



# **Indian Minerals Yearbook 2019**

**(Part- II :Metals and Alloys)**

**58<sup>th</sup> Edition**

**ALUMINIUM AND ALUMINA**

**(FINAL RELEASE)**

**GOVERNMENT OF INDIA  
MINISTRY OF MINES  
INDIAN BUREAU OF MINES**

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# 1 Aluminium and Alumina

The Aluminium Industry in India is strategically well-placed and is one of the largest producers in the world with discernible growth plans and prospects for the future. India's rich bauxite mineral base renders a competitive edge to the industry as compared to its counterparts globally. The Indian Aluminium Industry scaled lofty notches since the establishment of the first manufacturing company, namely, Indian Aluminium Company (INDAL) in 1938. In 2004, all business activities of INDAL have been merged subsequently with Hindalco Industries Limited (Hindalco).

Four major primary producers, National Aluminium Co. Ltd, Hindalco Industries Ltd, Bharat Aluminium Co. Ltd and Vedanta Aluminium Ltd (VAL) are at the forefront in aluminium production. The primary producers have a strong presence in the sheet business and are enlarging their roles in the foil segment. The primary producers are also in the extrusion segment in which a large number of secondary manufacturers participate with fragmental capacities.

The overall total annual installed capacity of aluminium plants in the country has remained same at 41 lakh tonnes and remained unchanged for three consecutive years, i.e, 2016-17 to 2018-19. The production of aluminium comes from the plants viz, NALCO, HINDALCO, BALCO, & VEDANTA whereas the MALCO plant remained non-operational during the year 2018-19. Producer-wise capacity of aluminium is furnished in Table-1.

The installed capacity of alumina plants in the country was 75.60 lakh tpy. However, the operational capacity was 72.75 lakh tpy and plant capacity of 2.85 lakh tpy remained non-operational. Producer-wise capacity of alumina is furnished in Table-2.

## PRODUCTION

### Aluminium

Aluminium production in 2018-19 at 3,696 thousand tonnes registered an increase of 9% as compared to that in the previous year. Seven plants reported production of aluminium during the year.

**Table – 1: Installed Capacity of Aluminium, 2018-19 (By Producers)**

(In '000 tonnes)		
Producer	Plant	Annual capacity
<b>Total</b>		<b>4100</b>
<b>Public Sector</b>		
National Aluminium Co. Ltd	Angul (Odisha)	460
<b>Private Sector</b>		
Bharat Aluminium Co. Ltd	Korba (CG) - I 245	570
	Korba (CG)- II 325	
Hindalco Industries Ltd	Aditya (Odisha)- 360	1280
	Hirakud (Odisha)- 215	
	Mahan (M.P) - 360	
	Renukoot(U.P) - 345	
Madras Aluminium Co. Ltd	Mettur (Tamil Nadu)	40 <sup>#</sup>
Vedanta Aluminium Ltd	Jharsuguda-I (Odisha) - 500	1750
	Jharsuguda-II (Odisha) - 1250	

*Source: Information received from the companies/Annual Reports.  
# MALCO has closed its smelter since December, 2008.*

*Largest integrated smelter with 2.3 million tonnes per annum proposed capacity.*

**Table – 2: Installed Capacity of Alumina, 2018-19 (By Producers)**

(In '000 tonnes)		
Producer	Plant	Annual capacity
<b>Total</b>		<b>7560</b>
<b>Public Sector</b>		
National Aluminium Co. Ltd	Damanjodi (Odisha)	2275
<b>Private Sector</b>		
Bharat Aluminium Co. Ltd	Korba (Chhattisgarh)	200 <sup>#</sup>
Hindalco Industries Ltd	Renukoot - 700	3000
	(Uttar Pradesh)	
	Belagavi - 350	
	(Karnataka)	
	Muri - 450	
	Utkal Alumina - 1500	
	(Odisha)	
Madras Aluminium Co. Ltd	Mettur (Tamil Nadu)	85 <sup>#</sup>
Vedanta Aluminium Co. Ltd	Lanjigarh (Odisha)	2000

*Source: Information received from the companies/Annual Reports.*

*# Plants remained non-operational during the year.*

Of these, one plant is of Public Sector and remaining plants are under Private Sector (Tables - 3 & 4).

During the year 2018-19, out of the seven, six smelters have reported higher production as compared to the previous year.

**Table – 3: Production of Aluminium  
2016-17 to 2018-19**

(Quantity in tonnes; Value in ` '000)

Year	Production	
	Quantity	Value
2016-17	2896629	319857753
2017-18	3400618	430308076
2018-19 (P)	3696181	528227924

**Table – 4: Production of Aluminium  
2017-18 and 2018-19  
(By Plants)**

(In tonnes)

Producer	Plant	Production	
		2017-18	2018-19 (P)
National Aluminium Co. Ltd	Angul	424949	437961
Hindalco Industries Ltd	Aditya	364591	361770
	Hirakud	161933	166718
	Mahan	355582	357118
	Renukoot	408929	409058
Bharat Aluminium Co. Ltd	Korba	568883	571480
Vedanta Aluminium Ltd	Jharsuguda	1115751	1392076

## Alumina

The production of alumina at 6,446 thousand tonnes in 2018-19 increased by about 5% as compared to that in the previous year. During the year 2018-19, except Hindalco (Muri & Belagavi) all other smelters reported higher production of alumina as compared to that in the previous year. NALCO continued to be the leading producer of alumina accounting for 33% of the total production during the year under review (Tables-5 & 6).

**Table – 5: Production of Alumina  
2016-17 to 2018-19**

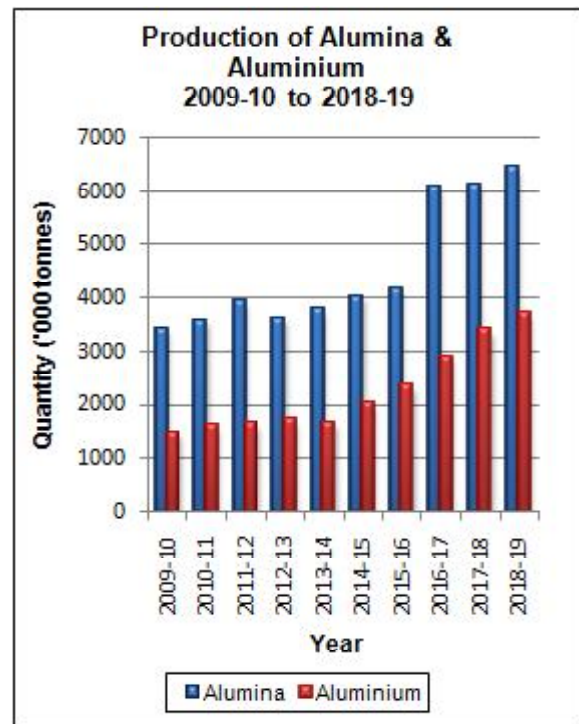
(Quantity in tonnes; Value in ` '000)

Year	Production	
	Quantity	Value
2016-17	6075839	102008547
2017-18	6119449	119895282
2018-19 (P)	6446370	153674440

**Table – 6: Production of Alumina  
2017-18 and 2018-19  
(By Plants)**

(In tonnes)

Producer	Plant	Production	
		2017-18	2018-19 (P)
National Aluminium Co. Ltd	Damanjodi	2085000	2107000
Hindalco Industries Ltd	Belagavi	317300	312300
	Muri	323717	286915
	Renukoot	684296	685885
	Utkal Alumina	1499700	1553600
Vedanta Aluminium Ltd	Lanjigarh	1209436	1500670



## INDUSTRY

Aluminium is the fastest growing non-ferrous metal in India and the same is evident by its growing and widespread use. Most of the Aluminium Smelters are located near their respective alumina refineries. Ten aluminium smelters are operated by four companies viz. NALCO, BALCO, HINDALCO & VEDANTA. NALCO is the only company in the Public Sector with installed capacity of 4,60,000 tpy. BALCO, earlier a Public Sector company, is now under Private Sector. The aluminium plants of NALCO and BALCO have their alumina-aluminium complexes at Damanjodi-Angul (Odisha) and Korba (Chhattisgarh), respectively.

NALCO is one of the largest integrated Bauxite-Alumina-Aluminium- Power Complex in the country. The Company has 4,60,000 tpy, Aluminium Smelter at Angul and 22,75,000 tpy Alumina Refinery located at Damanjodi in Koraput Odisha.

Hindalco Aluminium smelting operations are located at Renukoot (Uttar Pradesh), Aditya Aluminium (Odisha), Mahan Aluminium (Madhya Pradesh) and Hiralud (Odisha). Newly installed smelters at Aditya Aluminium and Mahan Aluminium have state-of-the-art AP36 technology. The Hindalco's total primary aluminium (metal) capacity has enhanced to around 13,00,000 tpy from earlier capacity of 5,62,000 tpy. This increase was primarily on account of production from Mahan and Aditya smelter commissioned during the year 2014-15. In addition to aluminium, Renukoot Integrated Aluminium Complex also produces semi-fabricated products viz. conductor redraw rods, sheet, extrusion, etc. The Alupuram (Kerala) smelter is closed but extrusion unit currently operates at a capacity of 8,000 tpy.

Hindalco's plants are equipped with sophisticated rolling mills and finishing equipment. The plants are located at Hiralud (Odisha), Belur (West Bengal), Mouda (Maharashtra), Renukoot (Uttar Pradesh) & Talaja (Maharashtra). Hindalco's finished products include, alumina, primary aluminium in the form of ingots, billets & wire rods, value-added products, such as, rolled products, extrusion and foils. Hindalco is the largest manufacturer of entire range of Flat Rolled Products. Flat Rolled Products facilities at Hiralud (Odisha) and Mouda (Maharashtra) are being modernised to

produce world class Can Body stock and Ultra Thin Gauge Foils, respectively. The Hiralud plant produces Flat Rolled Products (FRP), rolled products, extrusions products and wire rods. Hindalco has a conductor redraw capacity of 56,400 tpy at Renukoot plant and sheet rolling capacity of 2,05,000 tpy spread over at Renukoot (80,000 tpy), Belur (45,000 tpy), Talaja (50,000 tpy) and Mouda (30,000 tpy) plants. The Company also has two plants for aluminium extrusion with capacity of 31,000 tpy comprising units at Renukoot with 23,000 tpy capacity and Alupuram (Kerala) 8,000 tpy capacity.

Hindalco's foil unit located at Silvasa (Dadra & Nagar Haveli) has an installed capacity of 30,000 tpy and produces foils with thickness varying from 9 microns to 200 microns. Kollur plant in Medak district (Andhra Pradesh) has capacity of 4,000 tpy and produces an array of high-quality foils, from cigarette and blister foil to lidding foil in thicknesses from 50 to 7 microns.

The overall BALCO's smelter capacity augmented to 5,70,000 tpy with the commissioning of Korba-II smelter with 3,25,000 tpy capacity, has capabilities to produce ingots, wire-rods billets, bushbars and rolled products. The Korba-I plant with 2,45,000 tpy capacity showed consistent production during the year. The Company has two power plants for commercial power generation of which one produces power for captive consumption, refining, smelting, fabrication, etc. and the other 1,200 MW power plant is under construction. The ramp up of BALCO-II smelter was completed during the year 2018.

With the ramping up of the Jharsuguda- II smelter with capacity of 1.25 million tpy, the total smelter capacity of Vedanta in Odisha state has been enhanced to 1.75 million from 50,000 tpy capacity. MALCO, a Vedanta Group Company has not reported production of alumina and aluminium in 2018-19. MALCO is under care and maintenance by Vedanta since May, 2017. It generates 100 MW power from 4 units of 25 MW each through power plants located at Mettur (Tamil Nadu), and is one of the largest Private Sector power suppliers in Tamil Nadu.

Jindal Aluminium Ltd (JAL) established its factory for manufacture of aluminium extrusion in the year 1968 at Bengaluru. JAL has 11 aluminium extrusion presses with an installed capacity of

1,20,000 tpy. The Company is the leader in aluminium extrusions, meeting country's about 30% demand. JAL has taken a step forward by diversifying into Aluminium rolled products. Jindal commissioned the state-of-the-art Aluminium sheet and foil

manufacturing facility with installed capacity of 40,000 tpy, at Dabaspeta, Bengaluru, 35km from the existing extrusion plant. The information on installed capacity of Aluminium semis by different plants is given in Table-7.

**Table – 7: Capacity for Aluminium Semis**

(In tonnes)

Producer/product	Annual installed capacity
<b>HINDALCO INDUSTRIES LTD</b>	
Rolled product	205000
Extruded products	31000
Conductor redraw rods	56400
Aluminium foils	40000
Aluminium wheels (No. of pieces)	-
<b>NALCO</b>	
Aluminium wire rods	100000
Aluminium billets	30000
Aluminium strips (smelter)	26000
Aluminium strips (RPU)	52000
Rolled products	45000
<b>MALCO</b>	
Rolled products	12000
Properzi rods	36000
Bus bars-Aluminium wire rods	32850
<b>BALCO</b>	
Extruded products	8000
Rolled products	72500
Properzi rods	111500
Foil product	600
Conductors	1200
Aluminium wire rods	43200
<b>JINDAL ALUMINIUM LTD</b>	
Extruded products	128000
Foil product	40000

*Source: Information received from individual plants/Annual Reports.*

## DEVELOPMENT & EXPANSION

### National Aluminium Company Limited (NALCO)

NALCO is in the process of undertaking of 5<sup>th</sup> Stream expansion of its existing Alumina Refinery which would reportedly add 10.0 lakh tonnes to its existing installed capacity of 22.75 lakh tonnes per year (total capacity 32.75 lakh tonnes). This expansion would be based on improved Medium Pressure Digestion technology of M/s Rio Tinto Alcan International Limited (RTAIL).

Sourcing of bauxite for 5<sup>th</sup> Stream expansion of alumina refinery has been envisaged from Pottangi Bauxite Mines. The availability of bauxite from Pottangi Mines is expected beyond the scheduled commissioning of 5<sup>th</sup> Stream expansion. Hence, sourcing of bauxite from South Block of Panchpatmali Mines has been planned through setting up a crushing & conveying system.

NALCO plans for brownfield expansion of Smelter at Angul by adding a 5<sup>th</sup> Potline (5 lakh tonnes)

and upgradation of pot amperage of existing 4 Potlines from 180 KA to 220 KA (1 lakh tonnes) along with expansion of Captive Power Plant by addition of 2 units of 660 MW each or any other configuration.

NALCO has also prepared a detailed Project Report (DPR) for establishment of Aluminium Downstream Projects in Kamakhyanagar block of Dhenkanal district in Odisha.

Letter of Intent (LOI) for grant of Mining Lease of Utkal-D coal block has been issued to the Govt of Odisha and mining activities could be expected to start in 2019-20 and thereafter Utkal E coal block will be operationalised after obtaining of statutory clearances.

NALCO has signed an MoU with Mishra Dhatu Nigam Ltd (MIDHANI) for establishment of High End Aluminium Alloy Plant in JV mode for Defence, Aerospace & Automobile Sectors and NITI Aayog has given clearance for the JV project. The Company has signed an MoU with Neelachal Ispat Nigam Ltd (NINL) to set up a Coal Tar Distillation plant based on the Coal Tar generated in NINL's Coke Oven Plant.

The Company is in process of augmenting its wind power generation capacity from 198.40 MW to 223.90 MW by adding another wind power project of capacity 25.5 MW at Kayathar, Tamil Nadu.

The Company has plans to expand its manufacturing base in Wire Rod segment. With this objective, Alloy Wire Rod manufacturing facility of 60,000 tonnes per year of EC grade Aluminium Wire Rod or 40,000 tonnes per year Aluminium alloy wire rod at 100% utilisation have been planned.

NALCO and Odisha Industrial Infrastructure Development Corporation (IDCO) have formed a JV Company for establishment of Angul Aluminium Park Pvt. Ltd (AAPPL) for promotion of downstream industries in the State.

### **HINDALCO**

In the field of aluminium, Hindalco operates in primary aluminium and downstream aluminium segments and is one of the world's largest integrated aluminium producer. Hindalco's subsidiary Novalis with 61% recycling capability, is the largest aluminium recycler and producer of rolled aluminium products in the world. Hindalco launched India's first indigenous lightweight and eco-friendly aluminium bulker in India. This bulker saves up to 13,000 litres of fuel, generates 20 tonnes lower GHGs and is BS-VI compliant.

Hindalco's plans to expand alumina refinery capacity at Belagavi from 3.5 lakh tonnes per annum to 6.5 lakh tonnes per annum have been put on hold, pending Government's approval relating to bauxite mines. Hindalco's three greenfield projects are well on their way towards full capacity utilisation.

Hindalco won back the Krishnashila coal linkage of 3.1 million tonnes per annum auction conducted in 2018. Currently, three captive mines – Gare Palma IV/4, Gare Palma IV/5 and Kathautia – are fully operational. The captive mine at Dumri is in the process of obtaining necessary statutory clearances and is expected to be operational in the year 2019-20. The Company is also developing a coal mine for captive consumption jointly with Mahanadi Coalfields Ltd and Neyveli Lignite Corporation Ltd. Hindalco's 96% of annual coal requirement is secured through long-term linkages and captive mines.

Utkal Alumina (Odisha), announced expansion of Utkal Alumina by 500 kt during the year. Utkal alumina is sourcing bauxite from Baphlimali Bauxite Deposit in Odisha. Utkal Alumina International Ltd continues to be the most economical and an efficient alumina producer globally as it is working at maximum capacity producing 1.5 million tpy of alumina and providing strong support to Hindalco's smelting facilities, leading to better cost optimisation.

Hindalco announced plans to set up an extrusion and recycling plant at Mundra, Gujarat and signed an MoU with the Government of Gujarat for the same and also signed an MoU with the Government of Odisha to set up an FRP unit at Sambalpur. In addition, Hindalco engages the Aditya Birla Group's Corporate Research and Development Centre, Aditya Birla Science and Technology Company Private Limited ("ABSTCPL"), for conducting R&D in select areas of work through chartered R&D projects. These are based on the domain expertise and R&D facilities available in ABSTCPL.

### **VEDANTA**

Vedanta Aluminium Ltd (VAL) is the largest aluminium producer in India with a capacity of 2.3 million tonnes per annum. The aluminium smelting unit at Jharsuguda has come a long way to establish itself as the world's largest single-location smelter. With an installed capacity of 1.75 mtpa, backed by two smelters – 0.5 million tonnes per annum and 1.25 million tonnes per annum (SEZ) – and two power plants with a combined capacity of 3615MW, it boasts a run-rate of over 1.3 million tonnes per annum.

The production capability of the smelter and refinery has been significantly enhanced in the last few years. With the ramp up of both smelters, production of aluminium has increased during the last couple of years. Similarly, production of Alumina has also increased due to debottlenecking of the refinery operations. The bauxite requirements for alumina refinery are met from captive mines, domestic source and imports.

BALCO operates through its plant at Korba in Chhattisgarh with a smelter capacity of 0.57 million tonnes per annum and power generation capacity of 2010 MW. The state-of-the-art alumina refinery at Lanjigarh feeds the aluminium smelters at Jharsuguda and BALCO and forms a crucial link in the value chain. It is one of the world's largest one-site integrated alumina refining complexes with a current capacity of 2 million tonnes per annum that can be ramped up to 6 million tonnes per annum. Alumina Refinery along with 90 MW co-generation power plant is located at Lanjigarh in Odisha State. BALCO's operations include two bauxite mines viz, Mainpat with 7,50,000 tonnes capacity and Bodai Daldali (Kawardha) with capacity of 12,50,000 tonnes, four Captive Power Plants of 270 MW, 540 MW, 600 MW and 300 MW and refining, smelting & fabrication (570 kt) facilities in Central India.

Chotia, a coal block with capacity of 17.7 million tonnes per annum, is the captive coal block acquired by BALCO. BALCO has an NABL accredited quality laboratory for raw materials & finished goods.

## USES

Aluminium is more environment-friendly than steel, plastic and other materials. Aluminium has widespread uses throughout the economy and is equally important to both the industrial and consumer sectors. Aluminium is used in the Aerospace Industry as well as other industries requiring light metal. On the industrial side, aluminium is heavily used in electrical power transmission, machinery & equipment and construction. Aluminium usage in automobiles is rising and is expected to increase internationally. Over the past five years considerable progress has been made in aluminium-intensive vehicle production.

Housing, in particular, make heavy use of the lightweight material as a substitute for steel and wood in doors, windows and sidings. Aluminium is

also used in a variety of retail products including cans, packaging, air conditioners, furniture and automobile. In addition, India has pioneered the replacement of copper by aluminium in power transmission & distribution which has enhanced the demand for aluminium. There are nearly 600 cable and conductor manufacturing units in the country, having a total capacity of about 4,00,000 tpy. The major end-use of aluminium is as rolled sheets, extrusions and foils. India Foils, Pennar Aluminium and Century Extrusions are the major players in the extrusion & foil market.

## CONSUMPTION

Key sectors to drive aluminium consumption in India are Auto, Power, Electronics, Railways, Aerospace & Defence Construction, Solar Energy and Aluminium packaging.

China was the largest producer as well as consumer during the year, contributing about 57% share of the world production (36.15 million tonnes) and 55% of the world consumption (35.71 million tonnes) of aluminium. The world excluding China is expected to see aluminium consumption growth of around 1% in the year 2019 from around 2% in the year 2018 due to likely moderation in demand from North America and Europe.

In India, the power, packaging, transport, construction, machinery and equipment sectors are key demand drivers of aluminium. The domestic imports of aluminium products, including scrap, are growing significantly, which is a major concern for the domestic aluminium producers. In advanced economies, aluminium is increasingly replacing wood and steel in Building Sector. Aluminium cans and containers are used extensively, world over. Aluminium is also the ideal packaging material for pharmaceuticals and processed foods.

In India, aluminium was consumed mainly in the Electrical sector (48%), followed by Automobile & Transport sector (15%), Construction (13%), Consumer Durables (7%), Machinery & Equipment (7%), Packaging (4%) and others (6%). In the Electrical sector, aluminium usage is in overhead conductor, and power cable used in generation, transmission, and distribution of electricity. Aluminium is also used in switchboards, coil windings, capacitors, etc.

As per Technology Vision Document 2035, the per capita consumption of aluminium in India is

among the lowest in the world with only 2.2 kg as compared to world average roughly of 8 kg with 22-25 kg in developed nations.

Alumina is produced from bauxite. About one tonne of alumina is produced from 3 to 3.5 tonnes of bauxite and about one tonne of aluminium is produced from about two tonnes of alumina.

## RESEARCH & DEVELOPMENT

The Hindalco's Research & Development (R&D) activities are focused on providing innovative, cost-effective and sustainable solutions to support consistent growth of business. The R&D activities include process, product and application development, to develop short-term as well as long term solutions to the issues faced by non-ferrous sector, such as, raw material quality, new product development, cost-effective management of waste generated during processing, recovery of values from by-products as well as any waste products, developing better understanding of the science of processes, reducing the specific energy consumption and carbon footprint etc.

Hindalco operates three Hindalco Innovation Centres (HIC) (i) HIC-Alumina at Belagavi, Karnataka, undertakes specialised works on R&D of bauxite ore, alumina refining and specialty alumina, hydrate products as well as waste management; (ii) HIC-SemiFab located at Taloja, near Mumbai, Maharashtra, handles projects in the areas of tribology, metallurgy related to aluminium fabricated products and new applications and modelling; (iii) Innovation Centre at HIC-Copper at Birla Copper, Dahej, has its focus on maximisation of copper recovery as well as recovery of various metal values, such as, selenium, tellurium, nickel, bismuth etc. from the effluent generated in the plant.

The R&D activities undertaken at Hindalco during the year include (i) Developing a superior Aluminium-Jute packaging material by combining aluminium foil with jute. Aluminium foils are impervious to moisture, bacteria and gases while jute is an environment-friendly natural material with elastic properties. (ii) Aluminium foil for Li-ion batteries Hindalco developed aluminium foils which can be used for the packaging of Lithium-ion (Li-ion) batteries. These foils are approved by the Indian Space Research Organisation (ISRO) and the

Automobile Research Association of India (ARAI). These foils are expected to reduce the use of plastic in the manufacturing of Li-ion batteries and increase battery life.

NALCO is exploring to set up world class, state-of-the-Art research and development centre in the field of bauxite, alumina, aluminium, downstream products, power, waste utilisation and in other allied areas. Some of the in-house R&D activities carried out by NALCO include (i) R&D Project on '1<sup>st</sup> stage trial production of Strontium modified 6XXX series Aluminium Billet & first billing' has been successfully completed. (ii) R&D Project on 'Fabrication and trial commercial use of a highly porous pervious concrete material from fly ash & first billing' has been successfully completed. (iii) Collaborative project with NIT Rourkela "Embedded system for compressed air consumption monitoring in smelter plant" has been implemented (iv) In house project of Alumina Refinery Plant, i.e., "Replacement of synthetic flocculants by wheat bran flocculant" was implemented in all three streams of plant. (v) In house project of Smelter Plant, i.e., "Improvement of oxidation behaviour of anodes" has been implemented in both GAPS of smelter plant. (vi) Eleven new collaborative R&D projects have been taken during the year. As on 31<sup>st</sup> March, 2019, five inhouse projects and twenty-four collaborative projects are in progress.

The five ongoing Research & Development projects sponsored by Ministry of Mines (SSAG) at JNARDDC, Nagpur are as follows (i) Nano Processing of Industrial Rejects for use as additives in Mixdesigns for improved pozzolanic reaction efficiency with VNIT (ii) Fabrication of Advanced Ceramic Nano-coatings for Automotive Applications with Christ University (iii) Techno-economic Survey of Aluminium Scrap Recycling in India with MRAI (Metal Recycling Association of India) (iv) To study the fire retardancy of nano-ATH in polymers with CIPET (Central Institute of Plastics & Engineering Technology) (v) Bench-scale study on extraction of pure Silica and smelter grade Aluminium Fluoride from Coal Fly Ash (CFA)- S&T (Mines).

## RECYCLING

Aluminium is 100% recyclable and consumes 95% less and releases 95% less greenhouse gases as compared to primary aluminium and there is no



loss of properties or quality during the recycling process. Products of aluminium, such as, UBC (Used Beverages Can), aluminium foils, plates and automotive components can be easily recycled, thereby, saving energy and reducing greenhouse emissions. Aluminium recycling process is less capital intensive than primary metal production as the process requires only 5% of energy, i.e., 13-15 thousand units of power for producing one tonne of aluminium through primary route. Recycling of aluminium saves about 6 kg of bauxite/kg and 14 kWh of electrical energy/kg of primary aluminium. Besides, it keeps the emission levels of greenhouse gases as low as 5% from the actual emission experienced during primary production. Further, recycling facilitates reduced stress on the use of bauxite and thereby preserving about six lakh tonnes of bauxite resources every year.

India's metal recycling rate is about 25%. All the activity related to aluminium scrap recovery are limited to the unorganised sectors, catering mostly to the utensil and casting industries. The proportion of recycled aluminium has been increasing over the years. It is expected that in the years to come, it will reach a figure of about 35-40% of total aluminium consumption. Currently, there is only one recycling unit of Hindalco in organised sector at Taloja with 25,000 tonnes annual capacity. Although the plant at Taloja was facing challenges due to less availability of scrap, the production from the unit has improved and the plant is now operating at 80% of the rated capacity as against earlier capacity of 60%.

Most recycling units in India operate on outdated, or primitive technology which leads to high levels of pollution and energy consumption. This is an area that needs to be addressed by the Indian Aluminium Industry. Due recognition of recycling could encourage users of aluminium particularly in transport, housing, packaging and durable sectors to broaden the organised markets for the scrap generated. The Government of Gujarat, in September, 2018 signed an MoU with Hindalco Industries Ltd for setting up of 3,00,000 tonnes per annum aluminium recycling plant in Gujarat.

## WORLD REVIEW

World production of alumina was 130 million tonnes in 2018. China continued to be the leading producer with a share of about 56% which is

followed by Australia (15%), Brazil (6%), India (5%), Russia & Jamaica (2% each). World production of aluminium was at 63 million tonnes in 2018. China continued to be the leading producer with a share of about 57% which is followed by Russia (6%), Canada (5%) and India & UAE (4% each) (Tables-8 & 9).

To provide a generalised view of the development in various countries, the countrywise description source from latest available publication of minerals Yearbook 'USGS-2017' is furnished below:

### Australia

Alcoa restarted capacity at the 3,85,000 tpy smelter in Portland, Victoria, that was shut down after a power failure on December 1, 2016. Three weeks after the power failure, the smelter was producing at less than 30% of its capacity. Prior to the shutdown, the smelter had been producing at 85% of its capacity, and production returned to that rate by mid-October. The smelter was a joint venture of Alcoa World Alumina and Chemicals Ltd (55%), CITIC Group Corp. Ltd (22.5%) and Marubeni Aluminium Australia Pty Ltd (22.5%).

Production from the Boyne Island smelter was 13% less than that in 2016. High power prices in Queensland were cited by Rio Tinto plc (United Kingdom) for the shutdown of some capacity at the 5,71,000 tpy smelter. In January, about 45,000 tpy of capacity was shut down, and about 35,000 tpy of additional capacity was shut down in march after negotiations with power producers failed to produce a power supply contract for 14% of the power needed to operate the smelter at full capacity.

### Bahrain

During the year 2017, Aluminium Bahrain B.S.C. (Alba) experienced a power outage that lasted for 3 hours at its 9,70,000 tpy smelter. Although four potlines resumed production at full capacity, one potline was partially shut down and resumed full production by October. Despite the temporary shutdown of some capacity, production for the year increased slightly owing to new capacity that was ramped up in the previous year. Alba continued upgrades to two potlines to improve efficiency and increase capacity of the smelter to 1.05 mtpy from 9,70,000 mtpy by the end of 2018. Construction continued on a sixth potline that would have a capacity of 5,40,000 tpy when completed in 2019.

### Brazil

The Government extended the elimination of a 6% tariff on unwrought primary aluminum imports through the end of June 2018. A quota of 1,73,000 tonnes of unwrought primary aluminium would be permitted to be imported without payment of the tariff. Originally, the quota for the August 2016 to August 2017 period was for 2,40,000 tonnes, but in February the quota was decreased to 1,73,000 tonnes. In 2014, the tariff was eliminated as high power prices lead to shutdowns of primary smelting capacity, forcing manufacturers to rely on imports. Each year since then, the tariff has been eliminated for a limited amount of aluminium.

### China

Primary aluminium production in 2017 was 32.7 million tonnes, slightly more than the 31.9 million tonnes in 2016. Aluminium production generally decreased throughout the year with occasional spikes. Production was 3.14 million tonnes in January and decreased to 2.71 million tonnes in March. Production increased from March through June, reaching 2.93 million tonnes in June. From July through November, production generally decreased

and was 2.35 million tonnes in November, the lowest level of the year. The Government ordered unpermitted and inefficient capacity to be shut down, contributing to the downward trend of production in the second half of the year. By October, approximately 4.3 million tonnes per year of capacity had been shut down in compliance with the order in December, production increased to 2.71 million tonnes. The Government cited winter pollution control efforts for ordering the shutdowns of capacity at primary aluminum smelters, alumina refineries and power plants. In order to contain smelter capacity, the Government implemented a capacity replacement quota system. To expand capacity, companies were required to purchase capacity replacement quotas from companies that had shut down due to inefficient capacity. Approximately 7 mtpy of smelting capacity was under construction, between 2 and 3 million tonnes per year of which was not permitted. Construction of several unpermitted smelters was halted. The total smelting capacity at the end of 2017 was estimated to be 45 million tonnes per year, 9% more than the 41.5 million tonnes per year at year-end 2016. Aluminium consumption in China was estimated to be 35.4 million tonnes, 8% more than the 32.8 million tonnes consumed during 2016.

**Table – 8: World Production of Alumina  
(By Principal Countries)**

(In '000 tonnes of Al<sub>2</sub>O<sub>3</sub> content)

Country	2016	2017	2018
<b>World: Total (rounded off)</b>	<b>119900</b>	<b>128300</b>	<b>130500</b>
China	60906	69007	72531
Australia	20681	20486	20062
Brazil	10886	11061	8258
India* <sup>(d)</sup>	6076	6119	6547
Russia	2682	2822	2763
Jamaica	1865	1782	2484
Ireland, Republic of	1898	1880	1818
Saudi Arabia	1429	1484	1774
Kazakhstan	1746	1772	1751
Ukraine	1510	1676	1715
Other countries	10257	10196	10795

*Source: BGS World Mineral Production, 2014-2018.*

*(d) Years ended 31 March following that stated*

*\* During 2016-17, 2017-18 and 2018-19 India's production of alumina was 6,076, 6,119 and 6,446 thousand tonnes, respectively.*

**Table – 9: World Production of Aluminium  
(Primary)  
(By Principal Countries)**

(In '000 tonnes)

Country	2016	2017	2018
<b>World: Total (rounded off)</b>	<b>59600</b>	<b>60700</b>	<b>62700</b>
China	32698	33290	35802
Russia	3561	3584	3627
Canada	3209	3212	2937
India* <sup>(e)</sup>	2897	3401	2750 #
UAE	2471	2600	2640
Australia	1634	1488	1574
Norway	1247	1253	1295
Bahrain	971	981	1011
Saudi Arabia	871	916	932
USA	818	741	899
Other countries	9247	9272	9193

*Source: BGS World Mineral Production, 2014-2018.*

*(e) Years ended 31 March following that stated.  
# estimated*

*\* During 2016-17, 2017-18 and 2018-19 India's production of aluminium was 2,897, 3,401 and 3,696 thousand tonnes, respectively.*

## Germany

Norsk Hydro started commercial production from an expansion of its rolling mill in Grevenbroich. The capacity of the rolling mill was increased to 2,00,000 tpy from 50,000 tpy, and output would supply automobile manufacturers.

## Indonesia

PT Indonesia Asahan Aluminium (Inalum) expanded the capacity of its smelter to 3,00,000 tpy from 2,50,000 tpy. Further expansion to 4,00,000 tpy was planned by year-end 2019.

## Italy

Arconic sold its rolling mill in Fusina to Slim Aluminium S.P.A. in April. Arconic cited its plans to focus on supplying aerospace and automotive sheet for the sale of the rolling mill, which produced lower value sheet products.

## Netherlands

After acquiring the Aldel smelter from Klesch Aluminium Delfzijl in October, York Capital Management planned to restart idled capacity at the 1,50,000 t/year smelter. The smelter was producing at a rate of 50,000 tpy at the time of the acquisition, and the ramp-up of the remaining capacity was scheduled to begin in early 2018.

## Norway

Norsk Hydro completed a 75,000 tpy pilot plant in Karmoy to test more efficient smelting processes. The plant was designed to decrease carbon dioxide emissions by 15% compared with the industry average. Production was scheduled to start in early 2018. Norsk Hydro announced that 95,000 tpy of capacity at the Husnes smelter would be restarted, doubling the smelter's production. The potline was shut down in 2009, and Norsk Hydro had used it as a source of spare parts for other potlines. The potline would be upgraded, and production was expected to restart in 2020.

## Oman

A power failure resulted in the shutdown of the 3,75,000 tpy Sohars smelter. Production was restarted in mid-September, and the ramp-up was expected to be completed by April 2018. Owing to the shutdown, production decreased by 35% from that in 2016. The Sohars smelter was a joint venture between Oman Oil

Co. S.A.O.C. (40%), Abu Dhabi National Energy Co. PJSC (40%), and Rio Tinto (20%).

## United Arab Emirates

Aluminium production increased by 4% as compared with that in 2016 on account of increased capacity. Emirates Global Aluminium PJSC completed modernisation and expansion project at the Jebel Ali smelter in October. The project, which started in 2015, replaced 520 smelting pots in two potlines with pots that were more energy efficient and produced fewer emissions of perfluorocarbons. Capacity of the smelter increased by 58,000 tpy.

## Vietnam

Tran Hong Quan Trading Co. Ltd. was building a primary aluminium smelter. The capacity of the initial potline would be 1,50,000 tpy, and completion was tentatively scheduled for the year-end 2018.

## FOREIGN TRADE

### Exports

Exports of alumina increased marginally by 2% to 13.89 lakh tonnes in 2018-19 from 13.61 lakh tonnes in the previous year. Exports were mainly to UAE (42%), Egypt (20%), Malaysia (8%), Netherlands (7%), Iran (5%) and Qatar & Iceland (4% each) respectively.

Exports of aluminium and alloys including scrap increased by 16% to 23.38 lakh tonnes from 20.12 lakh tonnes. Exports in 2018-19 were mainly to Malaysia (18%), USA (12%), Republic of Korea (10%), Turkey (9%), Mexico (6%), Italy (5%), Taiwan & Spain (4% each) and Japan (3%) (Tables-10 to 12).

### Imports

Imports of alumina increased drastically by 28% to 28.56 lakh tonnes from 22.24 lakh tonnes in the previous year. Imports were mainly from Australia (48%), Vietnam (25%), Indonesia (13%), China (11%) and USA & Netherlands (1% each).

Imports of aluminium & alloys and scrap increased by 18% to 23.18 lakh tonnes in 2018-19 from 19.58 lakh tonnes in the previous year. The imports were mainly from China (16%), USA (11%), UAE & Malaysia (9% each), UK (7%), Saudi Arabia (6%), Australia (4%) and Republic of Korea, Netherlands & Qatar (3% each) (Tables- 13 to 15).

**Table – 10: Exports of Alumina  
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
<b>All Countries</b>	<b>1361385</b>	<b>32961497</b>	<b>1389106</b>	<b>46982494</b>
UAE	703993	16435288	582203	19800516
Egypt	214306	4815744	275900	9303621
Malaysia	61460	1336946	116557	3272628
Netherlands	2	2802	91860	3195393
Iran	154747	4371196	63239	2435704
Qatar	30602	767333	61203	2233670
Iceland	-	-	60950	1705080
USA	7526	287401	39978	1272243
Indonesia	2196	83599	31902	1045819
Taiwan	14209	495892	25754	1005614
Other countries	172343	4365297	39560	1712206

*Figures rounded off***Table – 11: Exports of Aluminium and Alloys Incl. Scrap  
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (`'000)	Qty (t)	Value (`'000)
<b>All Countries</b>	<b>2011780</b>	<b>307876721</b>	<b>2337860</b>	<b>398756254</b>
Malaysia	361598	49980258	430770	64398504
USA	249090	43867673	274010	54795640
Korea, Rep. of	368118	49273697	242822	36677937
Turkey	116416	16425872	210808	32490230
Mexico	73808	10270288	131480	21323784
Italy	91670	12719278	106936	17610457
Taiwan	41070	5715495	93678	14263840
Spain	66028	9669884	87324	14186707
Japan	66545	9170375	81309	12359802
Bangladesh	67386	10739181	54886	12291972
Other countries	510052	90044719	623838	118357381

*Figures rounded off*

**Table – 12: Exports of Aluminium  
(By Items)**

Item	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
<b>All items</b>	<b>2011780</b>	<b>307876721</b>	<b>2337860</b>	<b>398756254</b>
Aluminium & Alloys : Unwrought	1668660	228742067	1956926	299304134
Aluminium Alloys Unwrought	290062	41980438	408009	65013293
Aluminium Ingots	1370375	185604184	1538455	232653264
Aluminium Unwrought Nes	8223	1157445	10462	1637577
Aluminium & Alloys : Worked	162007	29776004	183153	38006916
Aluminium & Alloys :Worked (Bars, Rods, Plates)	103140	17002182	112775	21106147
Aluminium & Alloys :Worked (Bars, Rods, Profiles)	40525	9329666	48899	12564525
Aluminium Worked (Bars, Rods, Profiles etc.)	18343	3444156	21479	4336244
Aluminium & Alloys, Worked, Nes	172774	48041752	188159	59813230
Aluminium & Scrap	4852	525500	5939	714977
Aluminium Powders & Flakes	3487	791397	3682	916997

*Figures rounded off*

**Table – 13: Imports of Alumina  
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
<b>All Countries</b>	<b>2224196</b>	<b>60483411</b>	<b>2856522</b>	<b>102946450</b>
Australia	1513984	38401968	1362788	45010604
Vietnam	493077	12744335	702060	22811269
China	68773	3423962	321358	15408305
Indonesia	440	7139	372746	13817813
Netherlands	24316	1054990	32162	1626122
USA	33799	1378628	21994	1545381
Germany	15024	990715	8956	888718
France	10500	399682	10612	515104
Canada	3570	367617	3273	366577
Japan	684	182683	957	290407
Other countries	60029	1531692	19616	666150

*Figures rounded off*

**Table – 14: Imports of Aluminium Alloys Incl. Scrap  
(By Countries)**

Country	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
<b>All Countries</b>	<b>1957743</b>	<b>291546614</b>	<b>2317659</b>	<b>381662640</b>
China	238222	48672435	379563	82446906
USA	107563	14401494	263196	36074297
Malaysia	176382	25725807	209320	33888089
UAE	181869	25792938	209519	32190836
UK	179214	22544126	171873	23917405
Saudi Arabia	148504	19053035	129721	18105831
Korea, Rep. of	63725	14327798	77264	17743217
Australia	109866	13708564	99215	13486308
Qatar	60360	8591670	62179	9612351
Netherlands	60958	7341662	65538	8778480
Other countries	631080	91387085	650271	105418920

*Figures rounded off***Table – 15: Imports of Aluminium  
(By Items)**

Item	2017-18 (R)		2018-19 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
<b>All items</b>	<b>1957744</b>	<b>291546613</b>	<b>2317668</b>	<b>381662640</b>
Aluminium & Alloys:Unwrought	360847	51924873	316962	50258167
Aluminium Alloys Unwrought	47672	7850732	40389	7173970
Aluminium Ingots	304770	42875317	268537	41798188
Aluminium Unwrought Nes	8405	1198824	8036	1286009
Aluminium & Alloys:Worked	399956	80540929	556301	117975247
Aluminium & Alloys:Worked (Bars,Rods,Plates)	139921	27416760	179362	38155519
Aluminium & Alloys:Worked (Bars,Rods,Profiles)	198662	42027080	225842	53002819
Aluminium Worked(Bars,Rods,Profiles Etc)	61373	11097090	151096	26816910
Aluminium & Alloys,Worked,Nes	72626	26782334	91491	39901090
Aluminium & Scrap	1121436	131753048	1348971	172681033
Aluminium Powders & Flakes	2880	545429	3994	847104

*Figures rounded off*

## **FUTURE OUTLOOK**

As per the industry sources, the primary aluminium demand in India is expected to reach 6 million tonnes by 2025, which is equivalent to 4.1 kg per capita aluminium consumption. The present per capita aluminium consumption in India is around 2.5 kg which is much below the global average of 11 kg. Thus, Indian market offers a huge potential for demand growth of Aluminium Industry. To reach the global average of 11 kg per capita, India will require an additional annual consumption of 16 million tonnes, and if achieved India would become the second largest consumer in the world.

Aluminium contributes to nearly 2% of manufacturing GDP and with projected consumption growth, the share (% of manufacturing GDP) may go higher.

Aluminium consumption is most likely to increase as a result of Government's key flagship programmes like Make in India, National Capital Goods Policy, Development of 100 smart cities and Government's commitment to reach a 100 GW solar capacity by 2022 from 20 GW today. The Government's thrust in reinforcing the Power Sector, which a dominant consumer of aluminium in India, augers well for Aluminium Industry.

Aluminium has forward linkages with key sectors like aviation, defence, auto, electricity, construction, packaging, machinery, marine etc. and backward linkages with mining, chemical, power, machinery etc. By speeding up investment in sectors with high backward and forward multipliers, the industrialisation process can be speeded up which would in turn enable accelerating economic growth.