KN02 - Growth of Indian Aluminium Industry and Vedanta

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Abstract

This article provides an overview and characterization of the Indian aluminum industry and its importance to the economy and focuses on Vedanta's contribution in significantly shaping Indian Aluminum scenario. The growth of Indian Aluminum Industry over the years has significantly contributed towards the overall development of the country. India being the third largest producer of Primary Aluminum (approximately 3.74 million tonnes) in the world with a share of 5.8 % of the total world's production of 63.1 million tonnes per annum is fast emerging as hub of primary aluminum in the global context. Even with the domestic market's dependency on aluminum import especially scrap, emerging trends indicated optimistic scenario wherein aluminum consumption in India expected to double to 7.2 Mt in next 5 years backed by strong reforms and focus on domestic production. India still remains highly under-utilized market with current per-capita aluminum consumption of 2.5 kg against the world average of 11 kg. With India's focus on self-reliance, use of aluminum is expected to rapidly grow in diversified sectors of Indian economy. Vedanta's aluminum operation has significant contribution in this context. Its production has grown to 1.91 Mt in FY20 (Fiscal Year, 12 months ending at March 31, 2020) with compound annual growth rate (CAGR) 15.6 % (From FY16 - FY20) with the ramp up of the Special Economic Zone (SEZ) Smelter at Jharsuguda. With our operations based out of Odisha and Chhattisgarh, our Aluminium division currently reached 83 % of installed capacity with our portfolio focusing more on value added products (VAP). We have successfully commissioned Billet Plant in SEZ to achieve 120 % of design capacity within two years and gained global acknowledgement for our product quality. Vedanta poised for its next phase of growth with potential aluminum production ramp up to 2.3 Mt which will support Government of India's drive to be self-reliant through its flagship program "ATMANIRBHAR BHARAT" that aims to drive Indian GDP to 5 trillion US dollars economy.

Keywords: Indian aluminum market, growth of aluminum business, Vedanta growth history, Vedanta product portfolio, Atmanirbhar Bharat.

1. Indian Aluminium Scenario and Growth Potential

India holds a fair advantage in production and conversion costs in steel and alumina. Its strategic location enables export opportunities to the developed as well as fast-developing Asian markets. India produces 95 minerals – 4 fuel-related minerals, 10 metallic minerals, 23 non-metallic minerals, 3 atomic minerals and 55 minor minerals (including building and other minerals).

Rise in infrastructure development and automotive production are driving growth. Power, cement and aluminum industries are also aiding growth for the sector.

1.1. Primary Aluminium Growth

Primary production is also growing in the same tune of 8.4 % CAGR (from FY16 to FY20), which is almost ~ 93 to 98 % of total consumption. Aluminum consumption is growing at a CAGR of 2.7%, from 3.25 Mt in FY16 to 3.72 Mt in FY20. Installed capacity reached to 4.1 Mt with an investment of ~ 18.5 B$ in both upstream and downstream.

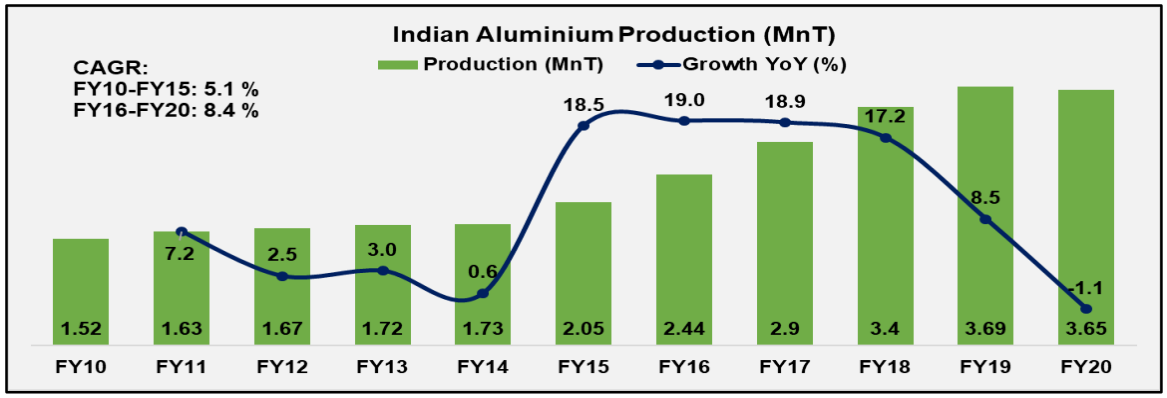

Figure 1. Indian Aluminum Production (Mt).

1.2. Aluminum Consumption Overview

- 43% of total demand is met through own primary production and 57 % of balance demand is managed through import route. Out of total import, 62 % is scrap, which is increasing at CAGR of 9.2 % (from FY16-FY20).
- Total primary consumption (own and import), remain at similar level over last 5 years of 1.8 Mt.

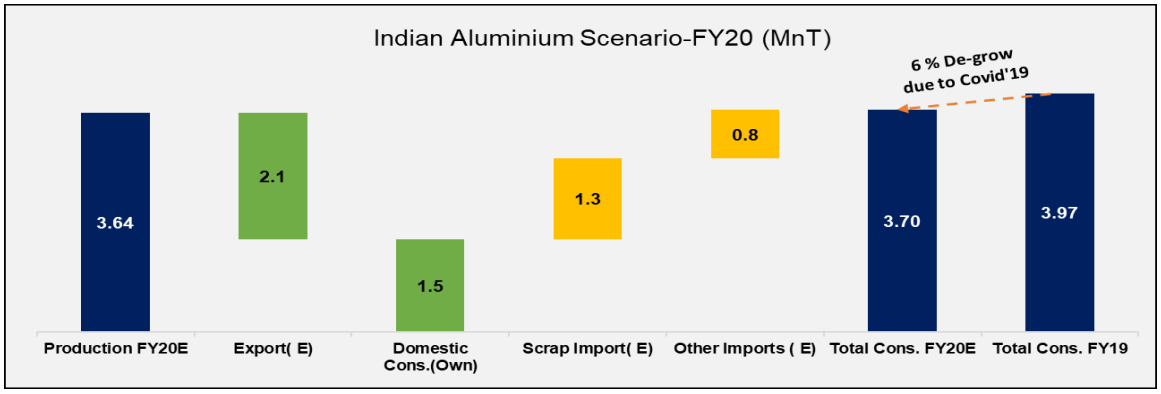

Figure 2. Indian Aluminum Production & Consumption balance.

1.3. Bauxite and Aluminum Growth

India has the 7th largest bauxite reserve (3 896 million tonnes: reserve-656 million tonne and 3240 million tonne-remaining resources in FY19) in the world. With this abundant bauxite, India is self-sufficient to meet domestic and export demand. Over the period of last 5 - 10 years, production has increased at a CAGR of 5.3 % from FY10 at 14.1 Mtpa to FY19 at 23.7 Mtpa, CAGR from FY15 at 22.5 Mtpa to FY19 at 23.7 Mtpa is 1 % level. In FY19, production is in place from 154 major mines, distributed over all states. Odisha contributes almost 71 % of total production of the country.

Over the period of last 6 years, alumina production is increasing at a CAGR of 4.6 %. Hindalco, NALCO and Vedanta are producers for alumina. Major growth in production is driven by ramp up of Vedanta Lanjigarh refinery from 0.98 Mtpa in FY15 to 1.18 Mtpa (10.8 % CAGR). Currently, all 3 primary players are planning for expansion of existing refineries in next 1 - 2 years by 1.7 - 2 Mtpa capacity. All these expansions are being supported by availability of domestic bauxite (majorly from Odisha).

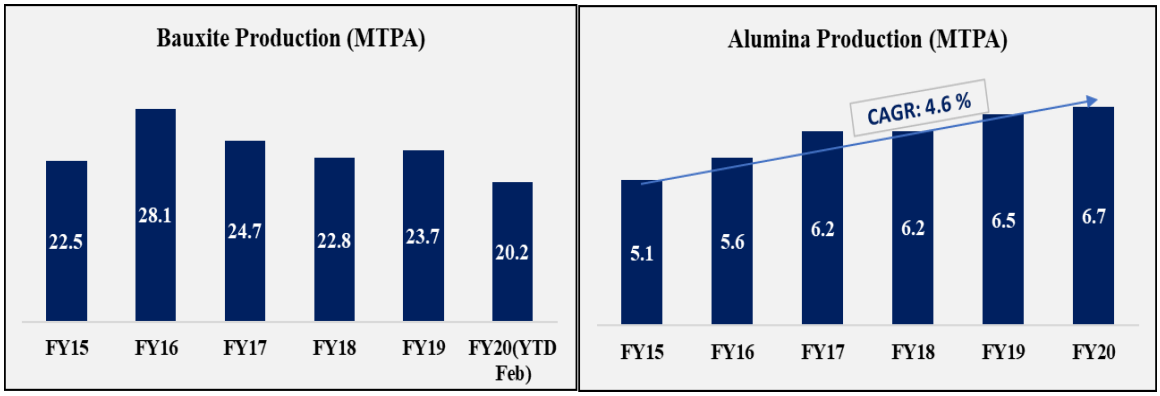

Figure 3. Indian Bauxite & Alumina Production.

1.4. Calcined Petroleum Coke Demand & Supply

With current aluminium production level of 3.65 Mtpa, Indian CP coke demand remains at 1.5 Mtpa. Out of total 15.8 Mtpa pet coke production in India from oil refineries, only 3.4 % i.e. 0.53 Mtpa is of anode grade (light sweet crude slate conducive to produce anode grade CPC). So, India stands deficit in Green Petroleum Coke (GPC) and Calcined Petroleum Coke (CPC). In reference to restriction from the Honorable Supreme Court, India, on restriction of pet coke for aluminium industry by capping both GPC and CPC import limits to 1.4 Mtpa and 0.5 Mtpa respectively, it just meets the supply and demand scenario.

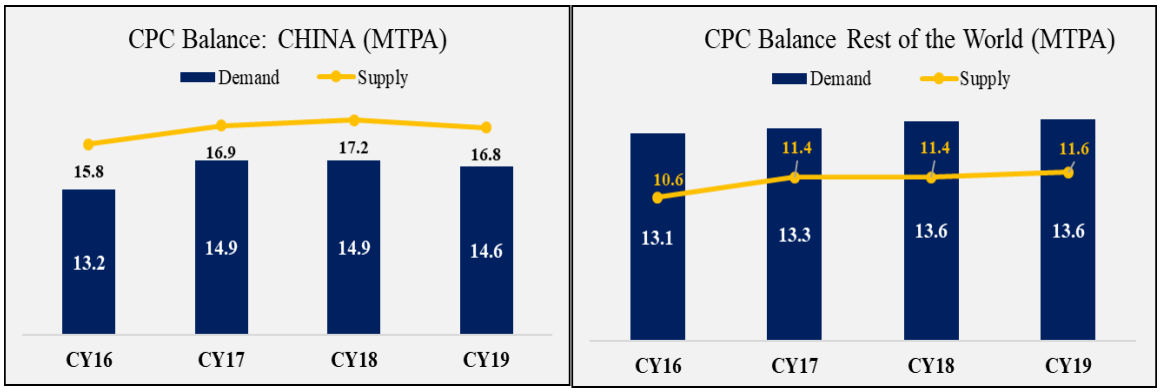

Figure 4. CP Coke Demand & Supply Balance. [1]

Above indicates China being surplus market of CPC, supplies to other deficient regions in Rest of the World (ROW). Total CPC and GPC import from China to India in Calendar Year 2019 (CY19) was 294 kt and 405 kt respectively. USA was the major importer of GPC to India of ~ 5.98 Mtpa in CY19.

With reference to installed primary aluminum capacity of 4.12 Mtpa, GPC demand will increase to 2.5 Mtpa from current 2.1 Mtpa, thereby deficit will increase to 2.3 Mtpa. Hence, there is a strong need to production of anode grade GPC.

1.5. Coal Tar Pitch Demand and Supply

China and Europe are two surplus regions of Coal Tar pitch (CT pitch) in the globe. However, surplus in China is getting depleted faster towards higher domestic demand and environmental restrictions. With reference to current aluminum production of 3.65 Mtpa, CT pitch demand in India stands at 0.3 Mtpa. There are only two major producers in India with integrated coal tar distillation plants. However, India was the deficit market of ~ 20% of CT pitch demand from both

aluminum and carbon black industry. With the increase in steel production and stagnant carbon black industries, dependency on import has been reduced drastically 7-10 ktpa in CY19 from 55-70 ktpa in CY16 to CY18.

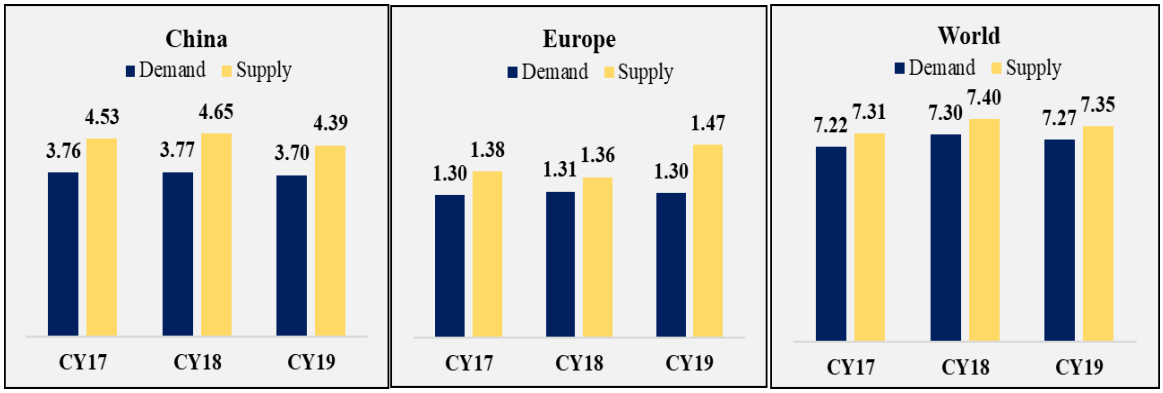

Figure 5. CT Pitch Demand & Supply Balance. [1]

1.6. Growth Potential in India

1.6.1. Consumption Potential

Per capita consumption of aluminum in India is still very low at 2.5 kg as compared to world average of 11 kg. Also, consumption is heavily concentrated in the electrical industry segment (38% share). Transport and consumer durables account for 21 % and 16 % share, respectively. Construction and packaging are even more under-utilized with share of just 11 % and 2 % respectively. With vast product portfolio installed base to cater the end use areas. There is a need for National Aluminum Policy and R&D facility development for new product.

Indian sectors show different consumption trend with respect to world in key areas like in:

- Electrical 38 % vs 12 % globally, due to large scale electrification being done across the country.
- Transport 19 % vs 26 % globally, followed by consumer durables 17 % vs 6 % in world.
- Construction 11 % vs 25 % globally, and packaging 2 % vs 8 % globally, which are second and fourth highest utilized sectors across the world are quite under-used in India

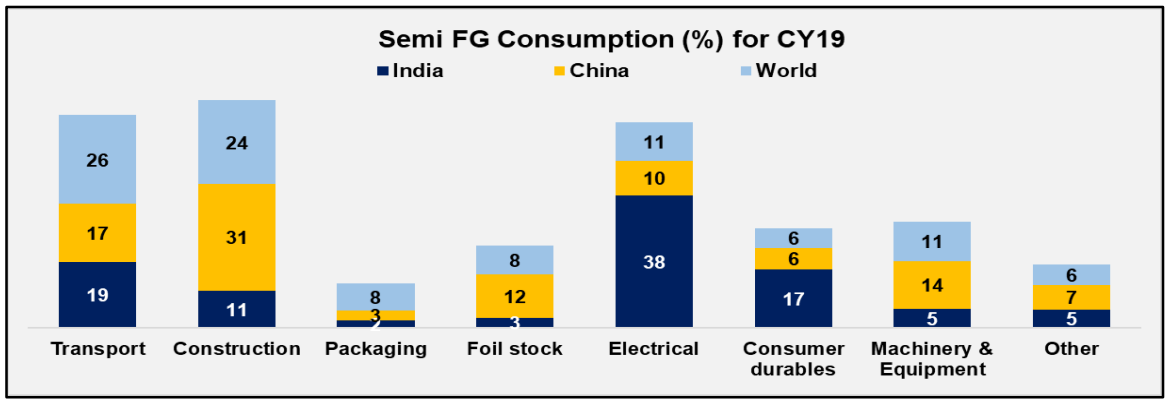

Figure 6. Semi FG Consumption. [1]

1.6.2. Competitive Advantage

India is the fourth largest alumina producer, third largest aluminum producer and fourth largest consumer of aluminium. It is endowed with rich and good quality coal and bauxite reserves (Fifth largest in the world for both). India's unique advantage of abundant, good quality bauxite along with coal, which needs to be leveraged to develop a globally competitive Aluminium industry which will also help achieve our economic development goals. India has a significant primary aluminium capacity (4100 kt) and downstream processing capacity, which lays a good platform for scaling up and leveraging our natural resources. Given our competitive advantage in terms of natural resources, capacity can be increased multi-fold to cater to domestic demand without any reliance on imports.

As the third largest producer and consumer of electricity in the world, India will have huge requirement for aluminium in the electrical segment over the next few years. India is currently the largest consumer of aluminium based conductors and cables (ex-China) with an annual consumption of around 1.1 – 1.3 million tonnes of aluminium wire rods. India's per capita consumption of aluminium in the electrical sector at 0.9 kg, which is well below world average of 1.3 kg or that of developed countries like USA and China at 2.5 kg and 3.2 kg, respectively.
Looking at the evolving consumption patterns and needs of the country in power sector, Vedanta Aluminium has ramped up production capacities for wire rod over the years. Today, Vedanta is the largest producer of aluminium wire rods in the world with a capacity of 621 ktpa, poised to meet the needs of domestic and global customers through top quality products. Currently the company is supplying electrical conductivity (EC) grade wire rods to most of the Indian conductor and cable manufacturing companies. At the same time, the company is also focusing on development of alloy wire rods for niche segments like coastal electrical applications. Outside India, Vedanta also supplies wire rods to countries in Asia and North America.

1.6.3. Job Creation and Development

The industry also has a high direct and an indirect employment generating potential creating close to 800,000 jobs. Plants are generally based in the hinterlands of the country and aid in generating peripheral employment and development of the region.

1.6.4. Government Initiatives

Major growth to be driven by the government's flagship programs like Make in India, National Capital Good Policy, development of 100 Smart Cities and Renewable Energy Enhancement.
Total semi-products consumption is expected to grow to 4.1 million tonne by CY2024. Major growth drivers being construction sectors (13.5 %), consumer durables (18 %) and packaging (2.3%). Following are the expected growth areas in respective sectors [3].

- Railways: Increasing speed of trains, safety of passengers and cost efficiency by weight reduction.
- Transport: Environment norms (CO_2 emissions), manufacturing of Electric Vehicles, enhance safety by Crash Management System etc.
- Renewable Energy: Target to increase renewable energy to 40 % share from current 34.6% and target to increase solar capacity to 100 GW from current 30 GW.
- Defense: As India is one of the largest importers of defense equipment, there is a need for in-house development through Make in India drive. Also developing R&D set up to develop new alloys.
- Packaging: Increasing urbanization i.e. urban population share to reach 50 % from current 33.6 % level with stringent environment and health centric regulations to eliminate plastic usage.

- Aerospace and Civil Aviation: Increase indigenization by Indian Space Research Organization (ISRO). To become third largest civil aviation market in the world by 2024. Expected investment of 6 B$ in Airports by FY18-23.
- Coal and Mining Sector: With recent reformation in coal and mining sectors, related to coal block, commercial mining and other mining auctions to bring better cost competitiveness.

2. Vedanta Growth Journey

2.1. Introduction

2.1.1 Core Purpose

Vedanta is a globally diversified natural resources company with low-cost operations. We empower our people to drive excellence and innovation to create value for our stakeholders. We demonstrate world class standards of governance, safety, sustainability, and social responsibility. Vedanta Limited supplies natural resources that help the world grow. Our major products are zinc-lead-silver, iron ore, steel, copper, aluminium, power, oil and gas. Our strategic capabilities and alliances are singularly focused on creating and preserving value for our wide stakeholder groups and our clientele. Vedanta Ltd. has a portfolio of world-class, low-cost, scalable assets that consistently generate strong profitability and have robust cash flows. The company holds industry-leading market shares across its core divisions. Vedanta has “seven core values” and the company operates with a safety-first ethos to business aspirations.

Figure 7. Vedanta Core Values.

2.1.2 Our Value Chain and Operations

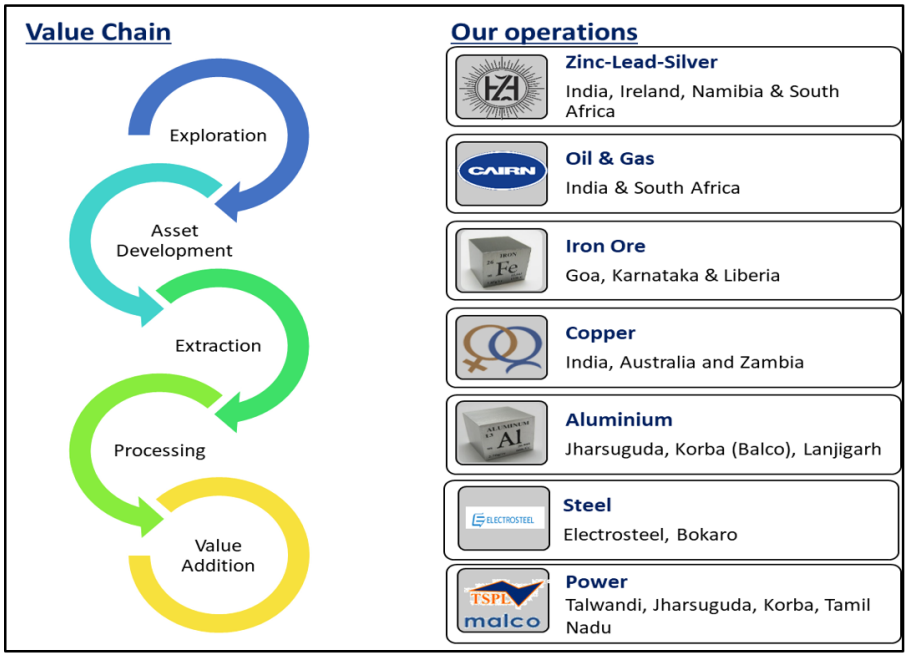

Figure 8. Vedanta Value Chain & Operations.

Vedanta has installed base of 2.3 Mtpa aluminium production and supported by power plant of capacity of 4.5 GW (total power capacity: 5.3 GW and power plant at Talwandi Sabo Power Limited (TSPL) of 1.98 GW). We have strategically located large-scale assets with integrated power from captive power plants in Indian states of Chhattisgarh and Odisha. Sector reached to 83 % of installed capacity. Vedanta's portfolio is focused more on the value-added products and demand for its rods, billets, Slab, Alloy Ingot, T-Ingot rolled products is likely to increase substantially. Following are key performance milestones:

- Production has grown at a CAGR of 15 % over last five fiscal years.
- Alumina production at Lanjigarh refinery has been increased to 1.81 Mtpa (21 % increment from FY19 of 1.5 Mtpa)
- Vedanta, Jharsuguda shares 37 % of India's production and 59 % of Odisha's production. It is worth to justify that Jharsuguda is the aluminium capital of India
- Vedanta Jharsuguda is spread over ~3000 acres (~1200 hectares) of land with 67 km of boundary span

2.1.3 Aluminium and Power Sector Asset Overview

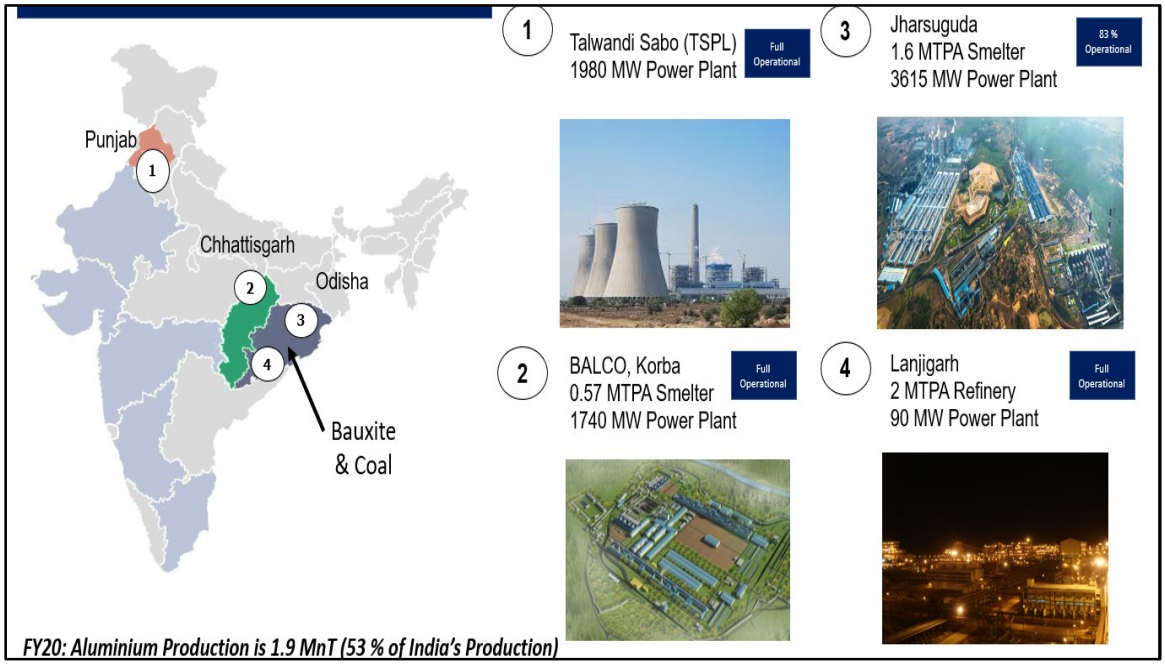

Figure 9. Vedanta Aluminium & Power Sector Overview. [2]

In April 2008, Vedanta started trial production from its integrated state of art aluminium smelting complex at Jharsuguda. Within a record time of 4 years crossed design capacity to achieve 0.53 Mtpa in smelter-I in FY13. Subsequently with Special Economic Zone (SEZ) unit ramp up in September 2015, Jharsuguda in February 2018 entered the 1 million tonne Production Club in the global aluminium industry. Currently Vedanta Ltd., Jharsuguda, is the world's largest single location smelter outside of China by virtue of its installed capacity.

Before April 2008, Indian aluminium production was 1.24 Mtpa (FY08). The current Indian primary aluminium industry capacity is 4.2 Mtpa post commissioning of Vedanta's Jharsuguda complex, and production level is 3.65 Mtpa. Besides production capability, Vedanta also increased export revenue of the country majorly, from 1.1 B$ (0.36 Mtpa) in FY08 to 4.2 B$+ (2.1 Mtpa+) in FY20.

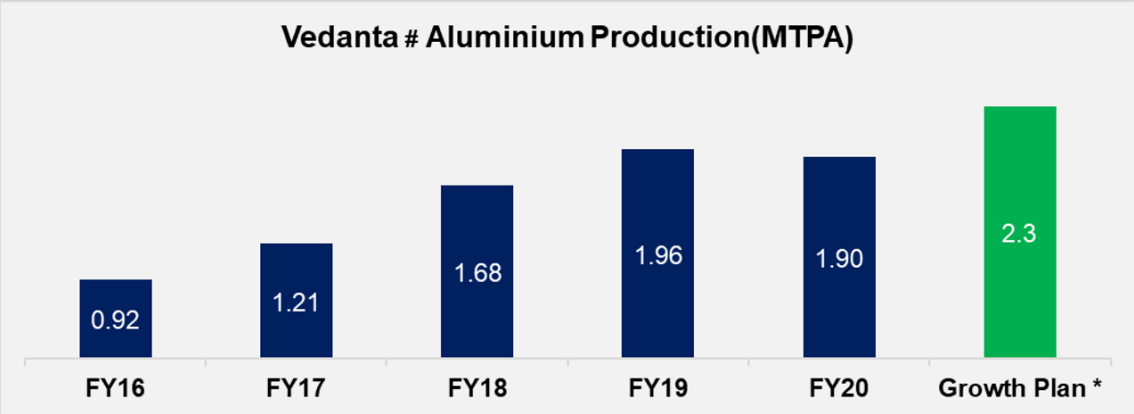

Figure 10. Vedanta Aluminium Production.
(#)- Jharsuguda & BALCO (*) In next 2-3 years progressively

With long term strategic cost reduction through raw material sourcing/security and operational efficiency improvement in both metal and power business, Vedanta aims to be in 1st quartile of global cost curve, among the world's top 10 Mtpa production capacities. We also have plans to ramp up of production in Jharsuguda smelter to 1.8 Mtpa capacity next 2-3 years in stages. As the drive of Atmanirbhar Bharat by Government of India gains momentum, Vedanta intends to maximize domestic aluminium production to meet rising domestic demand from domestic electrical, automotive, construction and packaging sectors in next 2 to 3 years.

2.1.4 Health, Safety, Environment and Sustainability

As the country's largest producer of aluminium, which is an eternally recyclable metal with minimal loss in quality and energy requirements, Vedanta integrates robust health and safety practices, smart innovation, best-in-class technology, environmental safeguards and sustainability-focused operating procedures to create value for the nation. The company has collaborated with the country's premiere technical institutes, global experts and technology consultants to assess and improve the company's sustainability initiatives.

As a part of their annual Key Performance Indicators (KPI), the senior leadership team must own and display Visible Felt Leadership to foster a safety-first work culture. The company has instituted a Permit to Work system for better safety performance. Vedanta Jharsuguda also engages with business partners to enhance their safety deliverables. The company has a strong safety compliance with Lost Time Injury Frequency Rate (LTIFR) reduced to 0.14. Robust vehicle safety management system, rescue preparedness, disaster mitigation plans as well as intensive audits and monitoring of processes and practices help continually streamline and improve the company's safety and sustainability performance.

Online and continuous Environment Monitoring Systems with real-time data acquisition for parameters like ambient air quality etc. help ensure that all parameters remain within stipulated norms. The company has Effluent Treatment Plants (ETP) augmented with Ultra-Filtration and Reverse Osmosis (UF and RO) systems to ensure 100% treatment of water, which is then recycled for usage in ash-handling, horticulture, etc. Aluminium dross is recycled through authorized re-processor. It is the first in the country to install Hybrid Electrostatic Precipitators (ESP) with bag filters in captive power plants to reduce particulate emission and has 100 % fly ash utilization. Additionally, natural draft cooling towers, state-of-the-art dry scrubbing systems, fume treatment plants, soil blanketing, and many other innovations adopted across the operations for better environment footprint.

2.1.5. COVID Management

As the global pandemic COVID-19 continues to disrupt lives across the country, Vedanta Jharsuguda has intensified preventive measures and management oversight to safeguard its employees, families and business partners against the disease:

- COVID-19 Rapid Response Team has been constituted at site to monitor plant and township round-the-clock and support management in taking appropriate decisions.
- With business continuity and disaster management plans in place, a Central Control Room with emergency helpline number has been established.
- The company has tied up with Kalinga Institute of Industrial Technology (KIIT), Bhubaneswar, for COVID testing for employees, families and business partners.
- Increased utilization of advanced technologies and digital solutions to boost employee connectivity and productivity, as the company continues to operate with limited manpower.
- Remote working has been initiated since April 2020 for employees in non-critical/operational functions.
- Entry into the plant and township is strictly regulated. All travels from plant/township to outstation destinations, whether business or personal, are currently restricted. All personnel who travelled to inter-district and inter-state post-unlock have undergone medical fitness test and quarantine, if needed, before resuming work as per government protocol.
- A dedicated COVID Care center has been developed to monitor health status of employees.
- Surveillance of plant and township premises is being carried out through drones and a centrally monitored network of closed-circuit television (CCTV) cameras.
- Biometric punching has been discontinued in favor of radio-frequency identification (RFID) based attendance clocking since early March.
- Mass thermal screening cameras have been setup to identify health aberrations and monitor collective health status at plant.
- Motion sensor-based hand sanitizer dispensing machines have been put up at all entry/exit points and building entrances.
- Telemedicine facility has been setup for employees and families to get proper health and medical consultation remotely. Regular and random thermal screening of employees, business partners and township residents are being conducted.
- Besides frequent sanitization of work surfaces and common areas, surprise audits are helping ensure that proper hygiene standards are maintained.
- Public amenities in Vedanta township like temples, parks, gyms, clubs, etc. continue to be closed for usage.
- With a consequence management action plan in place, a dedicated taskforce is monitoring compliance of all applicable COVID guidelines.

2.1.6. People and Process

Vedanta Aluminium prides itself in having one of the largest technically qualified, diverse and vibrant workforces in the country spread across its four assets. At Jharsuguda, the business' largest aluminium and power operation, young professionals with an average age of 27 run the operations guided by seasoned professionals with global repute and expertise.

The company recruits from some of the country's best institutes. High potential employees undergo an exacting and thorough assessment of their skill sets through ACT-UP (Vedanta Accelerated Competency Tracking programme), and qualifying candidates (Business and Technical Stars) are groomed for leadership positions through structured and customized Individual Development Plans (IDP). Vedanta believes in organically developing talent to lead the organization's global aspirations. To that end, the company also has successor development plan for up to two levels in place.

A crucial pillar in Vedanta's human resource management strategy is Learning and Development. The company offers Work Integrated Learning Program (WILP) opportunities for candidates aspiring to enroll in Bachelor's in Technology and Master's in Business Administration degrees, while employed at Vedanta. The company has a strong focus on competency, technical skills as well as value-based holistic learning curve for employees.

2.1.7 Operational Excellence

The company leverages Business Excellence programs to drive operational efficiency and de-bottlenecking projects with data analytics tools like 6 Sigma and KAIZEN to unlock full potential of its assets. Vedanta Jharsuguda has also developed a robust R&D function with best in class Innovation Centre to achieve long term organizational goals in the field of energy efficiency, environmental performance, quality improvement, waste management, new product development and Value-Added Products (VAP) capacity improvement.

2.1.8 Product Portfolio Diversification

Our total VAP production capability of 1 Mtpa includes the following:

Table 1. Vedanta Product Profile.

#	Product	Capacity (KTPA)	Technology Supplier	Remarks
1	Ingot: 22 Kg	800-950	Befesa, Spain	Continuous casting cooling conveyor with auto strapping & bundling facility
2	Sow Ingot	100	Befesa, Spain	Inline automated skimming and stacking facility
3	Billet	425	Wagstaff, USA Hertwich, Austria	In SEZ, homogenizing technology (Hertwich Austria) for continuous homogenizing air cooled furnace Online Ultrasonic Testing Machine. ACD Inline Degassing STAS & SELEE CFF Filtration System Product Sizes from 6" to 10"
4	Wire Rod	320	Southwire, USA Properzi, Italy	In-line Treatment Facility – ACD (STAS), CFF Emulsion system with Integrated Filtration Mechanism and On-line Quench arrangement For Cooling of Rod
5	Slab	75-100	Wagstaff, USA Sermas, France	Alloys of 1xxx, 8xxx and 3 alloys of 3xxx series SNIF Degasser System
6	T-Ingot	25-60	Wagstaff, USA Sermas, France	SNIF Degasser System – P140 model (Two Rotor) with CFF SERMAS Cutting machine
7	Cast Bar (10 Kg)	100	Properzi, Italy	Continuous Cooling Tunnel with Layer Conveyor System Automated Strapping and Bundling Technology ACD STAS Degasser 4 No. Rotors, Ceramic Foam Filter
8	Alloy Ingot:22 Kg	50-100	Befesa, Spain	Same Ingot lines are being used

Vedanta Jharsuguda has state-of-the-art facilities for producing a diverse portfolio of primary and value-added products set up in partnership with global technology suppliers. In line with production ramp up, we have also diversified our product portfolio to cater both domestic and export markets.

2.2. VAP Growth Success Story

2.2.1. Billet

Vedanta is the seventh largest primary billet producer in the world with a production capacity of 450 ktpa in both smelters, i.e. 113 % of design capacity by internal debottlenecking and cycle time improvement in both of its cast houses. In the SEZ cast house, 103 % of design production capacity was achieved within 20 months from commissioning along with meeting the best quality standards of export markets for sizes 6"-10". With further operational process optimization and modification, we envisage improving this capacity to 360 ktpa from design of 300 ktpa (currently at 325 ktpa) by the next year.

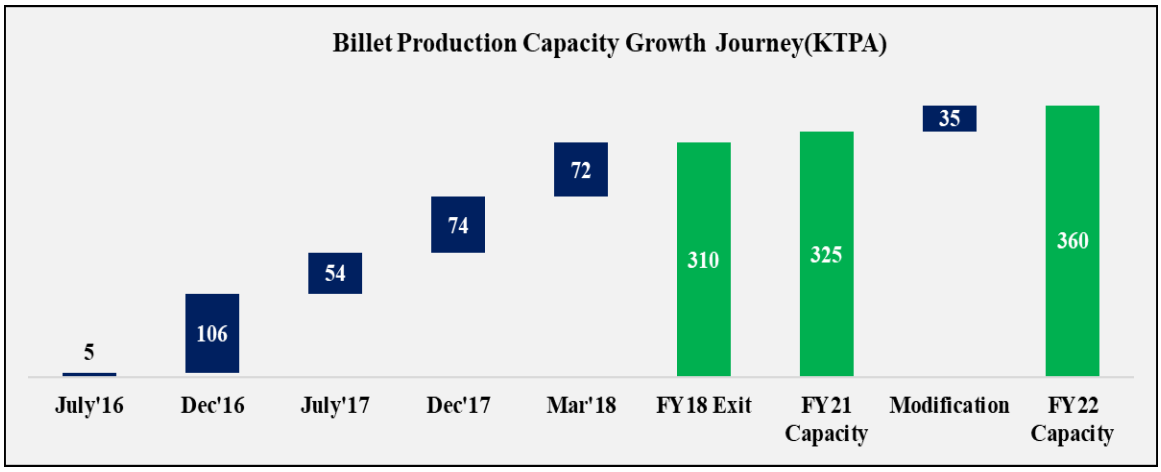

Figure 11. Vedanta Billet Production Capacity Growth.

2.2.2. New Value-Added Products facilities

We have commissioned and stabilized the following production facilities in cast houses in the last 1-2 years to meet domestic and export market for primary foundry alloy (PFA) and slab. Vedanta is the largest PFA producer in India with a current capacity of 150-200 ktpa.

- Cast Bar (10 kg): 2 casting lines of Properzi Continuous Cooling Tunnel with Layer Conveyor System and capacity of 100 ktpa
- T-Ingot (AlSi3): One casting line by Wagstaff Epsilon Ingot of 25-60 ktpa capacity, able to meet 1xxx series, AlSi3 and AlSi7 alloys.
- Alloy Ingot (22 Kg): Existing ingot lines in both cast houses can produce 22 kg PFA, with capacity of 50 ktpa.
- Slab: Production capacity of 1xxx, 8xxx series and 3 alloys of 3xxx series with a capacity of 75-100 ktpa.

2.2.3. Quality Certification

- ISO 9001:2015 Quality Management System
- ISO 14001:2015 Environment Management System
- ISO 45001:2018 Occupational Health and Safety Management System

- ISO 50001:2011 Energy Management System
- ISO 55001:2014 Asset Management System
- ISO 27001:2013 Information Security Management System
- ISO 22301:2012 Business Continuity Management System
- IATF 16949:2016 International Automotive Task Force (Automotive Quality Management System)
- ISO 17025:2005 Laboratory Management System

ASTM standards are being followed for testing parameters in chemical analysis, conductivity measurement and Ultimate tensile strength (UTS), elongation and diameter measurement.

2.2.4. Digitization and Technology

Out of the five operating pot lines, efficiency of potlines has been improved to 94-95 % level over last three years with process optimization. To improve further efficiency and new product following Digitization and R & D initiatives are being planned/under progress.

- Implementation of Manufacturing Execution System (MES) for all KPIs.
- Establishment of Smart Pot: Development of Digital Twin to reduce Specific DC Power consumption and specific AlF_3 consumption through efficiency improvement, partnering with General Electric.
- Automatic Furnace Planning to improve furnace cycle time.

3. Conclusions

In the global aluminium industry, utilization is steady at 81 % at current level. Post pandemic recovery, demand across all sectors is poised to grow, like in China where the recovery is almost V-shaped. Total demand is expected to grow to ~95-100 million tonnes in next 4 to 5 years from current level of ~82-85 million tonnes through growth in various sectors. This will be mainly driven by less raw material costs from power to upstream, different consumption avenues in construction, packaging, transport and energy sector, majorly renewable energy. All primary producers are aiming for higher profit margin through strategic raw material sourcing and switching to renewable energy sources, planning to ramp up capacity. India's primary industry is self-sufficient to meet the expected demand growth of 4.1 Mtpa by CY 2024.

Vedanta Jharsuguda has plans to continue ramp up to unlock installed capacity in next 2 to 3 years along with maximizing VAP production capabilities beyond design level. With the implementation of digital solutions, advanced process control system, exploration of renewable energy options, strategic sourcing, and the dedication of young and talented workforce, Vedanta will sustainably continue to be in first quartile of cost curve with best quality of production. Backed by a diverse product portfolio, R&D capabilities and customer-technical support, the company is committed to support its illustrious global clientele as well as fulfill the national vision for 'Atmanirbhar Bharat'.

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