



Indian Minerals Yearbook 2017

(Part- II : Metals & Alloys)

56th Edition

ALUMINIUM AND ALUMINA

(FINAL RELEASE)

GOVERNMENT OF INDIA
MINISTRY OF MINES
INDIAN BUREAU OF MINES

Indira Bhavan, Civil Lines,
NAGPUR – 440 001

PHONE/FAX NO. (0712) 2565471
PBX : (0712) 2562649, 2560544, 2560648
E-MAIL : cme@ibm.gov.in
Website: www.ibm.gov.in

March, 2018

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 in India 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 of 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 in the country has remained same at 41.00 lakh tonnes during 2015-16 & 2016-17. The production of aluminium comes from the plants viz, Nalco, Hindalco, Balco, & Vedanta whereas the Malco plant remains non-operational during the year 2016-17. Producer-wise capacity of aluminium is given in Table-1.

The installed capacity of alumina plants in the country was 65.60 lakh tpy. However, the operational capacity was 62.75 lakh tpy and plant capacity of 2.85 lakh tpy remained non-operational (Table-2).

PRODUCTION

Aluminium

Aluminium production in 2016-17 at 2,897 thousand tonnes registered an increase of 23% as compared to that in the previous year. Seven plants reported production of aluminium during the year. Of these, one plant in public sector accounted for about 13% of the total production. The remaining 87% production was reported by the private sector (Tables - 3 & 4).

During the year 2016-17, except Hindalco (Hirakud & Renukoot) all other smelters reported higher production as compared to the previous year.

Table – 1: Installed Capacity of Aluminium, 2016-17 (By Producers)

			(In '000 tonnes)
Producer	Plant		Annual capacity
Total			4100
Public Sector			
National Aluminium Co. Ltd	Angul (Odisha)		460
Private Sector			
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#
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.*

ALUMINIUM & ALUMINA

**Table – 2: Installed Capacity of Alumina, 2016-17
(By Producers)**

(In '000 tonnes)

Producer	Plant	Annual capacity
Total		6560
Public Sector		
National Aluminium Co. Ltd	Damanjodi (Odisha)	2275
Private Sector		
Bharat Aluminium Co. Ltd	Korba (Chhattisgarh)	200#
Hindalco Industries Ltd	Renukoot - (Uttar Pradesh)	700
	Belagavi - (Karnataka)	350
	Muri - (Jharkhand)	450
	Utkal Alumina - (Odisha)	1500
Madras Aluminium Co. Ltd	Mettur (Tamil Nadu)	85#
Vedanta Aluminium Ltd	Lanjigarh (Odisha)	1000*

*Source: Information received from the companies/Annual Reports/Ministry of Mines Annual report.
Plants remained non-operational during the year.
Plans to enhance capacity of alumina refinery from 1 million to 6 million tonnes per annum.

Alumina

The production of alumina at 4,576 thousand tonnes in 2016-17 increased by about 10% as compared to that in the previous year. During the year 2016-17, except Hindalco (Renukoot) 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 44% of the total production during the year under review (Tables-5 & 6).

**Table – 3: Production of Aluminium
2014-15 to 2016-17 (P)**

(Quantity in tonnes; Value in ` '000)

Year	Production	
	Quantity	Value
2014-15	2026803	244049823
2015-16	2354949	268362923
2016-17 (P)	2896629	319857753

**Table – 4: Production of Aluminium
2015-16 and 2016-17
(By Plants)**

(In tonnes)

Producer	Plant	Production	
		2015-16	2016-17 (P)
National Aluminium Co. Ltd	Angul	374042	386880
Hindalco Industries Ltd	Aditya	230575	363147
	Hirakud	157749	151901
	Mahan	335904	345542
Bharat Aluminium Co. Ltd	Renukoot	409257	405202
	Korba	331327	423308
Vedanta Aluminium Co. Ltd	Jharsuguda	516095	820649

**Table – 5: Production of Alumina
2014-15 to 2016-17**

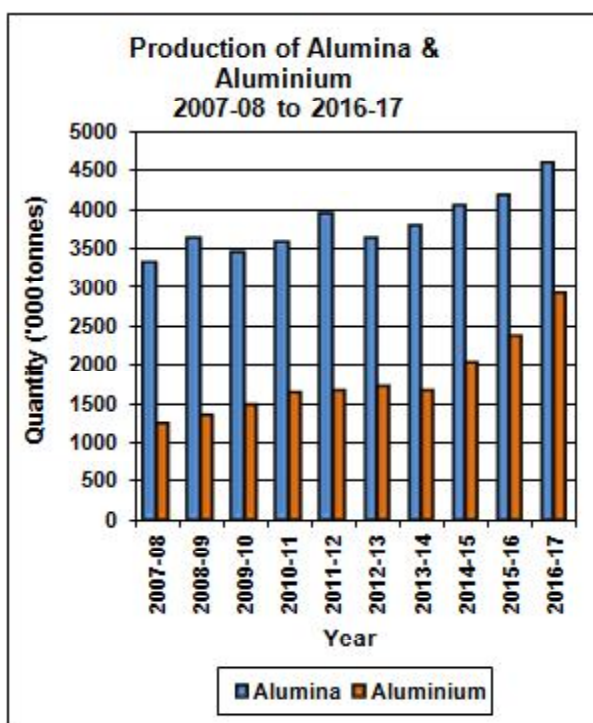
(Quantity in tonnes; Value in ` '000)

Year	Production	
	Quantity	Value
2014-15	4024215	71268236
2015-16	4172293	73735844
2016-17 (P)	4576239	84956047

**Table – 6: Production of Alumina
2015-16 and 2016-17
(By Plants)**

(In million tonnes)

Producer	Plant	Production	
		2015-16	2016-17(P)
National Aluminium Co. Ltd	Damanjodi	1917400	2028400
Hindalco Industries Ltd	Belagavi	250400	296800
	Muri	321600	333090
	Renukoot	712000	709992
Vedanta Aluminium Co. Ltd	Lanjigarh	970893	1207957



INDUSTRY

Ten aluminium smelters having total installed capacity of 41.00 lakh tpy operated by four companies viz. Nalco, Balco, Hindalco & Vedanta. The actual production of aluminium comes from a plant capacity 40.60 lakh tpy as 0.40 lakh tpy capacity remained non-operational. Of these, Nalco is the only company in the Public Sector with installed capacity of 460,000 tpy. Balco, earlier a Public Sector company, is now under Private Sector. The remaining Six smelters of Hindalco and VAL are in the 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 460,000 tpy Aluminium Smelter at Angul & 2,275,000 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 Hirakud (Odisha). Newly installed smelters at Aditya Aluminium and Mahan Aluminium are operating on 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 562,000

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 Hirakud (Odisha), Belur (West Bengal), Mouda (Maharashtra), Renukoot (Uttar Pradesh) & Taloja (Maharashtra). Hindalco's finished products include, alumina, primary aluminium in the form of ingots, billets and 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 Hirakud (Odisha) and Mouda (Maharashtra) are being modernised to produce world class can body stock and Ultra Thin Gauge Foils, respectively. The Hirakud plant produce 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 205,000 tpy spread over at Renukoot (80,000 tpy), Belur (45,000 tpy), Taloja (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 570,000 tpy with the commissioning of Korba-II smelter with 325,000 tpy capacity, with capabilities to produce ingots, wire-rods billets, bushbars and rolled products. The production at Korba-I plant with 245,000 tpy capacity remains stable during the year. The company operates two power plants for commercial power generation of which one is used to produce power for captive consumption, refining, smelting, fabrication, etc and another 1200 MW power plant is under construction. The BALCO-II smelter was fully commissioned, with all 336 pots operational in August 2016.

ALUMINIUM & ALUMINA

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 enhanced to 1.75 million , from 50,000 tpy capacity during the year. Malco, a Vedanta Group Company has not reported production of alumina and aluminium in 2015-16 . 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 120,000 tpy. The company is the leader in aluminium extrusions, meeting country's 30% demand. JAL has taken a step forward by diversifying into Aluminium rolled products. The company produce Aluminium flat rolled products i.e sheets, coils, and chequered sheets under 5mm thickness. Jindal commissioned the state - of -the- art Aluminium sheet and foil manufacturing facility with installed capacity 40,000 tpy, at Dabaspet, 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 during 2016-17

(In tonnes)

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

Source: Information received from individual plants/Annual Reports.

DEVELOPMENT & EXPANSION

Nalco augmented alumina refinery capacity enhanced to 22.75 lakh tonnes per year from 21 lakh tonnes. The company is going forward to set up 5th stream in its existing Alumina refinery which shall add 10.0 lakh tonnes per year to its existing capacity. The surplus alumina that remains after internal consumption is exported and small portion sold to the domestic market. Upgradation of aluminium smelter capacity from 4.6 lakh tonnes to 5.67 lakh tonnes per year under current-ampereage upgradation project is under progress.

Nalco plans to set up a 5 lakh tonnes per year smelter and 1050 MW power plant at Sundargarh district in Odisha. The company set up wind power plants of capacities 50.4 MW & 47.6 MW at Gandikota (Andhra Pradesh) & Jaisalmer (Rajasthan) and these are operational during the year. In September 2016, 3rd wind power plants having capacity of 50MW was fully commissioned at Devikot site in Jaisalmer, Rajasthan. The erection activity of wind power plant with a capacity of 50.4 MW is underway at Jath site, Sangli in Maharashtra. Utkal D & E coal blocks (200 million tonnes) have been allotted to Nalco in May-2016. Nalco has been granted mining lease over Gudam and KR Konda bauxite resources in Andhra Pradesh and Pottangi in Odisha. Term of reference for grant of mining lease of Pottangi Bauxite Mine was issued to Nalco from Government of Odisha in July, 2016. 10 lakh tonnes per year alumina refinery is being set up in Damanjodi, based on mineral available from Pottangi Bauxite Mine (Odisha). Based on bauxite resources, the company plans to develop a 42 lakh tpy bauxite mine and 14 lakh tpy alumina refinery complex in Andhra Pradesh. The company has port facilities at Visakhapatnam to export alumina at the rate of 1.4 million tpy. The company plans to set up a 14 MW wind power project in mined out area of its working bauxite mines in Damanjodi area of Odisha.

Hindalco's plans to expand alumina refinery capacity at Belagavi from 3.5 lakh tpy to 6.5 lakh tpy are on hold, awaiting government's approval relating to bauxite mines. Hindalco's three greenfield projects are well on their way towards full capacity utilisation.

Hindalco set up 3.60 lakh tpy aluminium smelter at Bargawan along with 900 MW captive power plant at Mahan in Madhya Pradesh, based on captive coal consumption from Sidhi district, Madhya Pradesh.

Utkal Alumina (Odisha), 1.5 million tpy alumina refining project along with 90 MW captive co-generation plant was completed during the year. Utkal alumina is sourcing bauxite from Baphlimali Bauxite Deposit in Odisha. Utkal alumina produced 1.5 million tpy and continues to be one of the lowest cost refinery in the world.

The other integrated aluminium project, namely, Aditya Alumina & Aluminium Project, alumina refinery at Koraput, 3.60 lakh tpy aluminium smelter at Lapanga, Odisha along with 900 MW captive power plant were commissioned during the year 2014-15. In addition, Hindalco operates two Hindalco Innovation Centers one at HIC -Alumina at Belagavi working on R&D of bauxite, alumina and specialty alumina products and another at Taloja, working in the area of aluminium fabricated products. 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.

A joint venture agreement on bauxite mines was signed with OMC. Hindalco won 4 coal blocks viz Kathautia, Dumri, and Gare Palma IV/4 & Gare Palma IV/5 during the coal auction held during the previous year and two of these mines Gare Palma IV/4 & Gare Palma IV/5 have started producing the coal during the year. The mining operation at Kathautia mines commenced in February, 2017. The company is also developing and mining coal for captive consumption jointly with Mahanadi Coalfields Ltd and Neyveli Lignite Corporation Ltd.

Hindalco's another greenfield project, viz Jharkhand Aluminium Project at Sonahatu, 55 km from Ranchi, entails setting up a 7.20 lakh tpy aluminium smelter with 1650 MW captive power plant. It is supported by 5 million tpy captive coal mine of Auranga Coalfields in Jharkhand with Tata Power.

Balco of Vedanta Group is undertaking programmes for modernisation and expansion. Balco's operations include two bauxite mines, two power plants (of which one is used to produce power for captive consumption), refining, smelting and fabrication. The total capacity of the Korba smelter is enhanced to 5.70 lakh tpy from 3.45 lakh tpy during the year. The production at Korba-I plant of Balco with smelter

capacity of 245,000 tpy is stable during the year and the new Korba-II smelter with 325,000 tpy with 84 pots commissioned during the year. Majority of the bauxite required for Balco's smelter are acquired from its two captive mines in the state of Chhattisgarh. In addition, the construction of coal-based 1200 MW captive power plant is in progress and of two coal mines viz. Chotia & Gare Palma Blocks. Chotia coal mine has reserve of 15.5 million tonnes and annual production capacity of 1 million tonne. Environment clearance for the 211 million tonnes coal block has been received and second stage of forest department clearance is under progress.

Vedanta Aluminium Ltd (VAL) has the largest integrated aluminium capacity in India (23.2 lakh tpy). VAL has 10 lakh tpy alumina refinery associated with 90 MW captive power plant at Lanjigarh in district Kalahandi, Odisha and 12.50 lakh tpy & 5 lakh tpy capacity aluminium smelters and 1215 MW captive power plant at Jharsuguda (Odisha). The commissioning of pots at the first line of the 1.25 mtpa Jharsuguda-II aluminium smelter was completed at the end of July 2016. The refinery currently has a debottlenecked capacity of 1.7-2.0 million tonnes per annum. Approval was received to expand to 4 million tonnes per annum.

During the year 2015-16, the company gained approvals to use the power generated from three units of the Jharsuguda power plant for captive use and received environmental clearance for expansion of Lanjigarh Alumina refinery capacity to 4 million tonnes per annum. Vedanta's two power plants were in the pre-commissioning phase during previous year, at Balco and at Talwandi Sabo in Punjab. Both are now fully commissioned and have added nearly 2,500 MW of new capacity. The total generating capacity enhanced to 9,000 MW making Vedanta a larger power generator than many other power utilities.

Further, VAL entered into an agreement with the Orissa Mining Corporation (OMC) regarding the establishment of an alumina refinery, an aluminium smelter and associated captive plants in Lanjigarh and Jharsuguda, Odisha.

USES

Aluminium has widespread uses throughout the economy and is equally important to both the industrial and consumer sectors. 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 400,000 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.

Foil is a very thin sheet of rolled aluminium supplied in its pure form or as alloys. The thickness of foil ranges from the thinnest currently produced at about 0.0065 mm to thickest 0.2 mm. Material thicker than 0.2 mm is defined as sheet or strip.

CONSUMPTION

The global primary aluminium demand in the year 2015 increased at around 4% to 56 million tonnes. The increase in consumption was primarily driven by China. China continued to be a major consumer of aluminium accounting for almost 51% of the global consumption. Elsewhere in Asia, consumption declined in Japan but was compensated by higher demand from India and the Middle East. In India, during 2015-16, the primary aluminium consumption increased to 1.87 million tonnes at 9.7%, primarily driven by robust demand from electrical, transportation, building and construction and packaging sectors. 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 and 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 and development work was mainly aimed at new product development; conservation of materials and resources; improvement in energy conservation; waste minimisation and reutilisation; environment preservation and sustenance, etc.

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 allied areas. Some of the in-house R&D activities carried out by Nalco are as follows:- (i) 150 m³ per batch Effluent Water Treatment Plant Emrion Nano Technology of Eesavyasa Technology Pvt Ltd, first of its kind in the world was commissioned at Smelter Plant (ii) High Speed Extrusion Alloy (HSA) billet, a value added product, the New Product Grade CH-90 added to Nalco's standard product list.(iii) Under the MOU agreement with CHALIECO/ Guiyang Aluminium Magnesium Design & Research Institute Co. Ltd (GAMI), China lab scale study for extraction of iron concentrate from red mud, a waste of Alumina Refinery Plant has been

completed. (iv) Conventional High Gradient Pulse Magnetic Separation and a new technology-Disperse Magnetic Calcinations & Magnetic Separation was attempted for extraction of iron concentrate from Red mud.(v) A study was undertaken to establish suitability for iron recovery and 100% utilisation of Red Mud (Plant waste) with M/s. Shenwu Group, China. (vi) An MOU has been signed with Bhabha Atomic Research Centre (BARC), Mumbai on 10th May, 2016 for development of chemical method and technologies for value added processes and product in aluminium industry.

The Research & Development projects completed by JNARDDC, Nagpur during the year 2015-16 is as given below- (i) Setting up of mini-pilot plant for red mud based light weight foamed bricks for Nalco (ii) Analysis of impurities (Fe, Si, Ca, etc.) in alumina and aluminate liquor using hand-held spectrometer (iii) Upgradation & utilisation of laterite of east and west coast deposits (iv) Study on scale formation in precipitation tank based on the operating parameter to optimise the uptime of tanks at Alumina Refinery plant (v) Development of ceramic proppant form PLK and fly ash at laboratory scale (vi) Development of a process for detoxification of SPL 1st cut for recovery of mineral values (Carbon, Soda, etc.) and (vii) Detailed study on melt generation and suggest solutions for reduction in melt loss.

RECYCLING

The Working Group for XII Five Year Plan (2012-17) on Non-ferrous Metals set up by the Ministry of Mines, Government of India, had made strong recommendation on the need to encourage recycling in India as a long-term solution for conserving energy and resources. In India, though aluminium industry is over six decades old, the recycling sector with modern state-of-the-art technology is still in its nascent stage.

Aluminium is 100% recyclable 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 emission. Aluminium recycling process is less capital intensive than primary metal production as the

process requires only 5% of energy, between 13-15 thousand units of power for producing one tonne of aluminium through primary route. Recycling of aluminium saves 6 kg of bauxite/kg and 14 kWh of electrical energy /kg of primary aluminium. Besides, it keeps the emission levels of greenhouse gases to a low of 5% from the actual emission experienced during primary production. Further, recycling facilitates reduced stress on the use of bauxite and thereby preserving 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 sector, 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 Talaja with 25,000 tonnes annual capacity. Although the plant at Talaja 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.

WORLD REVIEW

World production of alumina was 119 million tonnes in 2016. China continued to be leading producer with a share of about 51% which is followed by Australia (17%), Brazil (9%) and India (5%). World production of aluminium was 59 million tonnes in 2016. China continued to be the leading producer with a share of about 54% which is followed by Russia (6%), Canada & India (5% each) and UAE (4%) (Tables 8 & 9).

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

(In '000 tonnes of Al₂O₃)

Country	2014	2015	2016
World: Total (rounded off)	109100	116900	118900
Australia	20495	20097	20681
Brazil	10404	10452	10886
Canada	1563	1561	1566
China	52399	58979	60907
Germany ^e	1000	1000	1000
India*	4024	5400 ^e	5800 ^e
Ireland	1271	1283	1284
Jamaica	1851	1865	1865
Kazakhstan	1628	1448	1500
Russia	2672	2593	2682
Spain	1517	1633	1579
Suriname	1149	780	-
USA	4461	4234	2500 ^e
Ukraine	1455	1481	1510
Other countries	3331	4061	5138

Source: World Mineral Production, 2012-2016.

** During 2014-15, 2015-16 and 2016-17 India's production of alumina was 4,024, 4,172 and about 4,576 thousand tonnes, respectively.*

The country-wise developments in Aluminium & Alumina sector are as follows:

Australia

Primary aluminum production in Australia declined by 3% in 2015 compared with production in 2014 and was 15% less than production in 2011 owing to smelter shutdowns during 2013 and 2014.

Brazil

Primary aluminum production decreased to 772,000 tonnes 20% less as against in 2014 and the lowest level since 1990. Since 2013 high power costs have been cited as the reason for decreased production at several smelters. Annual average industrial power prices in 2014 increased by 23% compared with those in 2013.

Alcoa and BHP Billiton temporarily shut down the remaining 124,000 tpy of capacity at the 447,000 tpy Alumar smelter in Sao Luis. Low aluminum prices and high power costs were cited as the

ALUMINIUM & ALUMINA

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

	(In '000 tonnes)		
Country	2014	2015	2016
World: Total (rounded off)	54200	57800	58800
Australia	1703	1646	1635
Bahrain	931	961	971
Brazil	962	772	793
Canada	2858	2880	3209
China	28317	31410	31873
Iceland	699	725	700
India*	2027	2355	2897
Norway	1182	1224	1247
Russia	3488	3529	3561
Saudi Arabia	662	839	869
South Africa	745	695	701
USA	1710	1587	818
UAE	2296	2397	2471
Other countries	6606	6784	7033

Source: World Mineral Production, 2012-2016.

** During 2014-15, 2015-16 and 2016-17 India's production of aluminium was 2,027, 2,355 and 2,897 thousand tonnes, respectively.*

reason for the shutdown of potlines that began in 2013.

Alcoa owned 60% of the smelter and the other 40% was owned by BHP Billiton until the creation of South32. Alcoa also announced that the shutdown of the 96,000 tpy Pocos de Caldas smelter would be made permanent. With the high power prices and in spite of smelter shutdowns in 2015, the Government extended the elimination of a 6% tariff on unwrought primary aluminum to an additional 350,000 tonnes of aluminum imports through August 17, 2016. Novelis permanently shut down its 18,000 tpy primary aluminum smelter in Ouro Preto, Minas Gerais State. High power costs, inefficient capacity size, and the company's desire to focus on secondary aluminum production were cited as the reasons for the shutdown.

Canada

Rio Tinto plc completed an expansion and modernisation project and started production at its primary smelter in Kitimat, British Columbia.

The project increased the capacity to 420,000 tpy from 280,000 tpy. Production rampup was expected to be completed in the first half of 2016. Rio Tinto increased the capacity of the Alma, Quebec, smelter to 466,000 tpy from 440,000 tpy. Rio Tinto increased billet capacity at the casthouse of the Arvida smelter in Saguenay, Quebec, to 142,000 tpy from 132,000 tpy. The Provincial Government of Quebec signed a power supply agreement with the owners of the Aluminerie Alouette smelter. The contract would start in 2017 and last through 2029.

China

Primary aluminum production in 2015 was 31.4 million tonnes, 11% more compared to that in 2014, whereas primary smelting capacity increased by about 9% to 38 million tonnes during 2015. Capacity increases were focused in Gansu, Liaoning, Qinghai, Shandong, and Yunnan Provinces and Inner Mongolia and Xinjiang Uyghur Autonomous Regions. Primary aluminum smelters in China shut down a total of 1.16 million tonnes of capacity in November in response to low demand and prices. Total capacity shutdowns

in China through the end of November were 3.5 million tonnes and were estimated to be 5 million tonnes by the end of 2015. Lending restrictions prevented many smelters from obtaining the credit needed to continue production during the slump in prices. During the first half of 2015, aluminum consumption in China was 14.72 million tonnes, 12% more than the amount consumed during the same period in 2014. Consumption growth slowed during the second half of the year, and consumption was 30.6 million tonnes in 2015, 9% more than the amount consumed in 2014.

France

Trimet was expanding capacity of the St. Jean-de-Maurienne smelter to 145,000 tpy from 90,000 tpy. Completion of the project was expected by the year end 2014 or early 2015. Trimet acquired the smelter from Rio Tinto in December 2013.

Germany

Novelis completed expansion of the capacity of its rolling mill in Nachterstedt to 350,000 tpy from 230,000 tpy to cater to increased consumption by automobile manufacturers. Norsk Hydro signed an 8-year contract for Axpo Trading Ltd of Switzerland to supply power starting in 2018 to its 235,000 tpy Neuss smelter.

Norsk Hydro started an expansion of its rolling mill in Grevenbroich to 200,000 tpy from 50,000 tpy. The expansion was expected to be completed in 2016 and would supply automobile manufacturers.

Hungary

The Alumetal S.A. Capital Group was building a secondary aluminum smelter in Komarom. The 60,000 tpy smelter was expected to be completed by year end 2016 and would supply casting alloys to consumers in Hungary and elsewhere in Europe.

Malaysia

Press Metal Berhad's Samalaju smelter was expanded to 520,000 tpy from 320,000 tpy. The smelter was being expanded to 640,000 tpy with completion expected by year end 2018.

Netherlands

Aluminum Delfzijl (Aldel) (a subsidiary of Klesch Group) restarted its 110,000 tpy primary smelter in Groningen. The smelter had shut down on December 30, 2013, after it filed for bankruptcy protection, citing high power prices and low aluminum prices as the reasons for closure. The restart was enabled by a contract to obtain power from a supplier in Germany.

Russia

Primary aluminum production in Russia increased by 7% (230,000 tpy) compared with that in 2014. United Company RUSAL Plc completed construction of the first 147,000 tpy potline at the Boguchansky smelter and ramped up production from the potline to full capacity by the year end. Expansion of the smelter to 588,000 tpy was planned by year end 2018. The smelter would be powered by the 3,000-MW Boguchansky hydroelectric power plant on the Angara River.

FOREIGN TRADE

Exports

Exports of alumina increased considerably to 15.09 lakh tonnes in 2016-17, from 13.68 lakh tonnes in the previous year. Exports were mainly from UAE (37%), China (18%), Egypt (15%), Iran (14%) and Malaysia (10%). Exports of aluminium and alloys including scrap increased to 15.47 lakh tonnes from 11.53 lakh tonnes. Exports in 2016-17 were mainly to Korea, Rep. of (27%), Malaysia (10%), USA (8%), Mexico & Italy (6% each) and Turkey (4%) (Tables-10 to 12).

Imports

Imports of alumina increased drastically to 14.03 lakh tonnes from 9.98 lakh tonnes in the previous year. Imports were mainly from Australia (75%), Vietnam (16%), China (4%) and Netherlands (2%). In India, as per Union Budget 2016, the import duty on aluminium was increased to 7.5% from 5%.

Imports of aluminium & alloys and scrap increased marginally to 17.51 lakh tonnes in 2016-17 from 16.70 lakh tonnes in the previous year. The imports were mainly from China (13%), UAE (11%), UK & Malaysia (8% each), Saudi Arabia (7%), Australia & Oman (5% each), USA (4%), and Korea, Rep. of & Germany (2% each) (Tables- 13 to 15).

ALUMINIUM & ALUMINA

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

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
All Countries	1368526	25895759	1509464	30030430
UAE	427097	8154502	556880	10623135
China	555295	9834936	267186	5118543
Iran	92318	1887042	215360	4364919
Egypt	152158	2861984	220946	4218504
Malaysia	30821	543543	151953	2953535
Oman	339	14278	30818	713584
Indonesia	54534	997414	30034	624188
Chinese Taipei/Taiwan	1715	67750	8206	313491
Korea, Rep. of	2355	90497	6655	227063
USA	5109	206747	4908	221271
Other countries	46785	1237066	16518	652197

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

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
All Countries	1153445	171195449	1546990	216150533
Korea, Rep. of	315464	35413055	423496	49788762
USA	87922	19283747	125268	23460931
Malaysia	109183	12267150	155566	18028339
Mexico	101129	13271644	89478	11001725
Italy	9292	1389142	88158	10854597
Turkey	44968	5601234	55838	6792464
Bangladesh	17163	2774678	45247	6026563
Chinese Taipei/Taiwan	47666	5659104	47987	5639013
UAE	30745	6101292	26672	5370995
Spain	12390	1820418	37065	4761211
Other countries	377523	67613985	452215	74425933

ALUMINIUM & ALUMINA

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

Item	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
All items	1153445	171195449	1546990	216150533
Aluminium & Alloys : Unwrought	828645	94626208	1223846	143869283
Aluminium Alloys Unwrought	90505	11721969	124740	15884500
Aluminium Ingots	725384	82069371	1093651	127289001
Aluminium Unwrought Nes	12756	834868	5455	695782
Aluminium & Alloys : Worked	131828	23477114	148452	25620097
Aluminium & Alloys :Worked (Bars,Rods,Plates)	62810	9817043	85378	12940658
Aluminium & Alloys :Worked (Bars,Rods,Profiles)	49857	10416842	43062	9208649
Aluminium Worked (Bars,Rods,Profiles Etc)	19161	3243229	20012	3470790
Aluminium & Alloys, Worked, Nes	184427	51818583	166890	45497562
Aluminium & Scrap	4739	435697	4173	383166
Aluminium Powders & Flakes	3806	837847	3629	780425

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

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
All Countries	998446	22924845	1403569	33417506
Australia	856778	16334700	1051908	22110083
Vietnam	-	-	222186	4277979
China	45782	2313587	60390	2726012
Netherlands	20600	1031771	29903	1430761
Germany	10509	923564	9845	860843
Canada	1264	117333	4632	480880
USA	1398	358074	1621	473550
Japan	1716	175513	1874	328452
France	8622	374008	7857	287316
Bahrain	1503	59132	7468	264934
Other countries	50274	1237163	5885	176696

ALUMINIUM & ALUMINA

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

Country	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
All Countries	1670538	224193035	1750582	233259468
China	234073	44537255	230656	44390014
UAE	206454	23579024	196896	23677540
Malaysia	98048	13302803	134211	17292071
UK	122321	13958393	145020	16435126
Saudi Arabia	111539	11934110	125139	13605945
Oman	49469	5817354	90328	10950371
Australia	79860	9085250	95595	10603870
USA	80127	9810575	76683	9538609
Korea, Rep. of	41539	10084733	40488	8903536
Germany	34061	6583845	41471	8057882
Other countries	613047	75499693	574095	69804504

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

Item	2015-16 (R)		2016-17 (P)	
	Qty (t)	Value (` '000)	Qty (t)	Value (` '000)
All items	1670538	224193035	1750582	233259468
Aluminium & Alloys:Unwrought	421961	52294173	422355	52606221
Aluminium Alloys Unwrought	44566	5872300	57467	7341645
Aluminium Ingots	372293	45785005	354355	43896334
Aluminium Unwrought Nes	5102	636868	10533	1368242
Aluminium & Alloys:Worked	333865	65540415	349777	67192137
Aluminium & Alloys:Worked(Bars,Rods,Plates)	95205	19794847	96345	19554426
Aluminium & Alloys:Worked (Bars,Rods,Profiles)	175736	35202650	199338	38498352
Aluminium Worked(Bars,Rods,Profiles Etc)	62924	10542918	54094	9139359
Aluminium &Alloys,Worked,Nes	45116	19376875	44822	18980428
Aluminium & Scrap	867477	86594900	931279	94049706
Aluminium Powders & Flakes	2119	386672	2349	430976

FUTURE OUTLOOK

As per the industry sources, the primary aluminium demand in India is expected to reach 6 million tonnes by 2025, which equates 4.1 kg of per capita aluminium consumption in 2025, whereas at present per capita aluminium consumption in India is around 2.2 kg which is much below the global average and thus, Indian market offers a huge potential for demand growth of Aluminium industry in India.

India occupies fifth position in terms of bauxite reserve with deposit of about 3 billion tonnes with a share of 3.19 % of world reserves. Odisha and Andhra Pradesh accounts for more than 90% of country's metallurgical grade resources. While gibbsitic bauxite resources in the world are depleting, vast gibbsitic deposits in India assume particular interest because of its ease in processing.

Since gibbsitic bauxite processing has specific advantage of low energy consumption, the alumina refineries enjoy sustainable comparative cost advantage. It is projected that aluminium production capacity in India at the end of the 12th Plan Period viz, 2016-17 would be about 4.7 million tonnes. This would require about 9.2 million tonnes of alumina. So, if all the announced alumina capacity additions fructify, India would be surplus in alumina and would be a significant player in alumina trade. To produce 13.3 million tonnes of alumina at the end of the 12th Plan period, the bauxite requirement would be about 40 million tonnes. The Report of the Sub Group for the 12th Plan Period has recommended that all efforts should be directed towards ensuring bauxite availability to the alumina refineries.