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Mr. Choudhury carries an experience of over 29 years in Operations, Maintenance and Projects in Aluminium Smelter and Power Plant.



An Overview on the Indian Aluminium Sector

Aluminium is the third most abundant metal in the earth's crust that constitutes not less than 7.3% of the mass of earth. Following steel, aluminium is the second most used metal in the world. While the Indian economy consistently grows at a rate of 8% per annum, demand for various metals has been increasing across several sectors and industry segments. As a result of this, Indian aluminium industry is undergoing a phenomenal development. India has the credit of being the fifth largest producer of aluminium in the world. The country has a capacity to produce more than 2.7

million tones of aluminium per year, making up about 5% of the total aluminium production on the globe. India boasts of a massive quantity of Bauxite reserve of about 2.3 billion tones. India enjoys the eighth position among the leading producers of primary aluminium in the world. The country has been witnessing a phenomenal growth in aluminium production over the past ten years.

Production of aluminium commenced in India in the year 1938 with the commissioning of the Aluminium Corporation of India. The firm was established with a technical and financial collaboration of Canada

based firm Alcan. During the very beginning, the plant had a capacity to produce 2,500 ton of aluminium per annum. This was followed by Hindustan Aluminium Corporation (Hindalco) which was set up in the state of Uttar Pradesh in 1962, could give an output of 20,000 ton per annum. The year 1965 saw the commissioning of Malco, a public sector enterprise which had a production capacity of 10,000 ton per annum. BALCO in the public sector was commissioned in 1975. Following a number of such initiatives, the National Aluminium Company (NALCO) was commissioned in the year 1987 to produce aluminium, which could produce 0.218 million tons of aluminium per year.

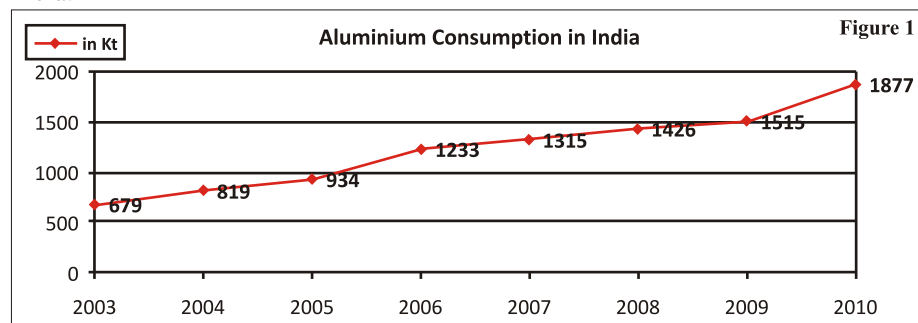
The government of India began introducing a number of measures in 1970s to control and regulate the aluminium industry in the nation. In the Indian aluminium industry scenario, restrictions with regard to the entry of new players and price distribution control measures became highly common. The implementation of Aluminium Control Order mandated the aluminium producers to sell not less than 50% of their total volume output for the purpose of electrical usage. However, this government order was withdrawn in the year 1989, with the revoking of government decontrolling. The industry was de-licensed in 1991, which resulted in the liberal importing of technologies and capital goods related to the aluminium industry. These measures could take up the volume of aluminium production by 12% as against the growth rate of 6% reported during the 1980.

Power shortage and transportation are the key bottlenecks that are currently undermining the profitability of the primary aluminum producers. In addition, increasing prices of raw material, energy and reducing margins are creating problems in production, cost reduction, and operation of the primary aluminum industry. Of all these adversaries, power shortage casts the most misfortunes on the industry, given the fact that primary aluminum production is highly power-intensive. Climate change and environment issues are also significant for the primary aluminium production as the process is highly energy intensive and

generates huge quantity of solid wastes starting from refining of ore to electrolysis of alumina.

Aluminium Consumption

There was stagnation in the consumption of aluminium between the 1990s and 2002 when the consumption of the metal was estimated at 500–600 KT. However, since 2002, there has been a sharp rise in the consumption of aluminium in India. Primary aluminium consumption in India increased by 16% year on year in 2010 on the back of strong growth in the electricity, transportation, industrial and infrastructure sectors. A series of government assisted policies and a relatively low base in 2009 helped to achieve these high double digit growth rates in 2010. Figure 1 indicates the aluminium consumption growth in India.



Over the medium term, there will be less incentive policies such as those encouraging purchases of new vehicles, but a number of multiannual government expenditure plans will underpin demand in the coming years. The power sector, for instance, will continue to support aluminium demand as village electrification plans carry on. Infrastructure investment as well as the execution of the final stage of the 11th Five Year Plan (2007–2012) will fuel housing investment over the coming three years.

While primary aluminium consumption is projected to grow at 8% year on year in 2011, the construction sector is estimated to grow at a higher pace. Growing urbanisation, an increasing number of households together with higher employment levels will drive demand for housing. Electricity expenditure is projected to slowdown in 2011 but given the high proportion of aluminium demand that comes from this sector it will still

represent nearly a quarter of a million tonnes in 2011. Total primary aluminium consumption in India is projected to reach 1.85Mt in 2011 besides consumption of around 18% of recycled metal.

Inflation has remained high in India, casting doubt about the ability of the country to grow at 8% per year or more without triggering an inflationary spiral and forcing the government to tighten its monetary policy. High food prices and deregulation of fuel prices in the country are the main inflation drivers in 2011 and beyond. As is the case in China and Brazil, inflationary pressure is forcing the Indian government to tighten its monetary policy further, increasing the risks of a slowdown in the economy. However, a combination of low aluminium consumption per capita and a growing urbanisation rate

in India in the coming years will continue to support aluminium consumption in the country which is expected to grow at around 10% in 2012 and 2013.

Primary Aluminium Production

Primary aluminium production industry in India is mainly dominated by about five firms that account for the majority of the country's metal production including National Aluminium Company (NALCO), Hindustan Aluminium Company (HINDALCO), Bharat Aluminium Company (BALCO), Vedanta Aluminium and INDAL. BALCO has been taken over by Sterlite Group, which owns Vedanta, Aluminium and INDAL has been acquired by HINDALCO. Last three years production volume of these firms is indicated in Table 1.

India has long shown the potential to be a significant player in the global aluminium industry, given its modest labour cost, proximity to fast growing

Table 1 : Primary Aluminium Production in Kt

Firms	2008	2009	2010
NALCO	354	420	437
INDAL	130	154	129
Vedanta, Aluminium	34	224	369
BALCO	362	285	260
MALCO	34	==	==
HINDALCO	381	397	408

end markets and its enormous bauxite and coal resources, which have been estimated at 2.3bnt and 250bnt respectively. India's alumina capacity could reach 11-12Mt/a by 2016, which would firmly establish the country among the top tier of global producers behind China, Australia and Brazil. However, a wave of anti-mining sentiment coalesced around the Vedanta/Niyamgiri issue in 2010, threatening the growth plans of that company and others.

Nalco completed its Phase II expansion projects at its refinery and smelter locations, the company announced plans to begin construction of Phase III in early 2012. Phase II included a capacity upgrade of the Damanjodi refinery from 1.57Mt/a to 2.1Mt/a. An approved expansion of the new production line is scheduled to lift the refinery's output to 2.28Mt/a by the end of 2012. Phase III expansion project of NALCO targets an alumina production capacity of 3Mt/a by 2016 and a bauxite mine expansion to support the higher alumina capacity. Concurrent with the Phase III refinery expansion, Nalco also plans to expand the Angul smelter from 460kt/a to 670kt/a by 2015. The total capital cost of the integrated Phase III aluminium expansion is estimated at \$1.42Bn.

Nalco plans to further grow its alumina capacity to 4Mt/a by 2020, including additional green field facilities elsewhere in India. The government of Andhra Pradesh state awarded Nalco an 80Mt bauxite reserves allocation. Nalco has completed a detailed project report and plans to build a 1.4Mt/a refinery and mine complex at an estimated capital cost of \$1.3bn. The company also recently submitted an Expression of Interest, which seeks to win the right to partner with the government of

Gujarat state, in the construction of a 1Mt/a refinery in that state.

The second greenfield project of NALCO was planned for Jharsuguda in Orissa state but local environmental issues may force the company to relocate the project to another location. Authorities have been concerned about a high concentration of power generation and industrial plants already approved for the Jharsuguda area, including Vedanta's aluminium expansion project and a Dubal/Larsen & Toubro joint venture aluminium project. The proposed Nalco project includes a 500kt/a smelter and 1250MW power plant. Nalco had identified an alternate location in Orissa at Sundergarh for the \$3.5Bn project.

Hindalco is undertaking a massive expansion of its alumina and aluminium production capability by 2015, for which it secured \$1.06bn in loans to finance the construction of its 1.5Mt/a Utkal refinery in Orissa state, India. The project includes a 90MW cogeneration plant and an 8.5Mt/a bauxite mine facility. Mechanical completion is now scheduled for early 2012. Hindalco also plans to complete a second 1.5Mt/a greenfield refinery and mine by the end of 2014. It is part of the Aditya integrated aluminium complex. Both greenfield refinery projects have been granted all of the required significant regulatory and environmental approvals. The company is also repositioning its 380kt/a Belgaum refinery to produce more non metallurgical alumina (NMA), with that component increasing from 138kt/a to 316kt/a.

Hindalco completed the expansion of its Hirakud smelter to 155kt/a and expected to creep capacity to 161kt/a. The company initiated the next capacity increase to 213kt/a at an



estimated cost of \$184M. The project involves the installation of 30 pots by December 2011 and another 50 pots to be commissioned by March 2012. Hindalco is evaluating a further expansion to 360kt/a, with a corresponding increase in captive power from about 467MW to 967MW. HINDALCO is engaged in implementation of three green field smelter projects in India, each having 359kt/a capacity and a captive 900MW coal fired power plant to result in a tripling of its capacity to 1.9Mt/a by 2015.

Vedanta completed the construction of its 500kt/a Jharsuguda smelter and 1215MW power plant in Orissa but halted the expansion to 1.75Mt/a after the company's alumina expansion was cancelled by the Indian government. The company launched a major expansion program in September 2008 to enlarge the refinery to 5Mt/a and increase its smelter capacity by 1.575Mt/a by the end of 2012, to achieve a fully integrated 2.5Mt/a aluminium production system. The Jharsuguda smelter was to be expanded by 1.25Mt/a and the company's 250kt/a Korba smelter was adding 325kt/a along with a 1200MW captive power plant at a total capital cost of \$4.74Bn for both locations.

Recycling

The world average use of recycled metal or secondary metal is about 30 per cent. In some of the developed countries, this is as high as 50 per cent. In India this is not a well organised business. The only 25000 TPY recycling unit in corporate sector is owned by INDAL and is utilized up to 50 percent only. However, it is estimated that about 80,000 tonnes of aluminium scrap gets imported into the country for recycling. And about 40,000 tonnes



of scrap from domestic sources gets recycled in unorganised sectors, accounting for 17% of domestic consumption. Compared with the production of primary aluminium, recycling of aluminium products needs as little as 5% of the energy and emits only 5% of the greenhouse gas. Recycling is a major aspect of continued aluminium use; this route offers growth opportunities for downstream industries to enhance use and application of aluminium in the country as well as to make value added exports.

Aluminium Down Stream

The capacity and performance of downstream industries in India has not been well documented, except where the primary producers and some of the major secondary producers are in downstream operations. Primary producers having downstream production are in better position to capitalize on value-addition compared to stand alone secondary producers who face fluctuations in metal prices, high import duty on primary metal and lately, the entry of multinationals in aluminium goods.

NALCO has acquired International Aluminium Products Ltd. (IAPL), a company promoted by M/s Mukand Ltd. in a partially completed condition in March 2000. The capacity of this project is 50,000 TPY of various cold rolled products like sheets, coils, slugs and foils. This unit has been commissioned in 2005-06 and is in the process of achieving the rated production capacity. Recently a special purpose vehicle has been formed by NALCO and Industrial Development

Corporation of Odisha to establish Angul Aluminium Park near NALCO Smelter plant to boost downstream industries in the region.

Hindalco has become the world's largest aluminium rolling company with its acquisition of Novelis, the global leader in value-added high-end aluminium flat rolled products and aluminium can recycling. The combined volume of sales of flat rolled products in the world market is about 3 million tonnes, and the market share is more than 20 per cent. Hindalco plans to introduce Eternia branded range of windows and door systems in addition to an all-aluminium façade for large buildings through its brand Novelis in India.

Aluminium Castings which consumes up to 4,50,000 tonnes of aluminium is an area of low technology and poor quality in India. But with growth in automotives, there is significant scope for this segment among the downstream industries to look up with better technology and advanced quality control measures.

The electrical conductor industry is estimated to have about 250,000 T capacities. This sector being highly dependent on the financial health of Electricity Boards and other distribution companies, the industry has lagged developments particularly in shifting to alloy conductors.

On the whole much is desired to be done in the downstream sectors of Indian aluminium industry.

Conclusion

Due to the 2008-09 global meltdown there was a great impact on

the manufacturing sectors cutting across the industries segment and as per the aluminium industries have been a major casualty. While shadows of the melt down loomed over the aluminium industries worldwide, the Indian perspective somewhat appeared bright with plethora of activities concentrating around additional capacity augmentation in mining, refining & smelting. The new aluminium scenario in India sent strong and positive vibes to the global aluminium communities reassuring the retention of domestic growth. However, the recent Euro zone crisis and severe energy deficit affected the industry and resulted in slowing down of most of the ongoing projects.

The sustenance of smelting operation with the given backdrop of energy deficit will remain major challenges in the coming years. The ambitious plan & India's meteoric rise in primary metal production will have multiple roadblocks with the new sets of business constraints. The optimism of operating higher KA smelting and adding gross metal production in India will be a major issue in future. A consolidated energy sustenance and energy policy to support aluminium industries is call of the day. Since alternative source of energy in India is yet to take-off, the predictability of cost economics is too early to be conclusive.

Having known the backdrop of challenges in primary metal production, specific emphasis needs to be given to enhance the recycling of aluminium and boost the downstream industries. Shifting of smelting operation to other low cost region of the world may also be a viable option before the Indian aluminium industry. The other possibilities before the aluminium industries per se will be focusing on high end value added products catering to the needs of specific segments like technology, space, defense and allied industries. This requires concerted effort to develop new alloys through judicious investment in R&D activities as a key to sustain growth of the Indian aluminium industry in long run.

(This article has been compiled in Asst. with S.Mishra, AGM (Electrical), Smelter, NALCO)

