Waste Management in the Indian Aluminium Industry – Key to Circular Economy

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Abstract

Aluminium is the second most used metal in the world, after steel, with an annual consumption of about 90 million tonne (including scrap). When the world is aiming towards decarbonization and Net Zero, aluminium, with its obvious advantages, is poised to be a key enabler in achieving this goal and waste management would play a significant role in reaching this end.

India aims to become a USD 5 trillion economy in 5 years and a strong foundation is being laid to achieve this objective. The role of aluminium sector in this endeavour will be crucial. Government of India missions such as "**Make in India**" and "**Atmanirbhar Bharat**" aspire to make the country self-reliant in meeting all needs including production of high-end aluminium required for strategic sectors like defence and aerospace.

Production of primary aluminium, which is a resource intensive process, is also associated with significant amount of waste generation. While lot of focus is there on green aluminium, sustainable waste management has not received the desired attention.

Significant investment in R&D and collaborative efforts are needed to find ways to utilise the various waste generated in the aluminium value chain, i.e., from mining of bauxite ore to smelting and casting of aluminium. This paper deliberates on this issue, primarily from NALCO's perspective, the major wastes generated, the current practices of disposal and the opportunities for better management in future, in the backdrop of the latest developments in this field.

Keywords: Make in India, Atmanirbhar Bharat, Waste management in aluminium industry, Circular economy.

Aluminium is the second most used metal in the world after steel, with an annual consumption of about 90 million tonne (including scrap). The demand for aluminium will grow significantly in the coming days, driven by its continuous increase in its use in automotive, construction, packaging, electrical, renewable energy sectors etc. Currently, out of the total demand of 90 million tonne, about 60 to 65 million tonne is met from primary aluminium production and the rest from secondary production. The secondary/recycled aluminium presents a huge opportunity for the World as the metal is infinitely recyclable without any deterioration in quality and consumes only 5 % of the energy that is required for making primary aluminium. This makes aluminium the metal of choice for the future in the path to the decarbonization. However, the growing demand for aluminium in near future can be met partly by recycling of scrap due to its limited availability and hence significant amount of demand will still be fulfilled through production of primary aluminium.

Production of primary aluminium is a resource intensive process with about 22 tonne of input materials required to produce one tonne of metal. The process also generates huge amount of waste across its value chain starting with mining of bauxite to ending with production of aluminium metal. In recent times, a lot of emphasis is being given on reducing the use of fossil

fuels for primary aluminium electrolysis process and a gradual shift to production of 'Green Aluminium'. However, the waste generated in the process has not yet received its due attention. Useful resources available in the wastes, if extracted in a commercially viable scale, will lead to a reasonable benefit for the companies and the nation apart from addressing environmental concerns.

1. Introduction

India is a rapidly developing country and the role of aluminium sector will be critical as the country advances to meet its economic growth goals. Aluminium consumption in India has witnessed a strong growth over the last 5 years - from 2.36 million tonne in financial year 2016 to 3.7 million tonne in financial year 2020 i.e. at a CAGR (compound annual growth rate) of ~11.84 %. At present, power (48 %), transport (15 %), building & construction (14 %), packaging (9 %), machinery and equipment (7 %), consumer durables and others (7 %) sectors as depicted in Figure 1, are key demand drivers of aluminium in the country.

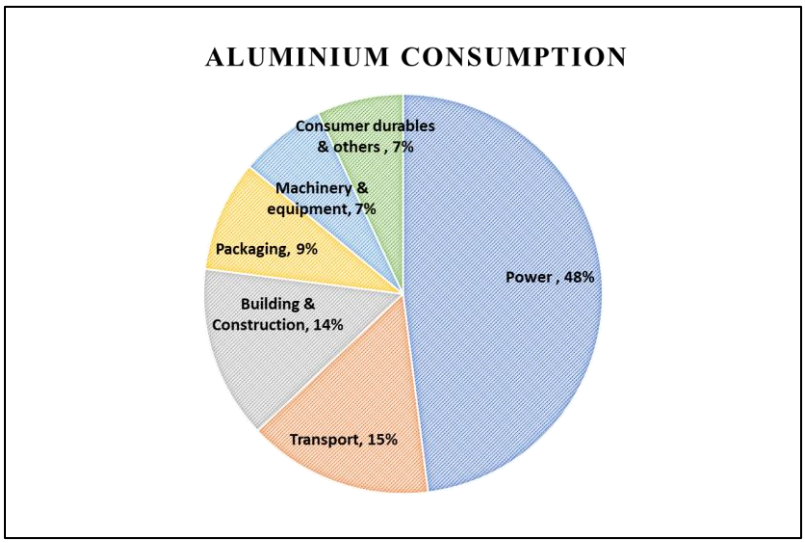

Figure 1. Sector wise Aluminium consumption in India.

However, the per capita Consumption in India is very low at about 2.5 kg to 2.8 kg compared to the global average of 11 kg. Per capita consumption of aluminium is closely related to Gross Domestic Product (GDP) of a country. India is aiming to become a USD 5 trillion economy by 2024-25 and a strong foundation is being laid to achieve this objective. The ambitious national projects like: Make in India, 100 % rural electrification, FAME (Faster adoption and manufacturing of hybrid and electric vehicle) scheme for switching to electric vehicles, renewable energy, National Infrastructure Pipeline (NIP) along with growth in urbanization will increase the demand for aluminium significantly in the coming years. It is projected that, the demand for aluminium in India will grow to about 7 million tonnes by FY 2030 from the current level of 3.7 million tonnes.

With the increase in demand for aluminium, there will be significant burden on the country's natural resources. Ores and minerals are non-renewable in nature and hence, with the ever-growing demand, it is imperative to achieve resource efficiency in the processes as well as reuse and recycle the metals that are already in use to conserve natural resources. Worldwide there is a growing recognition for development based on circular economy, which is also reflected in sustainable development goal, to ensure responsible consumption and production. Adaption of the 6Rs principles of reduce, recycle, reuse, recover, redesign and remanufacture will enable the aluminium industry to achieve a robust circular economy.

5. References

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