

HINDALCO INDUSTRIES LIMITED

Renukoot, Sonbhadra (Uttar Pradesh)

Unit Profile

Hindalco Industries Ltd., the Flagship Company of Aditya Birla Group, India's one of the premium business houses, was incorporated in 1958 and commercial production commenced in 1962. Company's principal products comprise of Aluminium Ingots, Aluminium Billets, Aluminium Wire Rods, Sheet Products, Extrusions, Aluminium Foils and Aluminium Alloy Wheels. The Company's by products include Gallium Metal, Vanadium Sludge and Aluminium Dross.

Hindalco, at Renukoot, houses a fully integrated plant, comprising of 3 main plants i.e. the Alumina, Smelter & Fabrication Plants. Each plant employs varying Technology. With integrated facilities, output from various plants is used by next, along with varying raw materials. Company has its own captive power plant at Renusagar (30 Km away from Renukoot) with installed capacity of 741.7 MW and 78 MW of Co Generation Plant at Renukoot itself.

Alumina Plant: - It was commissioned with an initial capacity of 40,000 MTPA, which has now increased, to 660,000 MTPA. The plant has been expanded in phases using new technology from time to time for energy efficiency and capacity enhancement. It employs the basic Bayer's process and the major raw materials for the plant are Bauxite, Steam, Caustic Soda and Furnace oil.

Aluminium Smelter: - It has 11 Potlines with 2038 Pots installed with annual production capacity of 3,42,000 MT. The Smelter employs the Hall Heroult Electrolysis Process for the extraction of Aluminium from Alumina. Basic raw materials for the smelter are Alumina, Power, Anodes and Aluminium Fluoride.

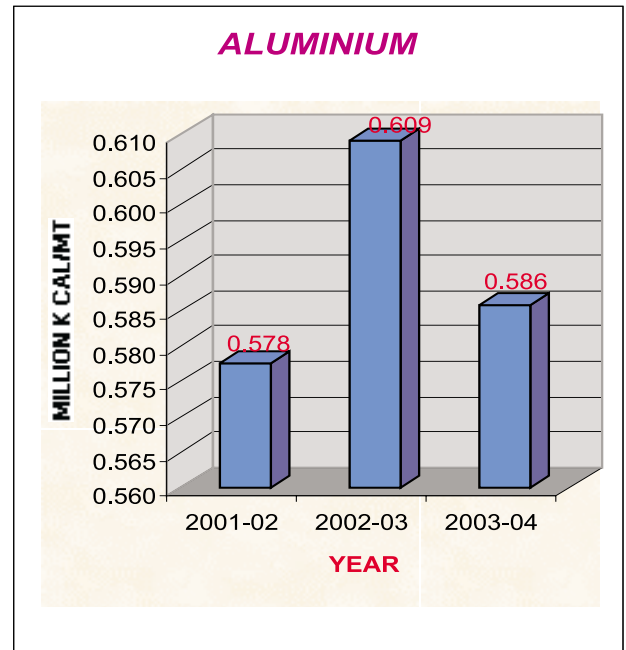
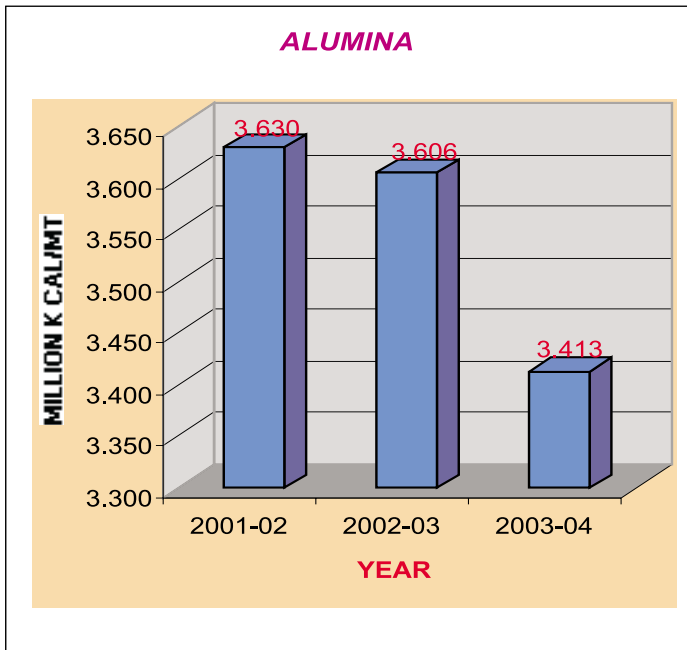
Fabrication Plant (Value Added Products): - The Fabrication Plant at Renukoot comprises of 4 Main Sections Remelt Shop, Cast House, Rolling Mills, Extrusion & Conform which produce Wire Rod, Sheets, Coils and Extruded Products.

Hindalco, an ISO 14001, ISO 9002 and OHSAS 18001 Company, has bagged 13 prestigious International & National Awards for Business Excellence, Quality, Energy Conservation and its efforts for preserving the Environment in last 4 years.

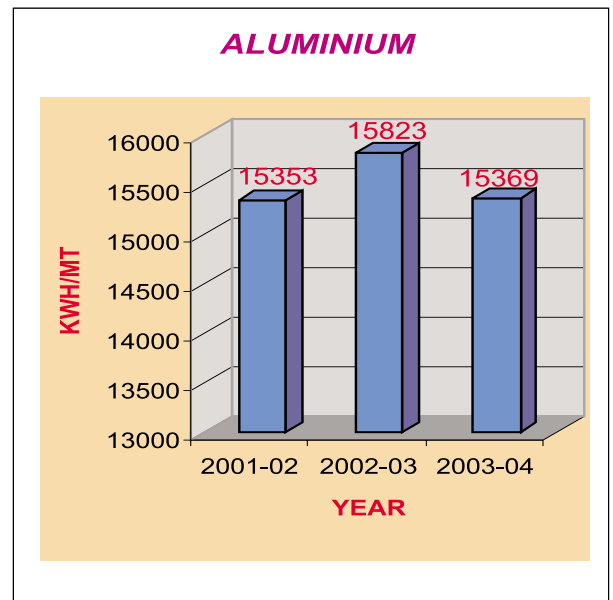
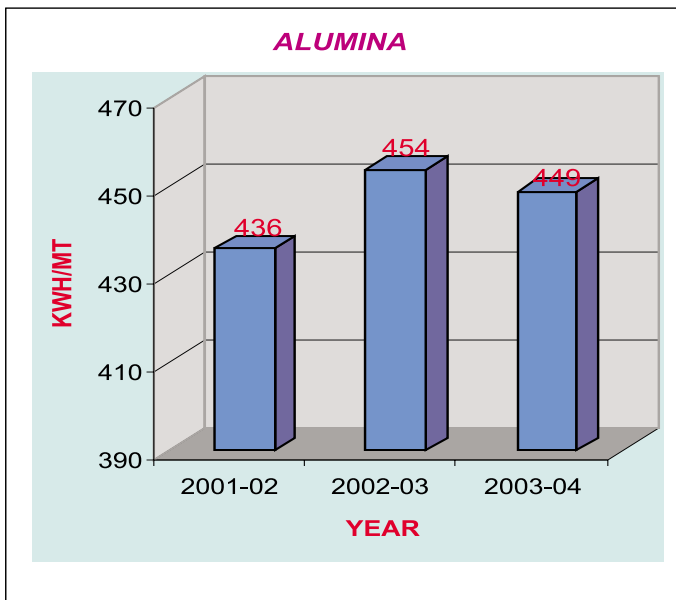
Energy Consumption

Manufacturing of Aluminium is a one of the most energy intensive process. The cost of Energy comprises about 41 % of the total input costs for producing Aluminium. Hindalco use 3 type of Energy resources to manufacture Aluminium i.e. Coal, Oil and Electricity. Out of these three, electricity has the highest share (almost 83 % of total energy consumption). Total cost of energy for last year was Rs. 790.31 crore which includes Rs 80.87 crore for Fuel oil , Rs 656.46 crore for Electricity and Rs 52.98 crore for Coal. Last year company consumed 397172 MT of Coal , 73270 KL of Fuel Oil and 53670 Lakh KWH of Electricity. Due to sincere efforts in the direction of Energy Efficiency by the company there has been significant reduction in the consumption of energy as depicted in the attached graphs.

SPECIFIC ENERGY CONSUMPTION (THERMAL) TRENDS



SPECIFIC ENERGY CONSUMPTION (ELECTRICAL) TRENDS



Energy Conservation Commitment, Policy and Set up

Energy Conservation continues to be focus area of the Company. The company has launched the Energy Policy to underscore its commitment to Energy Conservation. To inculcate awareness on the importance of Energy Conservation not only to the employees of the company but also to the society, the following setup is followed.

- Regular one-week programs arranged on "Energy Conservation Awareness" jointly with PCRA, New Delhi.
- Arrange "The 2nd Task Force on Energy Conservation Programme on ALUMINIUM sector" by Bureau of Energy Efficiency under Ministry of Power, Government of India.
- Setting up a dedicated Energy Cell with following agenda to enable the Company to reduce specific energy consumption on continual basis and thus becoming one of the lowest cost producers in the World.
 - to identify potential area for energy saving in consultation with department
 - to take care of latest technological developments in the field of energy conservation
 - to suggests measures for better energy efficiency for the implementation in the operating plant and new projects.
- to monitor the quantum of energy saved on account of energy conservation initiatives.
- The Company believes in all the modern techniques like TPM, Quality Circle, 5S, TQM, WCM etc. and is striving to become a World class Company in all its operations by creating awareness among employees towards energy conservation as well as resource conservation.
- The company has well-structured suggestion schemes to encourage employee to give their suggestions for energy conservation and employees are suitably rewarded for viable suggestions.
- Since the company has strong commitment towards Energy Conservation, the projects, which require investments, are normally approved. Company takes special care to allocate funds for these projects.

Energy Conservation Achievements

The company has been receiving National Energy Conservation Awards, continuously since 1995. During 2001-2004 company has implemented 120 measures to improve Energy Efficiency (including capacity enhancement) by investing Rs.462.8 Crore which resulted in a saving of energy worth Rs. 37.25 Crore/year and also increased production

YEAR	No of Suggestions	ACHIEVEMENTS OF ENERGY SAVING (PER YEAR BASIS)		
		POWER LAKHS KWH	THERMAL THERMAL (M Kcal) F. OIL (KL)	TOTAL RS. LAKHS
2001-02	16	102.39	42234.13	825.89
2002-03	44	171.03	218130.02	804.72
2003-04	60	1226.74	31778.99	2094.68
Total	120	1500.16	292143.14	3725.29

MAJOR PROJECTS IMPLEMENTED DURING THE YEAR 2003-2004 ARE LISTED BELOW

<p>ACID SHOOTING FACILITY FOR EVAPORATION I, II & III LIQUOR HEATERTE CHNICAL & FINANCIAL ANALYSIS Steam consumption with mechanical cleaning = 28.2837 MT/Hr Steam consumption with chemical cleaning = 27.2334 MT/Hr Reduction in steam consumption = 1.0503 TPH Steam saved = 8973.7632 MT/Year Coal consumption = 0.2229 MT/MT of steam Coal saved = 2000.251 MT/Year = Rs.20.886 Lakh/Year</p>	
<p>REDESIGN OF LINING PATTERN OF REFRACTORY IN FLS CALCINER VESSEL TECHNICAL & FINANCIAL ANALYSIS Total heat loss per day before modification = 13048508 Kcal Total heat loss per day after modification = 8368084 KCal Total heat loss reduction per day after modification = 4680424 Kcal CV of Furnace Oil = 10055 Kcal Total reduction of fuel oil per day = 465.48 Litres Annual saving of fuel oil = 165710.88 Ltrs Total Cost of Energy saved = Rs.10.59*165710.88 = Rs.17.549 Lakh/Year</p>	
<p>USE OF SLOTTED ANODE IN POTROOM SMELTER TECHNICAL & FINANCIAL ANALYSIS As derived from Faraday's law, power consumption for aluminium electrolysis process is: Power consumption (DC KWH/Kg Al) = $298.06 \times \frac{\text{Pot Voltage}}{\text{Current Efficiency (\%)}}$ Energy saving =348 kWh/T of Aluminum = 348×323184 kWh/Year =112468032 kWh/Year = Rs.1664.53 Lakh/Year</p>	<p style="text-align: center;">Original Anode Slotted Anode</p>
<p>INSTALLATION OF ENERGY EFFICIENT CENTRIFUGAL COMPRESSOR IN REDUCTION PLANT-1 TECHNICAL & FINANCIAL ANALYSIS Actual energy saving achieved =5760 kWh/day = 5760×350 kWh/Year = 2016000 kWh/Year = Rs.29.837 Lakh/Year</p>	

<p>STATE OF THE ART BAKE FURNACE FOR ANODE BAKING</p> <p>FINANCIAL ANALYSIS</p> <p>Furnace Oil consumption in Old bake furnaces = 72.2 Lt/ TGA</p> <p>Furnace Oil consumption in Bake Furnace # 5 = 68.0 Lt/ TGA</p> <p>As Bake furnace # 5 produces 40% of anode</p> <p>Overall furnace consumption is $(72.2 \times 0.6 + 68 \times 0.4)$ = 70.5 Lt/T GA</p> <p>Green anode production per year = 210000 MT</p> <p>Total furnace Oil saving per year = 357 KL</p> <p>Price of furnace Oil = 10592.88 Rs./KL</p> <p>Total Saving per year = Rs.37.816 Lakh</p> <p>INVESTMENT MADE = Rs.118.5 Crore</p>	
<p>INTRODUCTION OF VACUUM TAPPING IN PLACE OF OPEN CRUCE SYPHON TAPPING IN POTROOM</p> <p>TECHNICAL & FINANCIAL ANALYSIS</p> <p>Oil consumption reduction (Reduced temperature drop) = 0.8 Lit/MT</p> <p>Total production of Billet & Slab = 378 MT/day</p> <p>Fuel Saving (LDO)(70% molten metal) $= (378 \times 0.8 \times 0.7)$ = 211.68KL/Yr</p> <p>Monetary benefits (Rs in Lakh) = 211.68*16199Lakh/Yr</p> <p>Total production of Properzi, Caster & Pig Casting = 283.9 MT/day</p> <p>Fuel (FO) Saving taking 85% molten metal $= 283.9 \times 0.8 \times 0.85$ KL/Yr = 193.052 KL/Year</p> <p>Monetary benefits (Rs in Lakh) = 193.052*10593 = Rs.20.450Lakh/Yr</p> <p>Total fuel oil saved = 404.732 KL/Yr = 54.740 Lakh/Year</p> <p>INVESTMENT MADE = Rs.64.20 Lakh</p>	
<p>INCREASE IN CHARGE WEIGHT IN SOAKING PIT BY MODIFICATION IN SPACER TO REDUCE THE SPECIFIC ENERGY CONSUMPTION</p> <p>TECHNICAL & FINANCIAL ANALYSIS</p> <p>Energy consumption for the period (Apr'03- Sept'03) = 221.62kWH/Mt</p> <p>MT/Charge for the period (Apr'03 to Sept'03) = 53.47</p> <p>Energy consumption for the period (Oct'03 - Mar'04) = 208.29 kWH/Mt</p> <p>MT/Charge for the period (Oct'03 to Mar'04) = 60.50</p> <p>Total tonnage loaded in the pit in the year 2003-04 = 98528.69 MT</p> <p>Average load for a month = 8210.72 MT</p> <p>Reduction in energy with increased no. of slabs = 13.33 kWH/MT</p> <p>Total energy saving = 109448.90 kWH/mth = 1313386.8 kWH/Yr = Rs.19.44 Lakh/Year</p>	

In addition to above following 53 major projects have been implemented during 03 - 04 having annualized saving of Rs.1880.49 Lakh with an investment of RS. 1587.91 Lakh.

- Vanadium Sludge Recovery process conversion from batch to continuous.
- Good condensate transfer from Dig. # 1 Live Steam Heater Condensate Pot to Flash Vessel.
- Off Delay timer provided to reduce idle running of Stretcher M/c Hydraulic motor of Ext. Press#1,3.
- Interlocking of Scrubber Unit with main equipment to reduce running hrs. of Conform M/c.
- SS Pipeline installation for transferring hot DM water for Boiler#3.
- Replacement of mercury vapour lamp with sodium vapour lamp
- Replacement of higher wattage tube light with lower wattage tube lights in toilets
- Replacement of higher wattage exhaust fans with lower wattage exhaust fans in toilets
- Installation of capacitor bank in Alumina plant MCC feeders
- Replacement of higher rating (150hp) motor with lower rating (100hp) motor
- Replacement 20 hp ventilation fan with 85 watt exhaust fan
- Replacement 25 hp ventilation fan with 85 watt exhaust fan
- Stoppage of duplicate equipment running
- Replacement of 10 w incandescent type indication lamp with LED
- Installation of scrap charging machine in Slab Casting
- Improvement in cutting recovery by reduction of ramp portion during casting
- Installation of electronic load cell in metal pouring machine of Billet casting
- Stoppage of idle running of Shot blast machine
- Stoppage of idle running of conveyors, ID fan & rotary air lock in Pot Room plant-2
- Reduction in on time of electrical furnace of Lab
- Connection of Alumina conveying air slide with pot air slide fan in pot line # 4
- Replacement of 75 hp motor with 60 hp motor in pot line # 9
- Replacement of 250 watt MV lamp with 125 & 150 watt sodium lamp
- Optimization of roof light on time of pot line # 9 to 11
- Installation of capacitor bank in the power circuit of spray water pump to improve the power factor
- Modification in the Slab cutting machine layout to reduce the cycle time
- Connection of water spray system of pot line # 9 to 11 with the water spray system of pot line # 4 to 8.
- Connection of pot air slide fan header with silo discharge air slide fan in pot line # 6 & 8
- Connection of pipe line of silo fluidizing blower with filter hopper blower in pot line # 8 DSS
- Connection of pipeline of pot air slide fan with filter hopper fluidizing blower of pot line # 9 to 11.
- Connection of pipeline of silo to main air slide with pot air slide fan in pot line # 2.
- Change in size of cathode flexible of pot to reduce the voltage drop
- Full utilization of under loaded cooling tower and removal of one cooling tower
- Controlling exhaust fan by a timer in Ext Press # 2 & 3 finish product saw m/c to reduce the idle running
- Replacement of incandescent lamp of crane bus bar indication lamp with LED.

- Replacement of 100w incandescent lamp of crane bus bar indication lamp with 15w lamp.
- Installation of new small centralized cooling tower for annealing furnace & CTL control a/c unit to save the pumping power.
- Reduction in idle running of slitter motor & pinch roll motor of Blue Star slitting line
- Reduction in idle running of hydraulic motor of solution furnace
- Using the sludge as fuel oil, being generated during rectification process of coolant
- Speed of Davy cold mill has increased to increase the production as well as to reduce the specific energy consumption
- Increase in charge weight in Annealing furnace # 2 by modification in charging rack to reduce the specific energy consumption
- Installation of apron coal feeder in place of reciprocating coal feeder.
- Direct tapping of 50 psi steam from bottoming turbine extraction in place of 600 psi header
- Installation of auto changeover of lube oil pump to avoid the tripping of boiler # 1.
- Modification of Impactor discharge chute to increase the coal feed rate in boiler # 2 Coal Bunker.
- Installation of EOT crane in coal plant to reduce the HSD consumption being consumed by Dozer
- Procurement of rectifier unit of pot line # 11 with OFWF in place of OFAF heat exchanger.
- Installation of logo for air-conditioning unit of Pot Line # 9 to 11 MCC & control room.
- Replacement of lamp with 8 watt CFL.
- Installation of sigma search light in place of sodium vapour lamp.
- Replacement of copper ballast with electronic ballast

Energy Conservation Plans and Targets

The following energy conservation projects are under active implementation during the financial year 2004-2005.

	Energy conservation measures (planned)	Anticipated Savings in Rs in Lakhs	Approx. Investment (Rs. lakhs)	Project commencement and completion year
1	Use of 30 psig steam in Desilication Heaters in place of 100 psig steam.	21.7	-	May 04 & Jun 04
2	Revamping of Evaporation Unit II & HID II	62.8	103	May 04 & Jun 05
3	Efficient utilization of flash vapor by deploying Condensate pot with LCV	10.8		May 04 & Jun 06
4	Slurry heaters scale cleaning in Digestion Unit I using chemical solvents.	13.0	U.P.	May 04 & Jun 07
5	Replacement of 300 nos. filament indication lamps by LED type lamps.	0.15	0.25	04.05
6	Replacement of 50 conventional light fittings by energy efficient fittings.	0.34	1.20	04-05
7	Motor connection conversion from Delta to Star in FCB Calciner Fan	0.25	Nil	04-05
8	Reduction of energy consumption by using higher dia Stub. In anodes.	1039.0	U.P.	04-05 & 05-06

9	Modify bath chemistry (1.0 % LiF) to reduce specific energy consumption	1039.0	1080	Under trial
10	Optimization of DSS fan current	53.3	Zero	Aug-04
11	OPANOR treatment of anodes to reduce Net Carbon Consumption	70.0	276	04-05 & 05-06
13	TINOR coating of cathodes to reduce Cathode Voltage Drop in Smelter	346.3	U.P.	Under trial
14	Modification in point feeder air line circuit to reduce the compressed air consumption.	66.4	123.0	04-05 & 05-06
15	Installation of condensate recovery system for pitch melting	40.4	70	Aug-04.
16	Installation of Baling press to reduce the oil consumption in Slab Casting	10.0	121.6	Aug-04.
17	Replacement of 40W indication lamps of crane bus bar with 2.5W LED.	3.20	7.00	04-05
18	Use of FO in place of LDO in Slab & Billet casting regenerative Furnace.	369.33	38.00	04-05
19	Revamping of two Annealing furnaces for efficiency improvement.	11.78	68.00	04-05
20	Installation of VFD at 50 mm Shear machine hydraulic pumps motor.	0.98	4.00	04-05
21	Installation of VFD at Davy Cold Mill CPT Compressor to save energy.	1.67	3.50	04-05
22	Reduction of Fume exhaust fan speed of Cold Mill during Mill stoppage.	0.84	0.00	04-05
23	Reduction in running hours of T L motor by providing Off delay timer.	0.52	0.00	04-05
24	Reduction in running hours of hydraulic motor of Extrusion Press # 1, 2 & 3 Die ejecting press by providing OFF delay timer.	0.04	0.00	04-05
25	Optimization of soaking hours of slab in Soaking Pit.	2.20	0.00	04-05
26	Modifiacion in recuperator of Pzy furnace to improve the effectiveness.	4.06	0.05	04-05
27	To install on line conductivity meter, Silica meter in DM Plant for better monitoring of DM water quality.	5.15	17.55	Jun-05
28	Installation of heat exchanger in new DM Plant for waste heat recovery.	20	30	Jul-05
29	Replacement of two lower rating diodes with one higher rating diodes in potline#1 to reduce voltage drop and energy loss.	9.56	65	04-05
30	Modification of lighting circuit of 11.5 KV switch house to switch off the light when not in use.	0.89	0.04	04-05
31	To make full capacity utilization of coal circuit by modifying hopper.	12.02		Sept' 04
32	Installation of Sewage treatment Plant for residential water.	101.29	650	Jan'05

Environment and Safety

Hindalco Industries firmly believes in good corporate governance. The company is well aware & respects its obligations to the society and is committed to ensuring a pollution free and healthy environment to its employees and the community at large. This being the cornerstone of the company's work philosophy, all its business decisions are integrated with the environmental dimensions not only since inception but also during the continuous expansion phases. During the latest expansion to increase its annual metal producing capacity by approximately 100000 MT the company has ensured that the environment in and around the factory is pollution free and that the levels of pollutants are maintained within the prescribed limits.

Institutionalization of sound environmental management practices and striving for continual improvement in environmental performance has been the key guiding principle of the company through adoption of cleaner technologies and inculcating the culture of pollution prevention, waste minimization, maximizing treatment of inevitable wastes and environmentally compatible disposal systems.

A well equipped Environment Management Cell is operative with qualified personnel to oversee environmental activities and is supported by full fledged sophisticated control laboratories that have been set up to help to constantly monitor the quality of air emissions and water effluents. The company has well-articulated "Environment Policies" in all its locations in context to the nature of its operations. All employees have pledged their commitment to the policy, in thought and deed.

All the company's installations at the mines, power plant, the integrated aluminium complex, Wheel & Foils Division and Copper complex continue to do excellent work in Environment Management and are ISO - 14001 certified. The systems adopted are in consonance with the company's philosophy and this, clearly underlines the commitment to fulfill its promise for sustainable development

A few significant achievements in respect of environment are as follows:

1. Segregation and stacking of scrap and waste material in disposal area and recycling of various materials resulting in extra-earning of about Rs. 6.00 crore per annum.
2. About 75% of the total ash generated is being supplied to cement industries hence utilization of waste material for productive use. A major portion of the remaining ash is utilized in plantation projects, construction and land filling.
3. From the Effluent Treatment Plant, the sludge generated after treating effluents is 100 % utilized as soil conditioner in the Red Mud Plantation project.
4. Spent Pot Lining generated from the Smelter is taken to the Cryolite Recovery Plant where the fluorine values are recovered to make cryolite an useful raw material required in the smelter and the carbon residue is burnt off in the boilers to utilize its Calorific Value. Hence there is no waste disposal on this account.
5. All slab areas in Alumina Plant provided with geo-membrane lining to prevent seepage.
6. One extra field provided in ESP of boiler # 1 to bring down SPM emission to less than 100 mg/Nm³ from the present value of 135 - 140 mg/Nm³.
7. Made boiler & co-generation unit zero industrial water discharge plant by doing different modifications for recycling of water within the plants.
8. Upgraded ETP to achieve process water quality standards for total recycle.

9. Commissioned the Fume Treatment Plant in Baking Furnace No.5 to arrest emissions.
10. Hindalco was the first to start dry stacking of Red Mud, which helps to prevent run-offs, seepage and use less space to store.
11. Greenhouse Gas emissions reduced by 20.49 % in the last 15 years.

The company is not only ensuring full compliance with environmental standards and statutory norms but is also able to maintain its pollution levels in and around the plant to below prescribed standards despite having expanded many folds.

Hindalco as a responsible corporate citizen remains committed for better and healthier environment as part of its goals. It is also vital that undue strain is not placed on our natural resources for only then, can one safeguard the long-term prospects of business. Following a committed and continuous cycle of environment improvement is therefore a fundamental strategy, which will never end. Company also has the Safety Policy, which encompasses all the aspect of the health and safety of the employees. The prestigious International Aluminium Institute (IAI) has adjudged the Company as the best in Safety in the world for Alumina Plant in 1999-00 and for Smelter plant in 2000. The Company has adorned with OHSAS Certification from DNV, Norway. Company's commitment for the safety can very well depicted by the following awards

- National Safety Award (Winner) by Ministry of Labour - 2003.
- Greentech Gold Medal for Safety Management & Performance – 2003
- Received "Yogyata Praman Patra" from National Safety Council for the year 1999
- Mines – Reclamation / Rehabilitation / Afforestation Award, 1999