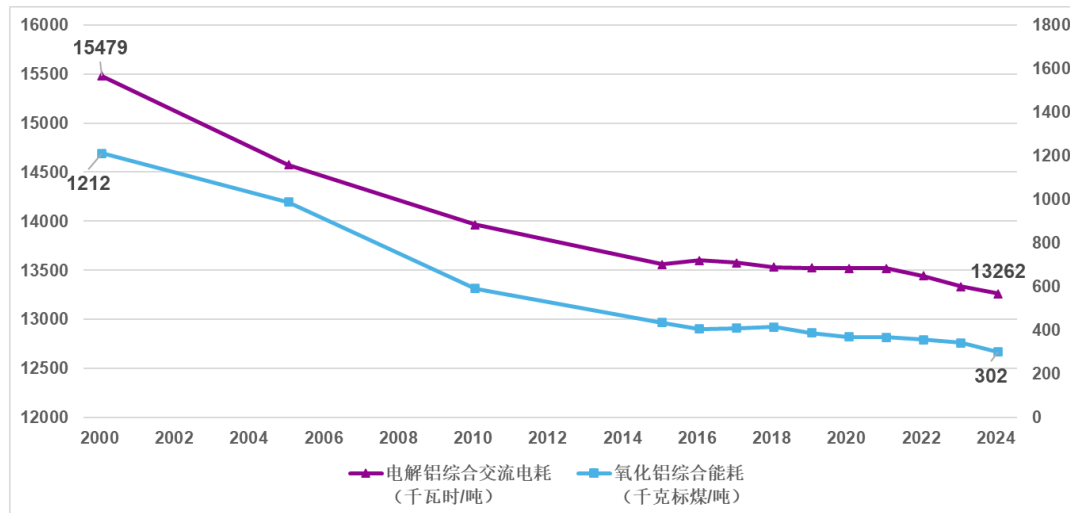


Figure 3. Evolution of the Specific Energy Consumptions for producing primary aluminium and alumina. Left y-axis: Total AC Power consumption kWh /t Al – Purple line, Right y-axis: Consumption in Standard coal kg Coal/t Alumina – Blue line.

1.5 International Cooperation

Under the guidance of the Belt and Road Initiative, Chinese enterprises have invested in and built a number of overseas aluminium industry projects, achieving good economic and social benefits. These projects have not only addressed China’s shortage of bauxite resources but also increased tax revenues for local governments, expanded employment, and launched “small but beautiful” livelihood projects for communities, realizing mutual benefit and win-win outcomes.

According to preliminary statistics, Chinese enterprises have invested in Guinea to build bauxite projects with a production capacity exceeding 100 million tonnes, and alumina capacity under construction is 1.2 million tonnes. In Indonesia, alumina capacity exceeds 6 million tonnes, and electrolytic aluminium capacity exceeds 1 million tonnes.

1.6 Global Position of Main China’s Producers.

Four China’s alumina producers form part of the World’s Top 5 – they totalise 38.1 % of the World production (Table 6).

Four China’s primary aluminium producers form part of the World’s Top 5 – they totalise 30.9 % of the World production (Table 7).

Table 6. World's 10 main alumina producers (2024).

Rank	Producer	Production (Mt)	Global Share (%)
1	China Aluminum Corporation	19.68	13.5 %
2	Shandong Weiqiao Group	18.05	12.4 %
3	Alcoa (USA)	10	6.9 %
4	Shandong Xinfu Group	9.35	6.4 %
5	Jinjiang Group	8.41	5.8 %
6	Rio Tinto	7.3	5 %
7	Rusal (Russia)	6.43	4.4 %
8	Norsk Hydro (Norway)	5.97	4.1 %
9	Nantou	5.02	3.4 %
10	Bosai Minerals Group	4.65	3.2 %
Total		94.86	65.1 %

Table 7. World's 10 main primary aluminium producers (2024).

Rank	Producer	Production (Mt)	Global Share (%)
1	China Aluminum Corporation	7.93	10.9 %
2	Shandong Weiqiao Group	6.52	8.9 %
3	State Power Investment Corporation	4.34	5.9 %
4	Rusal (Russia)	3.99	5.5 %
5	Shandong Xinfu Group	3.77	5.2 %
6	Rio Tinto	3.30	4.5 %
7	Emirates Global Aluminium (UAE)	2.69	3.7 %
8	Vedanta (India)	2.37	3.2 %
9	Alcoa (USA)	2.22	3 %
10	Norsk Hydro (Norway)	2.04	2.8 %
Total		39.17	53.7 % %

1.7 Future Prospects

After more than 70 years of development, the aluminium industry of New China has achieved remarkable success and undergone historic transformations. At present, China's aluminium industry is shifting from being a major producer to becoming a strong manufacturing power.

The next 5 to 10 years will be a critical period for building a modern aluminium industry system and promoting the development of a strong aluminium industry through high-quality growth. This shift relies on the five following drivers.

1) Independent and self-reliant technological innovation: Adhering to the global frontiers of science and technology and responding to major national strategic needs, we will focus on the challenges of high-end, intelligent, and green low-carbon development in the aluminium industry and carry out targeted technological breakthroughs. Guided by fundamental research and original innovation, we aim to overcome key core technologies. Through scientific and technological innovation driving industrial innovation, we will comprehensively achieve the transformation and upgrading of traditional industries, actively foster emerging industries, and strategically plan future industries by providing high-end new material support.”

2) Green, low-carbon, and sustainable development: Acceleration of the transition to clean energy. In 2023, carbon emissions from electrolytic aluminium were about 420 million tonnes, with a relatively high carbon intensity per tonne of aluminium. Therefore, it is necessary to fully implement the notice from the National Development and Reform Commission and the National

Energy Administration on the orderly advancement of green power direct connection. We should leverage the abundant wind and photovoltaic resources in western China and actively adopt new models and pathways for direct green power supply to electrolytic aluminium. This will significantly enhance the ability of electrolytic aluminium to consume clean energy locally. The goal is to ensure that by 2030, more than 30 % of China's electrolytic aluminium production capacity uses green electricity, achieving carbon peaking ahead of schedule.

Continue strengthening fundamental research to achieve early breakthroughs in key technologies for inert anodes and carbon-free anodes in electrolytic aluminium. Further advance comprehensive utilization technologies for red mud from alumina production, expand application scope, and increase total utilization.

3) Digital and intelligent empowerment: Full application of the State Council's '*Opinions on Implementing the Artificial Intelligence Plus Action*,' aiming for digitalization, networking, and intelligentization. Following the 'cloud-edge-terminal' technology architecture, in recent years, through the promotion of intelligent demonstration factories, gradually achieve full-process digitalization, networking, and intelligentization in mining, beneficiation, smelting, processing, process parameter measurement, quality control, and enterprise management. By 2030, intelligent factories (and mines) will make substantial and significant progress; by 2035, the aluminium industry will have basically achieved full intelligentization."

4) Optimize the global layout: Enhancement of the security of bauxite resources by continuing to intensify exploration in key domestic mineralization belts to increase reserves and production. Actively participate in the Belt and Road Initiative, focusing on solidifying the foundation of bauxite development in Guinea while seeking new investment opportunities to establish a number of resource bases with large reserves, high quality, and well-developed facilities.

Fully leverage China's competitive advantages in the global aluminium industry by locating electrolytic aluminium enterprises in regions with low political risk, favourable business environments, and abundant energy resources. Promote Chinese technology, equipment, standards, and services worldwide, and develop a group of multinational aluminium companies with strong international competitiveness.

5) Cultivate and develop a group of world-class talents: Talent is the primary resource. Efforts must be made to cultivate world-class strategic talent, leading scientific and technological experts, high-level innovation teams, young scientific and technological professionals, outstanding engineers, and highly skilled personnel. Focus on developing a large group of high-quality, internationally minded entrepreneurs. Build a large-scale, well-structured, and highly qualified international high-end talent team to provide strong support for the development of a powerful aluminium industry.