Practice and Innovation of Green, Low-Carbon and High-Quality Development Driven by Circular Economy

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Abstract

The aluminium industry is under increasing pressure to balance growth with sustainability. Xinfa Group has developed an integrated circular economy model that addresses this challenge by linking energy, non-ferrous metals, high-end chemicals, and eco-friendly building materials into a closed industrial system. Through cogeneration, aluminium–power integration, waste heat recovery, and by-product utilization, Xinfa has achieved substantial reductions in emissions and energy consumption, while maximizing resource efficiency. Annual solid waste reduction exceeds 14 million tonnes, with significant economic and environmental benefits. Continuous investment in technological upgrading, smart manufacturing, and digital management has enhanced Xinfa's competitiveness and resilience. Recent initiatives extend the circular model into agriculture, creating synergies between industry and ecological farming. Xinfa's experience demonstrates how circular economy practices can accelerate the aluminium industry's green, low-carbon, and high-quality development, offering a practical model for replication in China and globally.

Keywords: Circular economy, Aluminium industry, Low-carbon development, Resource efficiency, Green innovation.

(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.)

1. Overview of Xinfa Group

Xinfa Group was founded in 1972. It is a modern large-scale enterprise group integrating industries such as energy, non-ferrous metals, high-end chemicals, environmentally friendly building materials, mineral development, and modern agriculture. The group currently has more than 80 subsidiaries and holding companies, with total assets of 310 billion RMB (42.9 billion USD approx.).

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In 2024, it achieved a main operating revenue of 302.9 billion RMB (41.9 GUSD approx.), total profit and tax of 32.8 billion RMB (4.5 GUSD approx.), and paid 12.7 billion RMB (1.8 GUSD approx.) in taxes. From January to August this year, it achieved a main operating revenue of 204.56 billion RMB (28.3 GUSD approx.), an increase of 3 % year-on-year; profit and tax of 24.92 billion RMB (3.45 GUSD approx.), an increase of 9 % year-on-year; and paid 11.14 billion RMB (1.54 GUSD approx.) in taxes, an increase of 30 % year-on-year.

Xinfa Group actively implements the ecological concept of "Lucid waters and lush mountains are invaluable assets", vigorously develops a circular economy, and has gradually achieved high-level ecological and environmental protection alongside high-quality economic growth.
The Group has successively established production bases in Guangxi, Xinjiang, Shanxi, Shaanxi, and other regions, significantly boosting local economies.

It is one of the first leading national pilot enterprises for "Resource-Conserving and Environmentally Friendly" development; a key enterprise of the national "Double Hundred Project" for comprehensive resource utilization and a national base for comprehensive utilization of bulk solid waste.

2. A Unique Circular Industry Model

Xinfa Group has always adhered to the concept of green development and actively explored the application of the circular economy model in the aluminium industry chain. Through years of practice and innovation, by building, extending, strengthening, and upgrading the industrial chain with intelligence and sustainability, the Group has successfully developed an efficient circular economy model (Figure 1) centred on the aluminium and power sectors. This model maximizes resource utilization and minimizes waste emissions, demonstrating the strong advantages and competitiveness of the circular economy and driving the company toward green, low-carbon, and high-quality development.

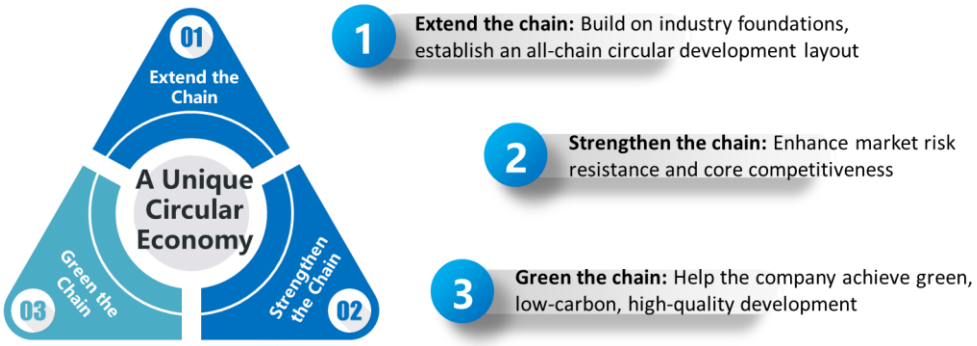

Figure 1. Circular economy model.

2.1 "Extend the chain" journey

2018: Building Materials Project
2006: Chemical Project
2004: Alumina Project, Aluminium powder integration
1998: Electrolytic Aluminium Project
Early 1990s: Combined heat and power (CHP)
1972: Plant established

2.1.1 Energy industry

Mainly focused on coal mining, power generation, and heat supply. Electricity and steam are used in the industrial park, while residual heat is utilized for agricultural parks and urban heating. The Group's main units are 1.1 GW and 660 MW "high-efficiency ultra-supercritical" units, which are among the most advanced in the world. Power generation coal consumption is 248 g coal/kWh, 20 % lower than the industry average, and emission indicators are more than 95 % better than those of natural gas power units. The project has won the Asian Power Award and the German Innovative Energy Efficiency Project Award.