

Future of Indian Aluminium Sector: Challenges and Progress

Sunil Gupta¹ and Nitin Kumar Tiwari²

1. Chief Operating Officer – Aluminium Business

2. Chief Operating Officer - Metal

Vedanta Limited, Jharsuguda, Odisha, India

Corresponding author: nitin.tiwari@vedanta.co.in

Abstract



The global demand for aluminium has experienced a tremendous increase in recent decades, driven by its exceptional physical and chemical properties, lightweight applications, recyclability and abrasion resistance. It has earned the title of “Metal of the future” for various reasons including the potential for carbon footprint reduction. Even after multiple times of recycling, aluminium products can act as resources at the end of their lifecycle without compromising quality. This makes the metal frontrunner in the circular economy.

Aluminium sector plays a crucial role in achieving India’s ambitious goal of attaining 5 trillion-dollar economy. In financial year 2022 (FY’22), India catered 4 million tonnes of primary aluminium which is 5.85 % of global aluminium production. Indian Aluminium market is expected to grow at a compound annual growth rate (CAGR) of 8-10 % against world average of 5.6 % and it is anticipated to be driven by the rapid growth of diversified sectors in domestic market, like - automobile, aviation, defence and small-scale industries. The metal commits an important role in the development of downstream sector, fostering MSME (Micro, Small and Medium Enterprises) ecosystem and enhancing the domestic value addition within the country. The recent trend in Indian aluminium industry is hovering over sustainability and green aluminium. Decarbonization, Net Zero emissions, waste management and zero liquid discharge are the main approaches in this endeavour.

Indian smelters have been aligning their strategies with Industry 4.0 to effectively address sustainability challenges in aluminium production in recent years. Extensive R&D efforts are underway to explore the utilization of hazardous wastes generated throughout the entire lifecycle of aluminium. By integrating environmental, social and governance (ESG) principles into the core strategies, like - fostering diversity and inclusivity in workforce, adopting electric vehicle policy and launching of green aluminium, Vedanta is aiming for reduction of carbon footprint and creating long term values for the organization while making a positive impact to achieve India’s vision of “AtmaNirbhar Bharat” and Net Zero emissions by 2070. This paper provides an overview of Indian aluminium industry and Vedanta’s sustainability practices, market scenario and how the smelters are prioritizing sustainable practices and incorporating ESG considerations into their business strategies.

Keywords: Indian aluminium industry, Sustainable production, Environmental social and governance (ESG), Net zero emissions, AtmaNirbhar Bharat.

1. Introduction

The aluminium industry has long been a key player in the global economy, with its versatile applications spanning various sectors such as automobile, power, construction, packaging, and aerospace. The development of innovative and advanced aluminium alloys has opened up a wide range of applications for aluminium in the consumer electronics sector. Additionally, the increasing use of aluminium as a substitute for plastics and steels is driven by its reliability, versatility, high mechanical strength, cost-effectiveness, and lightweight properties, thereby

strengthening the market. The growth of the global aluminium market is further propelled by the expanding applications, growing environmental concerns, and a shift towards the use of recyclable materials. The Asia Pacific region and the America have mature markets, with the Asia Pacific expected to dominate future growth rates. Over the next five years, various countries in the Asia Pacific region and the Middle East are anticipated to witness capacity expansions in aluminium manufacturing [1]. The per capita consumption of aluminium globally has reached an average of 11 kg, while in India; it remains significantly lower, ranging from 2.5 to 2.8 kg [2, 3]. However, it is predicted that the demand for aluminium in India will experience substantial growth in the coming years, primarily due to the projected high GDP growth in the country. The Indian government's ambitious initiatives such as Make in India, 100 % rural electrification, smart cities, the National Infrastructure Pipeline (NIP), and schemes, as FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) for electric vehicles, along with increased foreign direct investment (FDI), will boost the consumption of aluminium in the country. However, as the industry looks toward the future, it faces a myriad of challenges that require careful examination and strategic planning. Smelters across the globe are trying to develop energy efficient technologies, adopting renewable sources of energy and fostering best operational practices to reduce carbon footprints and integrating best energy management system. This research paper aims to delve into the challenges and progress in the aluminium industry, providing insights into the factors that will shape its trajectory in the coming years.

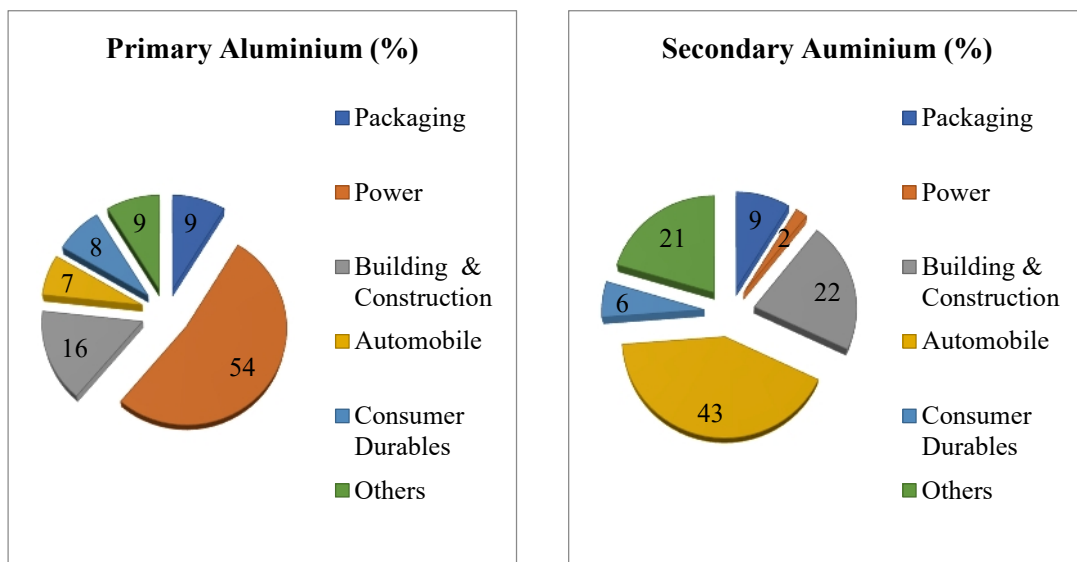


Figure 1. Primary and secondary aluminium usage in different sectors in India [2].

2. Global & Domestic Outlook for Aluminium Market

The Covid-19 pandemic and the ensuing lockdowns had a profound and far-reaching effect on the global aluminium industry during FY'20-21. In the post COVID period the demand of aluminium has shown an uptrend. Aluminium demand is forecast to grow by 33 million tonnes, going from 86 million tonnes in 2020 to 119 million tonnes in 2030. Around 37 % growth is expected to come from China, followed by 26 % other Asian countries and 37 % from rest of the countries [4].

The highest growth in terms of absolute demand will come from the automobile sector after introduction of decarbonization policies and shifting of traditional fossil fuel powered vehicles to electric vehicles (EVs). Followed by automobile sector, the electric and construction sectors are witnessing surge in demand for aluminium. The global market is expected to expand from USD 168.84 billion in 2022 to USD 255.91 billion by 2029. The global aluminium market is expected

Vedanta is committed to achieving excellence in technological advancements within the aluminium smelting industry. As part of its innovative breakthroughs, Vedanta has successfully developed an indigenous Pot Controller and Lining Design. This cutting-edge solution is designed to deliver multiple benefits, including energy savings, reduction in greenhouse gas emissions, and enhanced process control.

Vedanta has achieved 24 % reduction in greenhouse gas (GHG) emissions intensity in FY'22 compared to the 2012 baseline, despite an eight-fold increase in production during the same period. In line with India's vision of net zero carbon emissions by 2070; Vedanta has adopted electric vehicle (EV) policies such as implementation of lithium-ion battery powered electric forklifts.

Implementation of advanced tools like Industrial Internet of Things (IIoT), computational modelling and simulation for optimization of process has resulted in better emissions control and further reduce the carbon footprint.

Vedanta is actively engaged in the development of advanced technologies aimed at reducing specific energy consumption and enhancing process control through advanced control logics. Additionally, the organization has undertaken various waste-to-wealth initiatives, including the utilization of ash, Spent Pot lining (SPL) carbon, and dross. Vedanta has set ambitious targets for these initiatives, with a planned ash utilization of 14.56 Mt by FY'30, SPL carbon utilization of 33.966 kt by FY'30, and dross utilization of 32.53 kt by FY'30.

By closely monitoring the quality of raw materials and implementing strict emission control measures, Vedanta is committed to creating a sustainable future. The company values the importance of continuous value addition and strives to deliver superior quality products consistently. Through these efforts, Vedanta aims to contribute to a greener and more sustainable industry while upholding its core values.

6. Conclusion

Immense demand, affluent consumers, and visible profitability characterize the aluminium industry, creating an impression that numerous companies would eagerly enter the sector. However, the reality is more nuanced. The path to success in the aluminium industry is not as straightforward as it may seem. It requires the ability to establish and effectively manage the complete production cycle, encompassing the extraction of raw materials, the production of alumina, and the reduction of aluminium. Only those capable of efficiently navigating and overseeing this entire process can emerge as leaders in the aluminium industry.

Through the deployment of digital solutions, advanced process control systems, exploration of renewable energy alternatives, strategic sourcing, and the dedication of a young and talented workforce, Vedanta is poised to maintain its position in the first quartile of the cost curve while delivering the highest quality of production in a sustainable manner. With a comprehensive range of products, robust research and development capabilities, and unwavering dedication to customer-technical support, Vedanta is steadfast in its commitment to serving its esteemed global clientele. Simultaneously, the company actively contributes to the national vision of fostering self-reliance and promoting economic empowerment through the 'AtmaNirbhar Bharat' initiative.

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