CHAPTER 3

GROWTH AND DEVELOPMENT IN ALUMINIUM INDUSTRY OF INDIA

3.1 Introduction
3.2 Growth of Aluminium Industry of India
3.3 Location of Natural Resources
3.4 Manufacturing process of Aluminium
3.5 Present Fields of Applications of Aluminium in India
3.6 Problems of Aluminium Industry in India
3.7 Govt. Policy
3.8 Summary
3.1. INTRODUCTION

3.1.1 Aluminium is one of the most important non-ferrous metals of the modern age and is an essential pre-requisite for a country’s progress and industrial growth. It was only in the late eighties, that the indigenous Aluminium Industry was liberalised allowing paradigmic shift in the industry dynamics.

3.1.2 The Aluminium Industry is second only to the steel industry among the top ranking metal industries. The output of aluminium exceeds the combined output of the three non-ferrous metals – copper, lead and zinc. "Aluminium was first discovered only in 1886 A.D. and hence is one of the youngest metals of the world".

3.1.3 During 1885-1888 the use of aluminium was confined to fancy and luxury goods. The first commercial exploitation and technical application took place during 1890-1910. A technical revolution was achieved in 1909 when high strength duralumin alloys was produced by a German Metallurgist as a result of discovery of "age-harding" techniques. Along with the technical development the prices have come down considerably. Yet the cost of aluminium is about 5-7 times more than that of steel. During 1910-1930, the Aluminium Industry got a good boost because of the First World War, which started in 1914.
3.1.4 Aircrafts needed light metals and aluminium was the suitable metal for aircraft industry. At present more than $3/4^{th}$ of aircraft are being built of aluminium and its alloys. Later it was used in transmission lines. The latest phase started after 1930, when this metal was extensively used in transport, building architectural and structural engineering fields.

3.2. GROWTH OF ALUMINIUM INDUSTRY IN INDIA

3.2.1 India is the sixth largest producer of aluminium in the world. The Aluminium Industry in India has grown phenomenally since the independence. Starting with an installed capacity of 2500 tonnes per year in 1938, today it stands at 6,10,000 tonnes per year. Although production registered gradual increase, but over the periods, the capacity utilisation had fluctuated widely due to erratic power supply. The least capacity utilisation was 37.3 percent in 1961-62 and the highest utilisation was 108.2 percent a decade later in 1970-71.

3.2.2 Aluminium production in India commenced in 1938 with commissioning of Aluminium Corporation of India’s (INDAL) Plant in technical and financial collaboration with Alcan, Canada having a capacity of 2,500 tonnes per annum. The plant started with sheet production using imported aluminium gots. In 1959, Hindustan Aluminium Corporation (HINDALCO) was set up at Renukoot in Uttar
Pradesh with an initial capacity of 20,000 tonnes per annum. After that, Madras Aluminium Company (MALCO), a private sector undertaking was commissioned in 1965 with a capacity of 10,000 tonnes per annum. This was followed in 1975 by Bharat Aluminium Company (BALCO), a Public Sector undertaking with a similar capacity of 10,000 tonnes per annum. Finally, in 1987, National Aluminium Company (NALCO) with a capacity of 0.218 million tonne was commissioned in technical collaboration with Pechinery of France. Today, the organised sector of aluminium down stream operations has about 60 players in addition to the large number of casting and re-rolling units in the unorganised sector. These units offer employment opportunities to a much larger number of people than these five major producers.

3.2.3 In Asia, five countries namely Japan, China, India, Turkey and Taiwan produce alumina. India rank third after China and Japan. "In India, there are five major aluminium-producing companies, e.g. NALCO, BALCO, HINDALCO, INDALCO and MALCO". Out of these five companies, one is in Public Sector and four are Private Sector. A brief description of each of these companies is given below.

1. NATIONAL ALUMINIUM COMPANY LIMITED (NALCO)

3.2.4 A memorandum of understanding was signed in January 1980 by the Govt. of India for technical collaboration
### Table 3.1

**Comparison of Major Domestic Aluminium Companies**

<table>
<thead>
<tr>
<th>Company's Name</th>
<th>Technology</th>
<th>Aluminium metal capacity (TPA)</th>
<th>Production (TPA)</th>
<th>Capacity Utilisation (in %)</th>
<th>Bauxite available/not available</th>
<th>Power supply</th>
<th>Alumina</th>
<th>Semi-Fabrication facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>HINDALCO</td>
<td>Kaiser (USA)</td>
<td>1,50,000</td>
<td>1,66,197</td>
<td>111</td>
<td>AV</td>
<td>AV</td>
<td>Purchase</td>
<td>Yes</td>
</tr>
<tr>
<td>NALCO</td>
<td>Pechinery (France)</td>
<td>2,18,000</td>
<td>1,51,330</td>
<td>83</td>
<td>AV</td>
<td>AV</td>
<td>Sold</td>
<td>No</td>
</tr>
<tr>
<td>INDALCO</td>
<td>Alcan (Canada)</td>
<td>1,17,000</td>
<td>63,363</td>
<td>54</td>
<td>AV</td>
<td>Deficient</td>
<td>Sold</td>
<td>Yes</td>
</tr>
<tr>
<td>BALCO</td>
<td>Russian</td>
<td>1,00,000</td>
<td>92,940</td>
<td>93</td>
<td>Inadequate</td>
<td>AV</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MALCO</td>
<td>Montecatini</td>
<td>25,000</td>
<td>2,400</td>
<td>10</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

NA - Not Available  
AV - Available
and financing of an integrated aluminium complex with Aluminium Pechinery of France with a capacity of 0.218 mn tonne. To implement the project, the National Aluminium Co. Ltd. (NALCO) was incorporated on 7th January 1981 as a wholly owned enterprise of Government of India. Its bauxite mine is at Panchpatmali hills, Koraput district in Orissa, Alumina Plant at Damanjodi, Orissa, alumina smelter plant at Angul, Orissa and port facilities at Visakhapatnam, Andhra Pradesh. The company started commercial production in 1987. The main objective of this company to manufacture the aluminium hydrate, calcined alumina, aluminium ingots and aluminium wire rods.

3.2.5 During the year 1999-2000, production of bauxite alumina, aluminium and power wearer 2,822,464 MT, 886,000 MT, 212,663 MT and 3,985 MU respectively. Out of these export sales for alumina/hydrate was 679,620 MT and aluminium 95,185 MT and domestic sales for alumina/hydrate 8,027 MT, aluminium 120,171 MT and power 595 MU.

2. BHARAT ALUMINIUM COMPANY (BALCO) /[ AT PRESENT) STERLITE INDUSTRIES (INDIA) LIMITED

3.2.6 Bharat Aluminium Company limited (BALCO) is the oldest public sector aluminium company in the country, incorporated in 1965 and started producing aluminium in 1974. BALCO has
been closely associated with the growth of the Indian Aluminium Industry and has played a pivotal role in making aluminium, a leading metal with myriad uses ranging from household, industrial to strategic defence and aerospace applications. Till 2001, BALCO was a public sector enterprise owned 100% by the Government of India. In the year 2001, Government of India handed over 51% percentage equity and management control in favour of Sterlite Industries (India Limited).

3.2.7 BALCO is a part of the first moving Vedanta Resources, a London listed metals and mining, deal with aluminium, copper and zinc operations in United Kingdom, India and Australia. It has two working units- the first one is Integrated Aluminium Complex at Korba, Madhya Pradesh and the second one is at Bidhabag in West Bengal, equipped to produce only downstream facilities. It has production capacity of 2,00,000 tonnes p.a. for alumina and 1,00,000 tonnes p.a. of smelting capacity. The company has contributed significantly as a primary aluminium producer providing sustenance to vital industries and has proved its mettle by developing and supplying special aluminium alloys to the nation’s intermediate range ballistic missile “Agni” and surface missile “Prithvi”.

3.2.8 The marketing network is involved in the sale of the products. It has regional marketing offices at New Delhi, Mumbai, Calcutta and Chennai. Besides, territorial offices, in Hyderabad
and Nagpur, also assist in marketing. In addition, the services of various assignment agents are also availed of by the company. The company has achieved the highest ever turnover of Rs. 896.63 crore during 1999-2000, i.e., an increase of 3 percent over last year turnover of Rs. 871.00 crore, despite lesser sale by 1618 tones.

3.2.9 This could result mainly on account of higher sale of value-added products by the company. Balco's share of rolled products, among all primary producers, account for 33 percent sale in the domestic market and has achieved an all-time record despatch of 44,035 tonnes, both from Korba and BBU combined during the year 1999-2000. The company has exported 116 tones of cold-rolled products to Sri Lanka in the year 1999-2000, earning foreign exchange of approximately $222,846 (Rs. 96.70 Lakhs). With the commissioning of a new cold rolling mill by the first quarter of 2001, the availability of rolled products will increase by approximately 2000 tonne in 2000-01, by 25,000 tonne in 2001-02 and will reach the target level of 26,240 tonne by 2002-03.

3. INDIAN ALUMINIUM COMPANY LIMITED (INDAL):

3.2.10 The role of private sector in aluminium industry is also of great significance. INDAL was first to commence production from imported alumina for producing aluminium ingots. It is considered
as the oldest private sector aluminium company in the country. It was incorporated in 1938 under the name of “Aluminium Production Company of India Ltd.”, but subsequently changed in 1944 to Indian Aluminium Company Ltd.

3.2.11 The main objectives of INDALCO is the manufacture of aluminium and its semi-fabricated products. The company also produced alloys, architectural sections, barns, chequered plates, circles, coil sheets, foils, stock silos, ingots, paste for plant and pigments, powder, plates, irrigation tubing, prefabricated house and sheds, rocs, slugs, stripes, structural sections and chemicals such as alumina calcined, alumina hydrated, carbon electrole paste etc.

3.2.12 INDAL has a number of working units. These are Hirakud (Smelter and Power), Lohadarga (Mines), Muri (Alumina), Belur (Sheet), Balasore (Extrusions), Rayagada (Alumina), Hyderabad (Foil), Nanjangud (Electronics), Alupuram (Smelter & Extrusions), Belgaun (Alumina & Smelter), Goa (Lamitubes), Chandigarh, Durgamanwadi (Mines), Taluja (Sheet) and Kalwa (Foil). Its regional sales office situated at New Delhi, Calcutta, Bhubaneswar, Hyderabad, Chennai, Coiminator, Bangalore, Pune, and Mumbai. During the year 1999-2000, the turnover was Rs. 1,174.20 Crores. In this year, the company produced semi-fabricated aluminium of 53,870 tons, alumina hydrate 4,13,000 tons and primary aluminium of 43,458 tons and sales during that year 50,923 tons,
3,04,319 tons and 6,113 tons respectively. The performance of the company is also satisfactory mainly due to high capacity utilisation of plant and machinery, continuous technological up-gradation and persistent efforts at improvement in productivity.

4. HINDUSTAN ALUMINIUM CORPORATION (HINDALCO)

3.2.13 The company has formed by the House of Birla’s in collaboration with KAISER organisation of USA. According to Company’s agreement with KAISER Aluminium and Chemical Corporation, the collaboration agreed to provide know-how consisting of processes and operating reports and/or large quantities of other materials relating to technology of aluminium industry. It is the largest integrated aluminium plant in India with all its production facilities, viz., Alumina, Aluminium and Fabrication located at Renukoot near Rihand Dam in Sonbhadra (U.P). In 1959, an industrial licence was granted by the government for setting of with an initial installed capacity of 20,000 tons per annum. Now HINDALCO is producing about 1,50,000 tons aluminium per annum.

3.2.14 HINDALCO’s products range includes primary aluminium ingots, alloy ingots, billets, cast slabs, wire rods, alloy wire rods, rolled products extrusions. During 1998-99 sales was Rs. 2,013.08 crores as compared to Rs. 1670.72 crores in 1997-98. And export was Rs.165.40 crores as compared to Rs. 170.19
crores in 1997-98. The export declined due to increased in domestic demand and shortfall in productions.

5. MADRAS ALUMINIUM COMPANY LIMITED (MALCO)

3.2.15 In 1960, the company entered into a collaboration agreement with M/s Montecantine of Italy. The factory was inaugurated on 2nd July 1965 at Mettur Dam, near the city of Salem, Tamil Nadu. MALCO has its own bauxite mines in the state of Tamil Nadu, Yercaud of Salem district having reserves of 0.8 mn tones and Kolli Hills of Namakkal district having reserves of 0.9 mn tones. The company has an integrated Aluminum Complex at Mettur comprising 40,000 tonnes per annum Aluminium Smelter, 80,000 tonnes per annum Aluminium Refinery, Captive Power of 75 MW and associated metal casting and fabrication facilities. Production of alumina commences from May 1965 and of aluminium ingots by June 1965. The project plant was erected in November, 1966 and production of EC grade wire rods was started from January, 1967. MALCO was taken over by the Sterlite Group in 1995. During 1998-99, turnover declined to Rs. 178.42 crores.

3.2.16 Production of aluminium and alumina was also affected due to reduced level of operation after 21st Feb'1999, on which date the concessional power tariff expired in accordance with the scheme of BIFR. The main objective of the company is to manufacture
the aluminium ingots and alloys from the bauxite reserves of Sheveroy Hills and rolled products.

3.3 LOCATION OF NATURAL RESOURCES

3.3.1 The occurrence of bauxite ore can broadly be divided into four regions. (1) Chhotanagpur Plateau bordering the states of Bihar and Madhya Pradesh, (2) The Maikal Range (Amarkantak Plateau) in Madhya Pradesh. (3) The Western Ghats and (4) The Eastern Ghats.

3.3.2 The smaller isolated areas of bauxite occurrence are met within high-level laterites with an area of 3,370 square kilometers. Amongst the localities, the Khadagpur Hills of Monghyr District of Bihar, Sconi Plateau of Bailadila Range of Bastar District of M.P., Khariar High lands of Sambalpur District of Orissa and Sheveroy of Salem District of Tamilnadu are worth mentioning. "The Indian Bauxite known reserves is estimated to be 264.14 mn. tonnes of all grades". About 15 percent of these reserves are considered to be high grade, suitable for manufacturing aluminium, which can sustain for about 100 years at the rate of about 304,800 tons of aluminium per annum. This avoids the fears in some quarters that high-grade ore will be exhausted in a few decades.
3.3.3 But India should carry on extensive surveys and detailed prospecting to increase the quantum of known reserves.

The details of bauxite reserve are as follows:

**TABLE 3.2**

WORLDS MAJOR Bauxite Reserves

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>RESERVES (MN. TONS)</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>7,860</td>
<td>26.69</td>
</tr>
<tr>
<td>Guinea</td>
<td>5,900</td>
<td>20.03</td>
</tr>
<tr>
<td>Brazil</td>
<td>2,900</td>
<td>9.85</td>
</tr>
<tr>
<td>Jamaica</td>
<td>2,000</td>
<td>6.79</td>
</tr>
<tr>
<td>India</td>
<td>2,650</td>
<td>9.00</td>
</tr>
<tr>
<td>Others</td>
<td>8,140</td>
<td>27.64</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>29,450</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

SOURCE - Internet Services

3.3.3 The table 3.2 represents world’s major bauxite reserves of the world. From the table it is clear that, Australia tops the list having 26.69 percent of th world reserve followed by Guinea 20.03 percent. India ranks fifth having 9 percent share.

3.3.4 From the table 3.3, we can see that bauxite reserve in Orissa is highest in India, i.e. 1601.58 mn. tonnes followed by Andhra Pradesh 479.16 mn. tonnes. Thus Orissa is the largest supplier of natural raw-material for Aluminium producing companies in India.
### Table 3.3

**BAUXITE RESERVES IN INDIA (mn. tons)**

<table>
<thead>
<tr>
<th>STATE</th>
<th>PROVEN</th>
<th>PROBABLE</th>
<th>POSSIBLE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>54.63</td>
<td>47.93</td>
<td>376.60</td>
<td>479.16</td>
</tr>
<tr>
<td>Bihar</td>
<td>17.60</td>
<td>17.68</td>
<td>37.98</td>
<td>73.26</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>60.43</td>
<td>64.61</td>
<td>68.87</td>
<td>193.91</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>63.46</td>
<td>12.21</td>
<td>26.47</td>
<td>102.14</td>
</tr>
<tr>
<td>Orissa</td>
<td>272.00</td>
<td>303.79</td>
<td>1025.79</td>
<td>1601.58</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>9.39</td>
<td>0.64</td>
<td>4.00</td>
<td>14.03</td>
</tr>
<tr>
<td>Others</td>
<td>21.17</td>
<td>49.86</td>
<td>77.73</td>
<td>148.76</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>498.68</td>
<td>496.72</td>
<td>1617.44</td>
<td>2612.84</td>
</tr>
</tbody>
</table>

**SOURCES** – Internet Services

### 3.4 MANUFACTURING PROCESS OF ALUMINIUM

3.4.1 Aluminium is produced from bauxite in two stages, viz. (A) Extractions of alumina from bauxite, (B) Extraction of aluminium from alumina, i.e. Hall Herault Process.

**A) EXTRACTION OF ALUMINA FROM BUXITE:**

The bauxite is blasted out of the ground and then either manually or mechanically broken into smaller chunks of boulder. In the plant, the bauxite is crashed and then wet ground to form slurry. The slurry is fed into digesters, where the alumina content
of bauxite is dissolved in caustic soda and the slurry is separated into red mud and sodium aluminate solution. Alumina Hydrate is then precipitated in tanks from filtered sodium aluminate solutions by the batch precipitation process. Precipitated alumina hydrate is then filtered and washed free of caustic soda and then calcined gas suspension calciners to produce calcined alumina.

B. EXTRACTION OF ALUMINIUM FROM ALUMINA:

In the second stage of aluminium production, calcined aluminium is conveyed to the pre-baked pot lines, which have a number of pot cells. The aluminium is converted into metallic aluminium in these cells by the standard hall heroult process, where electrolysis of the alumina takes place in a molten bath of cryolite. The molter aluminium is siphoned into crucibles and either poured into moulds to form ingots or transferred for further processing into semi-fabricated products.

3.5 PRESENT FIELDS OF APPLICATION OF ALUMINIUM IN INDIA

3.5.1 Along with the expansion of aluminium production, there has been diversification in the aluminium uses, which has been achieved through imaginative market exploration and market promotion. Today, the organised sector of aluminium downstream operation has about sixty players in addition to the large number
of casting and rerolling units in the unorganised sector. These units offer employment opportunities to a much large number of people than the 3-4 major primary producers. In India, the fields in which the aluminium is used are given below.

1. Building and Construction: The main consumption area in this sector is roofing and siding account for about 80% of the sheet consumption. However, the share of aluminium in the roofing segment is barely 5 percent. Galvanised steel and asbestos sheet are main material used for roofing. In addition, aluminium can be used in architectural applications, storage tanks, silos, irrigation pipes and light bridges.

2. Transportation: Aluminium rolled products is mainly consumed in bodybuilding of buses, where the overall penetration is around 60 percent. The major substitutes are mild steel and wood. In the case of trucks, aluminium sheets mainly used for cabin paneling. Aluminium sheets are also used for panelling of three wheelers. Consumption of aluminium sheets in railways has not been shown any significant growth. It is restricted to coaches and EMU units. The Indian railways have not yet used aluminium sheets for wagons. The use of aluminium sheets in shipping is minimal, while India’s need for applications in the aircraft segment is mainly through import.
3. Consumer durables: Electric fans, utensils and pressure cookers account for bulk of consumption in this sector. The other areas are milk cans, end caps, refrigerators and air conditioners. A large quantum of the production of the consumer durables comes from unorganised sector. Substitution by alternative materials will have a significant impact in aluminium consumption. Stainless steel/CRCA/Plastics pose threats to the growth of aluminium consumption.

4. Industrial machinery: The main application areas are insulation cladding, litho, agricultural sprinkler tubes, caulboard and textile machinery. This segment comprises a large number of manufacturers in each application areas. The consumption in this sector depends the overall industrial activity and in particular the capital goods segment.

5. Packaging: The main consumption areas are closure stock (PP caps, Vial seals, LPG seals), slug stocks and foil. PP caps (Pilfer proof caps – pharmaceuticals) are a big consumption area in the packaging industry. Slug stocks are used for aluminium collapsible tubes (used for tooth paste), aerosol containers and rigid containers (canned foods and diary products). Lamitubes have made in roads in the collapsible tube segment for packaging of cosmetics.
6. Electrical and Electronics: The main consumption areas are bus bars, lamp caps, dish antenna, light reflectors, capacitor cans, cable trays, all aluminium conductors, telegraph and telephone cables and switch gears etc. Sheets account for 5 percent of the total consumption of aluminium in this sector.

7. Defence and ordnance: In this area, the aluminium is needed to construct the bridges- lightweight jeep mule bridge, pontoon bridge, tent and tanks and stretchers. The working groups on “Use of Aluminium in Defence” have identified the following areas of application of aluminium in defence.

i) Heavy bridging and engineering equipments.
ii) Filler wires for welding of aluminium.
iii) High capacity stretchers.
iv) Rolling mills.
v) Indirect extrusion techniques.
vi) Dimple plates and stiffened plates.
vii) Master alloy, such as zirconium aluminium alloys.
viii) Specialised oxidiser container for missiles.
ix) Naval requirements.
x) Aircraft industry of the Air Force.
xi) Vehicles.
$xii$) Special weapons.
8. Miscellaneous: Aluminium is also used for coinage, aerospace, ceramics, solar panels and gas meters etc.

3.6 PROBLEMS OF ALUMINIUM INDUSTRY OF INDIA

3.6.1 The problems confronting the Aluminium Industry in India are many and they cover a wide sphere. However, a few important ones are discussed in the following paragraphs.

1. High cost of power: The Aluminium Industry as such is very power intensive and the Indian power rate is very much high than that of the foreign countries. “While they vary from Rs. 165/- to Rs. 175/- per K.W. per annum in India, it is only Rs. 47/- in Norway”. In India, since the power generation and the fixation of the rates are the responsibilities of the government, they try to fix it sufficiently high to augment their revenue earnings. “Hence a reduction in the cost of power is a desirable necessity to reduce the cost of production in aluminium, as 20,000 to 25,000 Kwh are required to produce a tonne of aluminium”.

2. Economic size of the production units: The optimum size of the primary aluminium plants has a great bearing on the cost of production of aluminum. The optimum size of the aluminium plants may be 0.10 M.T. as 46 percent of the world’s output is being manufactured in them. Plants with below 20,000 tonnes capacity are considered economical as 6 percent of the
total world production is manufactured by them. The optimum size of the smelter may be fixed at 50,000 tonnes as 73 percents of the world production comes from such smelting units and the minimum economic size is suggested at 20,000 tonnes. The size of aluminium plants in India is not optimum, due to which the cost of production of aluminium is more.

3. Nature of Bauxite: Although the bauxite is a tri-hydrate type, Indian bauxite contains substantial proportions of monohydrate, making processing complicated and costlier as compared to the straight tri-hydrated process, which is in vague in other producing countries of the world. Processing in India involves more caustic soda consumption. This entails additional expenses in the terms of extra equipments and labour charges. All this in turn adds to the cost of production.

4. Paucity of the caustic soda: In the Aluminium plants, the grounded bauxite is digested under pressure in strong solutions of caustic soda. After the removal of the impurities like iron and silica etc., aluminium hydroxide is produced which is then calcined to produce pure alumina. The dearth of caustic soda for consumption in the Aluminium Industry drives India to resort to imports from abroad. For imported caustic soda, India pays almost double the price at which it is available to other world producers. This is the serious drawback of Aluminium Industry in India.
5. Petroleum Coke: Petroleum coke is required to manufacture soderberg electronic paste. About 0.66 tonne of pastes are required for every tonne of aluminium. These in turns call for 0.76 tonne of green petroleum coke or 0.5 tonne of calcined petroleum cokes. For 240 thousand tonnes of aluminium productions, 182.9 thousand tonnes of petroleum coke will be required. It is desirable that the raw petroleum coke should be calcined at refineries in order to take advantage in the freight savings. It will not be economical for each aluminium plant to have its own calcining facility.

6. Cryolite and Aluminium Flourite: As there is no cryolite deposit in India, fluorite is being used as one of the basic raw material for the manufacture of synthetic cryolite. The Indian fluorspar deposits are of low grade with high silica percentages, which can be upgraded by flotation methods. Fluorspar could also be used for the manufacture of fluorite and once the production of synthetic cryolite is started in mass scale, the problem will be considerably solved.

7. Problem of Freight charges: The geographical distances among the smelters, ingot plants and rolling mills should not pose any problem and must not add substantially to the cost of production. Hence the reduction of freight charges need not arise at all. In this context, the example of the leading aluminium
producing countries may be cited. Canada, Germany, Norway, Switzerland etc. have to depend entirely on bauxite ores.

3.7 GOVT. POLICY

3.7.1 In the 1970s, the Government of India regulated and controlled the Aluminium Industry through price contribution controls and barriers to entry. The 1970 Aluminium Control Order compelled the Indian companies to sell 50 percent of the aluminium produced for electrical purposes. The government fixed ingot prices on the basis of a Retention Pricing Mechanism taking into consideration the average retention prices of all producers and a minimum return on equity.

3.7.2 The above control resulted in a skew product mix and shortage of aluminium for other sectors. The problem was further compounded by the vulnerable financial position of State Electricity Board (the main users of electrical grade aluminium) and high import and excise duties. The producers resorted to inflated prices for other types of aluminium to compensate for the disadvantages they suffered because of this regulation.

3.7.3 The government decontrolled the industry in 1989 with the removal of the Aluminium Control Order. The Industry was de-licensed in 1991 and was allowed liberal import of capital goods and technologies.
3.7.4 The aluminium industry along with the rest of industries of India will be looking to the government to bring in improvements in the fiscal, trade and industrial policies. The industry looks forward to significant investment both from government and private sector towards infra-structural development such as power, roads, railways, ports and telecom. The assurance from the government of a level playing field and protection against dumping would go a long way in boosting long-term growth and expansion. Introduction of global norms in interest, duties, taxes and cost of administered raw materials would further help the industry in its quest towards global competitiveness.

3.8 SUMMARY

3.8.1 Aluminium is the most necessary material in the modern age. It is the youngest metal of the world, because it was first discovered in 1866 A.D. At that time it was used in luxury goods. But, after the first World War, aluminium and its alloys was used in aircraft industry. After 1930, this was extensively used in transport, building, packaging, industrial machinery, etc.

3.8.2 India is the sixth largest producer of Aluminium in the world. Aluminium production in India commenced in 1938 with commissioning of Aluminium Corporation of India’s (INDAL) Plant having a capacity of 2500 tons per annum. In 1959, Hindustan Alulminum Corporation (HINDALCO) was set up at Renukoot in
Uttar Pradesh with an initial capacity of 20000 tons per annum. After that in 1965, Madras Aluminium Company (MALCO) was setup with a capacity of 10000 per annum. This was followed by Bharat Aluminium Company (BALCO), a public sector undertaking established in 1975, with the capacity of 10000 tonnes per annum. Now, the equity and management control of both BALCO AND MALCO are taken over by Sterlite Industries (India) Limited. Finally, in 1987, National Aluminium Company (NALCO) was established with a capacity of 0.218 mn. tonnes per annum.

3.8.3 The Bauxite Ore available in Khadagpur hills of Monghyr district of Bihar, Sconi plateau of Bailadila Range of Bastar district of Madhya Pradesh, Khariar highlands of Sambalpur Districts of Orissa and Sheveroy of Salem district of Tamil Nadu.

3.8.4 Aluminium is produced from bauxite in two stages. In the first stage, alumina is extracted from bauxite and in the second stage, aluminium is extracted from alumina. For the production of aluminium from bauxite, caustic soda and alumina hydrate are required. In India, aluminium is used in the different fields. It is used in roofing, storage tanks, silos and irrigation pipes for the building and construction sector and bodybuilding of different types of vehicles in transportation. It is also used in production of electric fans, utensils, airconditioners, refrigerator, etc. In the packaging sector, it is used in LPG seals and collapsible tubes.
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