

HINDALCO INDUSTRIES LIMITED **RENUKOOT; SONEBHADRA; U.P.**

COMPANY PROFILE

Hindalco Industries Ltd. is the Flagship Company of Aditya Birla Group. The **Aditya Birla Group** is India's second largest business house with a turnover of Rs. 280 billion, and assets are valued at over Rs. 265 billion. The group has nearly 72000 employees in 18 countries.

Hindalco Industries Limited was incorporated in 1958 and commercial production commenced in 1962. The Company was set up in technical collaboration with Kaiser Aluminium & Chemicals Corporation, USA. Hindalco is today one of India's premium corporates, contributing significantly to economic growth, generating employment and setting high standards in respect of fulfilling of obligations to all stakeholders.

The Company prizes its 'Human Capital', and employees have been reciprocating by turning in a sterling performance for the Company, year after year. Hindalco has an enviable record of harmonious Industrial Relations, with not a single man day lost since the past 30 years on account of industrial strife.

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. The Table below provides a brief perspective of end uses for the Company's products.

Product	Major End Uses
Aluminium Ingots	Remelted and used in the form of Castings, Consumer Durables, Powders & Chemicals, Redraw Rods etc.
Aluminium Billets	Supplied to Secondary Extruders for the production of Extruded Profiles
Aluminium Wire rods	Drawn to smaller Diameter for applications - largely in Conductors & Cables.
Aluminium Sheet Products	Transport, Electrical & Electronics, Consumer Durables, Architectural Applications
Aluminium Extrusions	Major consumption in Architectural applications. Others include Transport, Computer Hardware, Textile Machinery, Strategic Applications
Aluminium Foils	Packing of Food and Pharmaceuticals
Aluminium Alloy Wheels	Cars

Hindalco, at Renukoot, house a fully integrated plant, comprising of 3 main Plants i.e. the Alumina, Smelter & Fabrication Plant. Each plant employs varying Technology. With integrated facilities, output from various plants are used by others, 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

Hindalco's Alumina Plant employs the conventional Bayer's process was commissioned with an initial capacity of 40,000 MTPA which has now increased to 660,000 MTPA. The Company has been inducting new technology from time to time and the most recent initiative in this regard is the adoption of Alusuisse Precipitation Technology for energy efficiency and capacity enhancement. The major raw materials for the Alumina Plant are

Bauxite, Steam and Caustic Soda. Bauxite is procured from the Company's Mines in Jharkhand and Chhatisgarh, as well as through market purchases and requirement of steam is met thru Cogeneration plant at Renukoot.

Aluminium Smelter

The Company's Smelter commenced operations in 1962 with 1 Potline having a capacity of 20,000 MTPA. The smelter now has 11 Potlines with 2038 Pots installed with annual capacity of production 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. Alumina is produced by the Company's Alumina Refinery at Renukoot, Power is made available from the Company's Captive Power Plant at Renusagar and Cogeneration plant at Renukoot and Anodes are produced at the Carbon Plant located in the Renukoot . Aluminium Fluoride is sourced from the Company's JV, amongst other sources.

Fabrication Plant (Value Added Products)

The Fabrication Plant at Renukoot comprises of 4 Main Sections:

- Remelt Shop
- Cast House
- Rolling Mills
- Extrusion & Conform

The Remelt Shop houses 3 Properzi Mills for the production of Wirerods and Feedstock to Conform Machine.

Cast House is comprised of a state of the art Pig Ingot casting, Rolling Ingot (slab) casting and Extrusion Billet casting facilities. Product of Pig Ingot Casting is directly sold to customer and product of slab casting and billet casting are the feedstock to Rolling Mills and Extrusion presses respectively.

The Company has a Hot Rolling Mill and 2 Cold Rolling Mills. The Rolling Mill facilities also include a Continuous Strip Caster, which contributes substantially to Energy efficiency since it eliminates numerous intermediate operations.

The Company's 3 Extrusion presses and one Conform Machine are well supported by a well-equipped Die Shop.

Hindalco, an ISO 14001, ISO 9002 and OHSAS 18001 Company, has received following prestigious Awards for Business Excellence, Quality, Energy Conservation and its efforts for preserving the Environment.

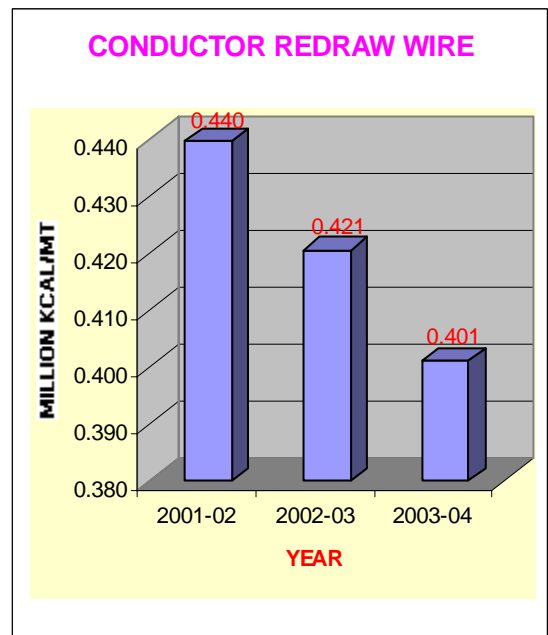
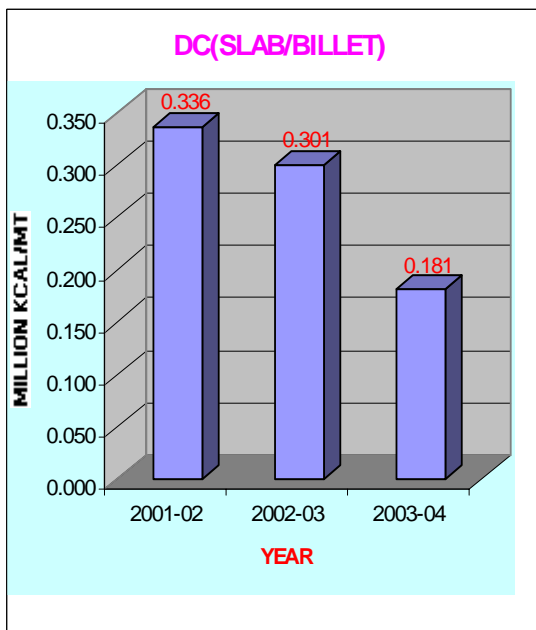
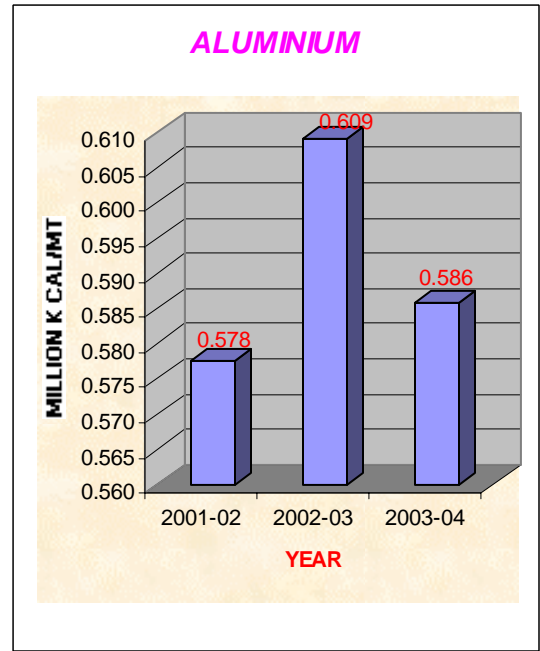
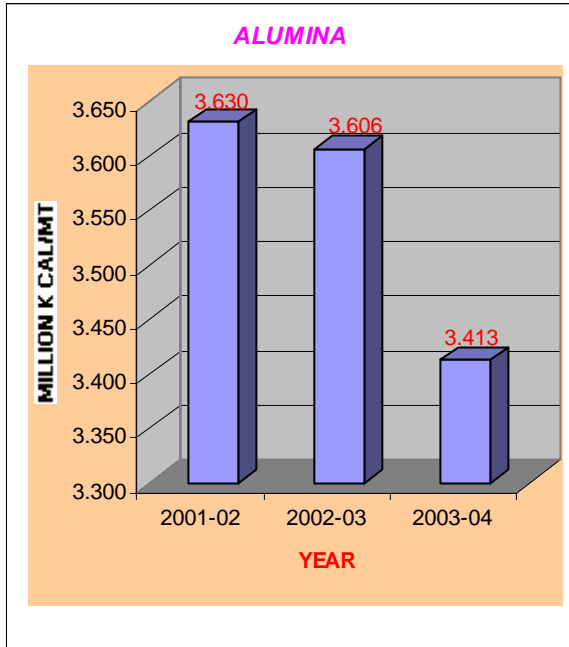
- National Safety Award (Winner) by Ministry of Labour - 2003.
- National Viswarkarma Award by Ministry of Labour – 2003
- Greentech Gold Medal for Safety Management & Performance – 2003
- CII National Award for Excellence in Energy Management for 2003
- Ist Prize in National Energy Conservation Award for 2002

- CII-Exim Commendation Certificate Award for Strong Commitment to TQM on the journey towards Business Excellence from CII in 2002
- CII National Award for Excellence in Energy Management for 2002
- Community Development Initiative Awards by FICCI in 2002
- Non-Ferrous Quality Award from Indian Institute of Metal in 2002
- IMC-Ramkrishna Bajaj National Quality Award-Certificate of Merit, 2002
- Alumina Plant & Reduction Plant of Hindalco declared best performing plant in the field of safety for the year 2000 by International Aluminium Institute, U.K.
- Received “Yogyata Praman Patra” from National Safety Council for the year 1999
- Mines – Reclamation / Rehabilitation / Afforestation Award, 1999

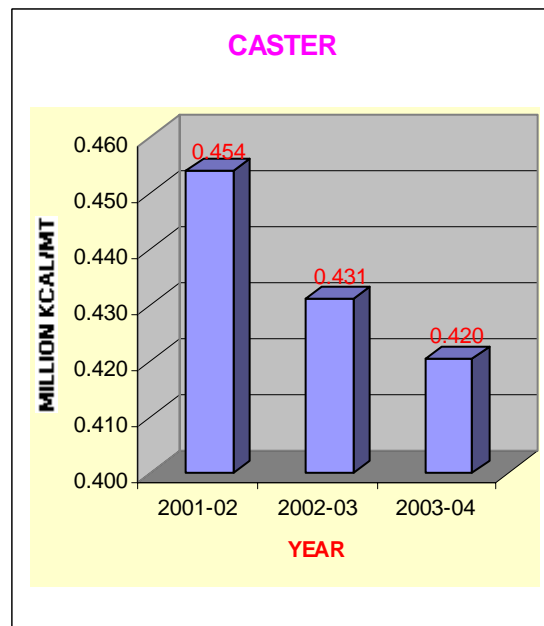
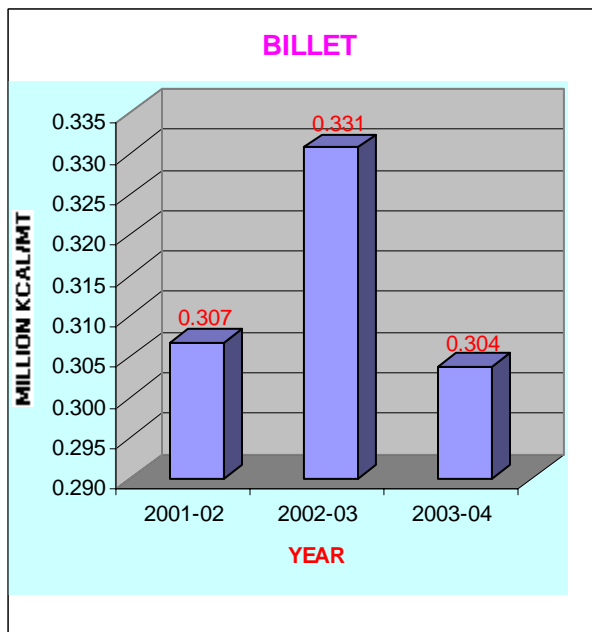
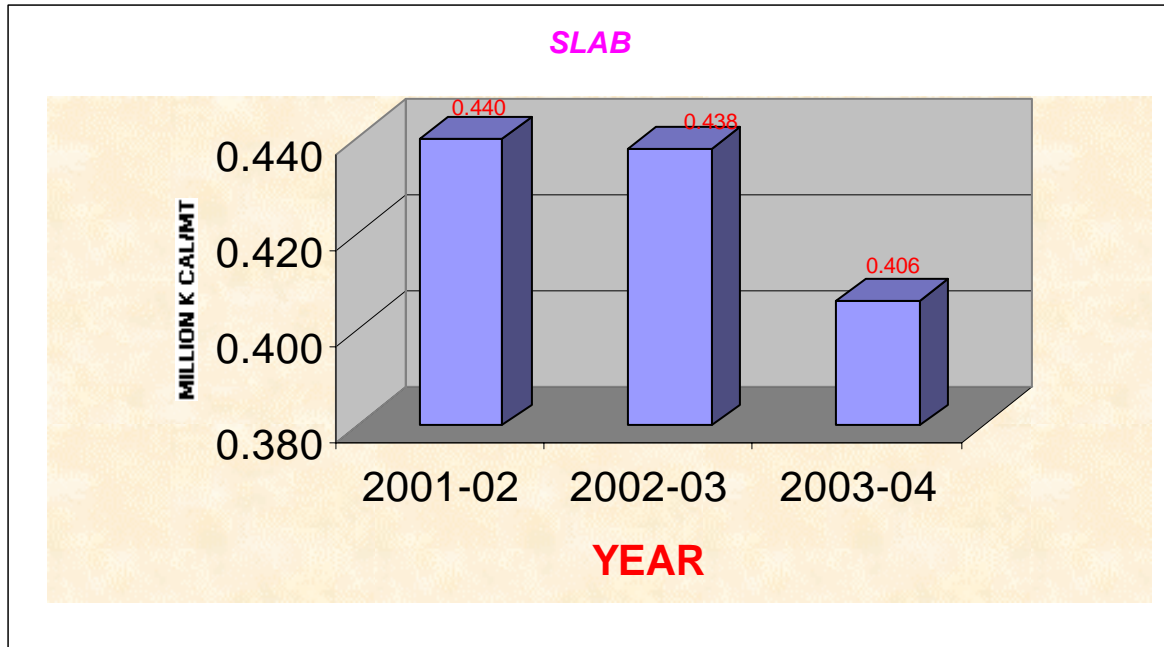
ENERGY CONSUMPTION

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.

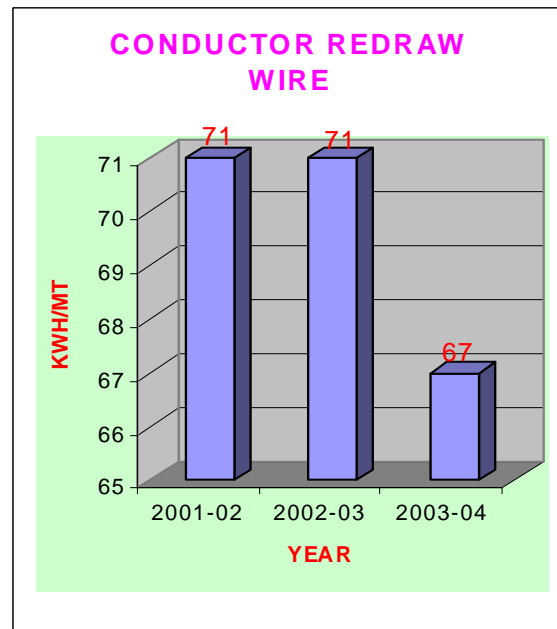
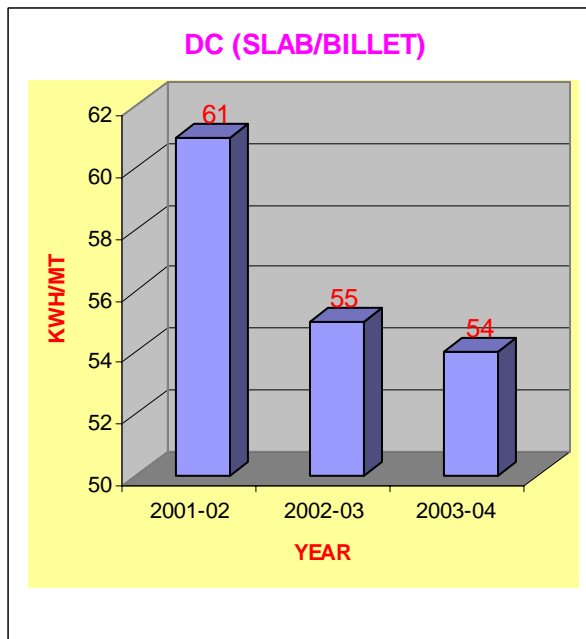
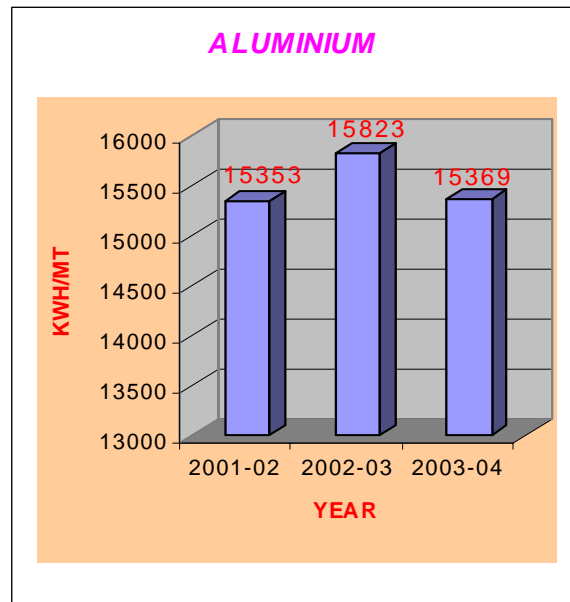
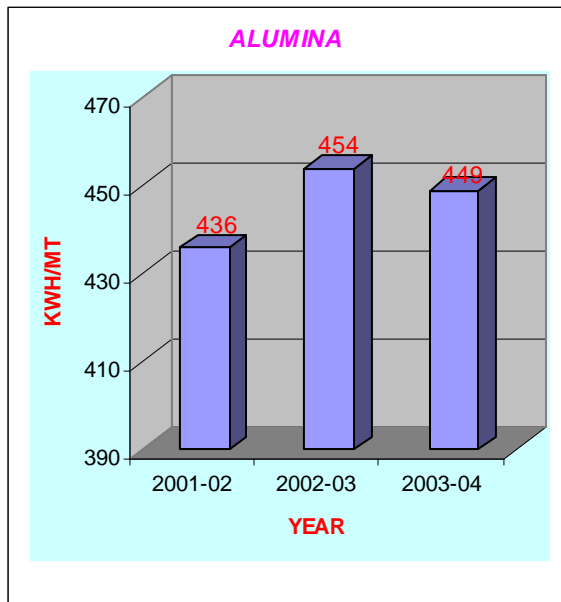
SPECIFIC ENERGY CONSUMPTION (THERMAL) TRENDS



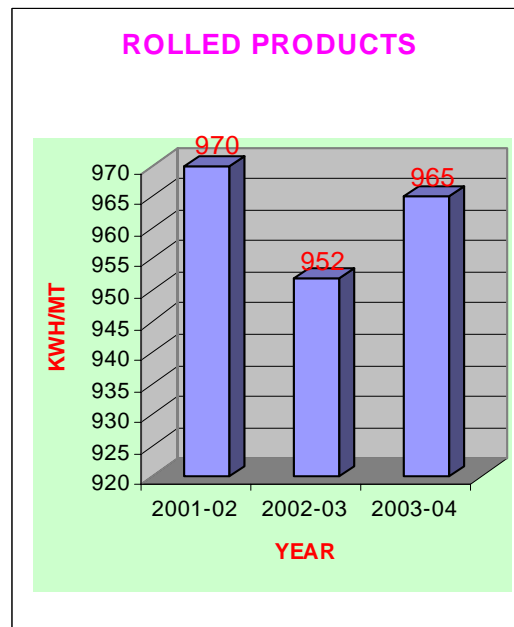
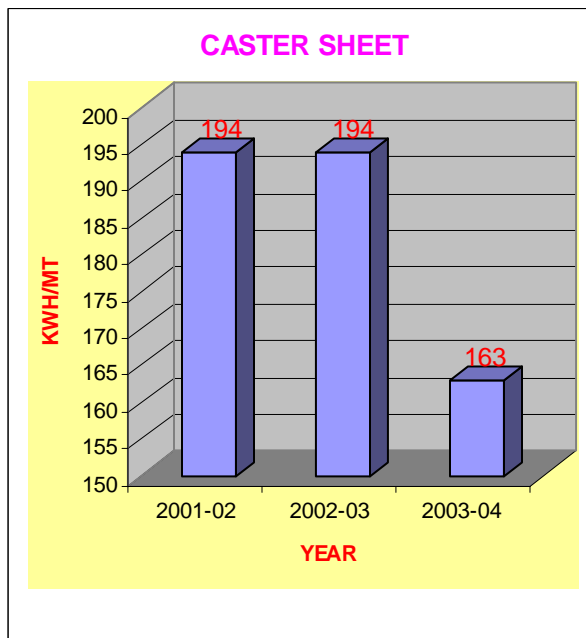
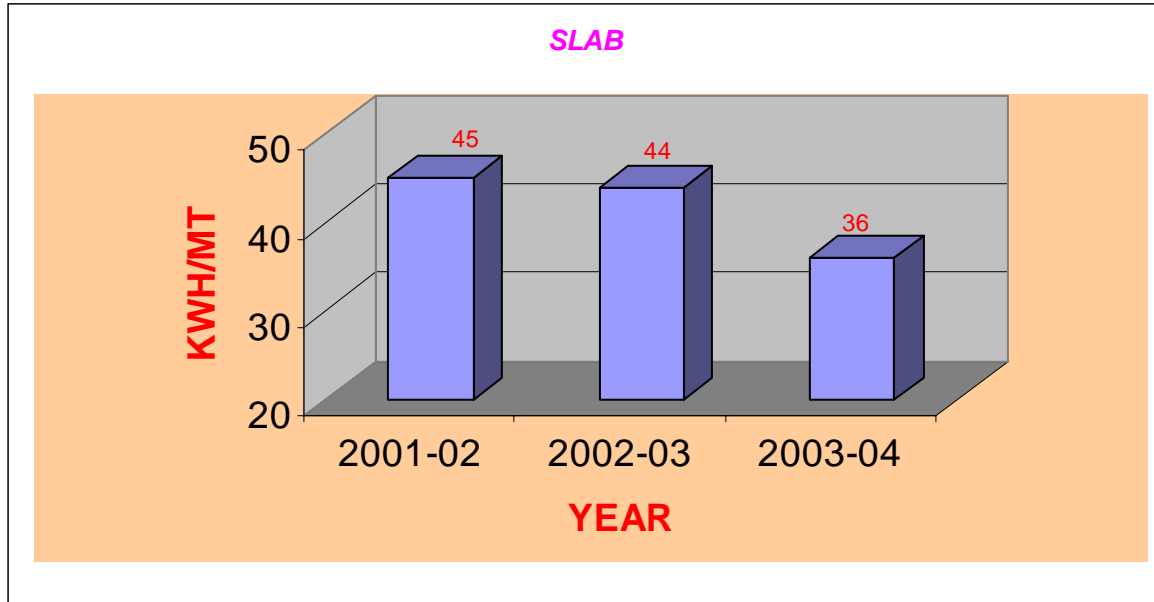
SPECIFIC ENERGY CONSUMPTION (THERMAL) TRENDS



SPECIFIC ENERGY CONSUMPTION (ELECTRICAL) TRENDS



SPECIFIC ENERGY CONSUMPTION (ELECTRICAL) TRENDS



ENERGY CONSERVATION : COMMITMENT, POLICY & 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, which is being followed meticulously across the industry. A copy of the Energy Policy issued by Director (Whole Time) is enclosed. To inculcate awareness on the importance of Energy Conservation not only to the employees of the company but also to the society, company regularly arrange a one week programme on “Energy Conservation Awareness” jointly with PCRA, New Delhi. Company has also arranged “The 2nd Task Force on Energy Conservation Programme on ALUMINIUM sector” by Bureau of Energy Efficiency under Ministry of Power, Government of India. Company has a dedicated Energy Cell who make efforts to identify potential area for energy saving in consultation with department, takes care of latest technological developments in the field of energy conservation and suggests measures for better energy efficiency for implementation in the operating plant as well as in the new projects. They are also responsible to monitor the quantum of energy saved on account of energy conservation initiatives. This commitment has enabled the Company to reduce specific energy consumption on continual basis and thus becoming one of the lowest cost producers in the World.

In line with “Energy Conservation Act -2001” the company has trained three staff of Energy Cell to acquire the certificate for “Certified Energy Manager” awarded by FICCI. The company has further nominated seven Engineers to be certified as Energy Managers/Auditors from NPC. The organization chart of The Energy Management is enclosed.

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. The implementation and initiatives taken in these areas by the Company has played a very positive role for 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. Highly motivated Engineers in association with operational heads have been suggesting various measures for energy conservation on a day to day basis. During 2001-2004 company has implemented 120 measures to improve Energy Efficiency by investing Rs.462.8 Crore which result in saving of energy of Rs. 37.25 Crore/year and also increased production

YEAR	No of Suggestions	ACHIEVEMENTS OF ENERGY SAVING (PER YEAR BASIS)		
		POWER LAC KWH	THERMAL	TOTAL RS. LAC
			THERMAL (M Kcal) F. OIL (KL)	
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 :

ENERGY CONSERVATION PROJECTS

1. ACID SHOOTING FACILITY FOR EVAPORATION I, II & III LIQUOR HEATER

TECHNICAL & 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



2. 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



3. CONVERSION OF EXISTING VANADIUM SLUDGE RECOVERY PROCESS FROM BATCH TO CONTINUOUS

TECHNICAL & FINANCIAL ANALYSIS

HP of motor stopped	= 60
Energy saved due to stoppage of motor	= 60*0.746*0.77*24*355 = 293643 kWh/Year = Rs.4.346 Lakh/Year



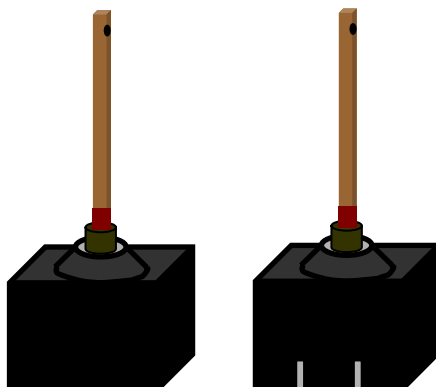
4. DIRECT TRANSFERING OF GOOD CONDENSATE FROM DIGESTION # 1 LIVE STEAM HEATER CONDENSATE POT TO FLASH VESSEL

TECHNICAL & FINANCIAL ANALYSIS

HP of motor stopped	= 5
Energy saved due to stoppage of pump	= $5 \times 0.746 \times 0.8 \times 24 \times 355$
	= 26140 kWh/Year
	= 0.387 Lakh/Year



5. USE OF SLOTTED ANODE IN POTROOM SMELTER



Original anode

Slotted anode

TECHNICAL & FINANCIAL ANALYSIS

As derived from Faraday's law, power consumption for aluminium electrolysis process is:

$$\text{Power consumption (DC KWH/Kg Al)} = \frac{298.06 \times \text{Pot Voltage}}{\text{Current Efficiency (\%)}}$$

Energy saving

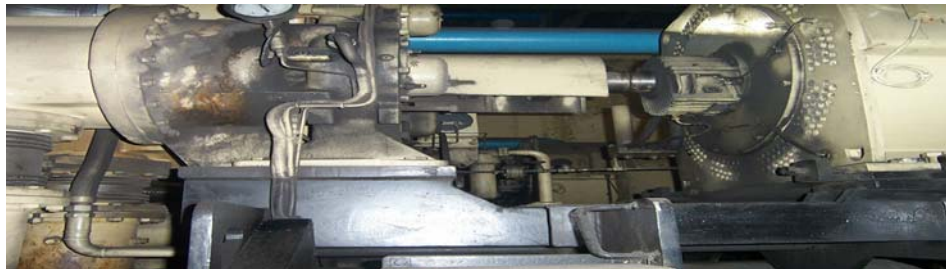
$$\begin{aligned} &= 348 \text{ kWh/T of Aluminum} \\ &= 348 \times 323184 \text{ kWh/Year} \\ &= 112468032 \text{ kWh/Year} \\ &= \text{Rs.}1664.53 \text{ Lakh/Year} \end{aligned}$$

6. INSTALLATION OF ENERGY EFFICIENT CENTRIFUGAL COMPRESSOR IN REDUCTION PLANT-1

TECHNICAL & FINANCIAL ANALYSIS

Actual energy saving achieved

$$\begin{aligned} &= 5760 \text{ kWh/day} \\ &= 5760 \times 350 \text{ kWh/Year} \\ &= 2016000 \text{ kWh/Year} \\ &= \text{Rs.}29.837 \text{ Lakh/Year} \end{aligned}$$



7. STATE OF THE ART BAKE FURNACE FOR ANODE BAKING

FINANCIAL ANALYSIS

Furnace Oil consumption in Old bake furnaces	=72.2 Lt/ TGA
Furnace Oil consumption in Bake Furnace # 5	=68.0 Lt/ TGA
As Bake furnace # 5 produces 40% of anode	
Overall furnace consumption is (72.2*0.6+68*0.4)	=70.5 Lt/T GA
Green anode production per year	=210000 MT

Total furnace Oil saving per year	=357 KL
Price of furnace Oil	=10592.88 Rs./KL
Total Saving per year	=Rs.37.816 Lakh

INVESTMENT MADE	=Rs.118.5 Crore
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8. INTRODUCTION OF VACUUM TAPPING IN PLACE OF OPEN CRUCE SYPHON TAPPING IN POTROOM

TECHNICAL & FINANCIAL ANALYSIS

Reduction in Oil consumption due to reduced temperature drop	=0.8 Lit/MT
Total production of Billet & Slab	= 378 MT/day
Fuel oil Saving (LDO) taking 70% molten metal	= 378*0.8*0.7 KL/Year
	= 211.68 KL/Year
Monetary benefits (Rs in Lakh)	= 211.68*16199
	= Rs.34.290 Lakh/Year
Total production of Properzi, Caster & Pig Casting	= 283.9 MT/day
Fuel oil Saving (FO) taking 85% molten metal	= 283.9*0.8*0.85 KL/Year
	= 193.052 KL/Year
Monetary benefits (Rs in Lakh)	= 193.052*10593
	= Rs.20.450 Lakh/Year
Total fuel oil saved	= 404.732 KL/Year
	= 54.740 Lakh/Year*

<u>INVESTMENT MADE</u>	= Rs.64.20 Lakh
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9. REDUCTION OF IDLE RUNNING OF STRETCHER MACHINE HYDRAULIC MOTOR OF EXT. PRESS # 1 & 3 BY PROVIDING OFF DELAY TIMER

TECHNICAL & FINANCIAL ANALYSIS

No Load current of these two pumps
Energy saving

$$\begin{aligned} &= (22+27) \text{ Amp} \\ &= 1.732 \times 49 \times 415 \times 0.8 \times 1/1000 \\ &= 28.176 \text{ kWh/day} \\ &= 10284 \text{ kWh/Year} \\ &= \text{Rs.0.152 Lakh/Year} \end{aligned}$$



10. REDUCTION IN RUNNING HOURS OF SCRUBBER UNIT OF CONFORM MACHINE.

TECHNICAL & FINANCIAL ANALYSIS

Fan Motor H.P	=10 HP
On Load current	=7.0 Amps
Pump motor H.P	=10 HP
On load Current	=9.0 Amps
Fan motor actual power	= 4.206 kW
Pump motor actual power	= 5.498 kW
Total actual power consumption	= 4.206+5.498 = 9.704 Units
Running hours saved	=12 Hours/day
Energy saved	=9.704*12*240 kWh/Year
	=27947.52 kWh/Year
	=Rs.0.414 Lakh/Year



11. INCREASE IN CHARGE WEIGHT IN SOAKING PIT BY MODIFICATION IN SPACER TO REDUCE THE SPECIFIC ENERGY CONSUMPTION

TECHNICAL & FINANCIAL ANALYSIS

Energy consumption for the period (Apr'03 to Sept'03)	= 221.62 kWh/Mt
MT/Charge for the period (Apr'03 to Sept'03)	= 53.47
Energy consumption for the period (Oct'03 to Mar'04)	= 208.29 kWh/Mt
MT/Charge for the period (Oct'03 to Mar'04)	= 60.50
Total tonnage loaded in the pit in the year 2003-04	= 98528.69 MT
Average load for a month	=8210.72 MT
Reduction in energy with increased no. of slabs	=13.33 kWh/MT
Hence Total energy saving	=109448.90 kWh/month
	= 1313386.8 kWh/Year
	= Rs.19.44 Lakh/Year



12. STOPPAGE OF ONE SCRUBBER UNIT OF CASTER PLANT

TECHNICAL & FINANCIAL ANALYSIS

Operating load of pump & fan of one scrubber	= 8.0 kW
Duration of operation	= 240 Days/Year
Energy saved	= $8 \times 24 \times 240$ kWh/Year
	= 46080 kWh/Year
	= Rs.0.682 Lakh/Year



13. INSTALLATION OF SS PIPE LINE FOR TRANSFER OF HOT DM WATER FOR BOILER # 3.

TECHNICAL & FINANCIAL ANALYSIS

Temp. of make up water for Boiler # 3 after modification	= 81°C
Temp. of make up water for Boiler # 3 before modification	= 62.3 °C
Quantity of make –up water for Boiler # 3	= 64.61 TPH
Duration of Cold DM transfer	= 5.3 Hrs/day
So, gain in thermal energy (64.61*(81-62.3)*1*5.3*1000)	= 6403497 Kcal/day
Enthalpy of Deaerator Steam	= 683000 Kcal/Ton
Gain in term of Steam	= 6403497 / 683000
	= 9.375 Ton / day
Actual steam saving for 355 days	= 3328.125 Ton/Year
Coal consumption	= 0.2229 MT/MT
Coal saved	= 741.839 MT/Year
Cost of Coal	= Rs.1044.195 / Ton
Money saved	= 741.839*1044.195
	= 7.746 Lakh / Year

INVESTMENT MADE

= Rs.3.63 Lakh



OTHER PROJECTS IMPLEMENTED DURING 2003-2004

- Replacement of mercury vapour lamp with sodium vapour lamp
- Replacement of higher wattage tubelight 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 Lac	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	To replace body to body steam traps with condensate pots with LCV for efficient utilization of flash vapours	10.8		May 04 & Jun 06
4	Development of suitable chemical cleaning solvent for slurry heaters scale cleaning in Digestion Unit I.	13.0	Scheme under formulation	May 04 & Jun 07
5	Replacement of 300 nos. filament indication lamps by LED type lamps.	0.15	0.25	2004.05
6	Replacement of 50 nos.non energy efficient light fittings by energy efficient fittings	0.34	1.20	2004-05
7	FCB calciner Bag filter fan Conversion of delta connection motor to star connected configuration	0.25	Nil	2004-05
8	Increase Stub diameter from existing 130 mm to 180 mm to reduce specific energy consumption	1039.0	To be assessed	2004-05 & 2005-06
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	2004-05 & 2005-06
13	TINOR coating of cathodes to reduce specific energy consumption by reduction in Cathode Voltage Drop	346.3	To be assessed	Under trial
14	Reduction in compressed air consumption by modification in point feeder air line circuit in one Pot line.	66.4	123.0	2004-05 & 2005-06
15	Installation of condensate recovery system for pitch melting	40.4	70	Aug-04.
16	Installation of Baling press to reduce the melt loss as well as specific oil consumption in Slab Casting	10.0	121.6	Aug-04.
17	Replacement of 40 watt indication lamps of crane bus bar with 2.5 watt LED in Reduction Plant.	3.20	7.00	2004-05
18	Use of Furnace oil in place of LDO in Slab & Billet casting regenerative type furnaces.	369.33	38.00	2004-05
19	Revamping of two Annealing furnaces for efficiency improvement.	11.78	68.00	2004-05

20	Installation of VFD at Bliss Hot Mill 50 mm Shear machine hydraulic pump motor to save energy.	0.98	4.00	2004-05
21	Installation of VFD at Davy Cold Mill CPT Compressor to save energy.	1.67	3.50	2004-05
22	To reduce the speed of Fume exhaust fan of davy Cold Cold Mill during roll change & Mill stoppage.	0.84	0.00	2004-05
23	To Provide Off delay timer in Tension Leveler Line to avoid the idle running of Feeding Roll DC motor during line run.	0.52	0.00	2004-05
24	To minimize the idle running hours of hydraulic motor of Extrusion Press # 1, 2 & 3 Die ejecting press by providing OFF delay timer.	0.04	0.00	2004-05
25	Optimization of soaking hours of slab in Soaking Pit.	2.20	0.00	2004-05
26	Modifiaction in recuperator of Properzi furnace for better & regular cleaning to improve the effectiveness.	4.06	0.05	2004-05
27	To install on line conductivity meter, Silica meter in DM Plant & CBD flow control operation from control room. For better monitoring of DM water quality.	5.15	17.55	Jun-05
28	Installation of heat exchanger in new DM Plant to reduce the auxiliary steam consumption.	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	2004-05
30	Modification of lighting circuit of 11.5 KV switch house to switch off the light when not in use.	0.89	0.04	2004-05
31	To make full capacity utilization of coal circuit by providing one additional hopper so that the unloading of 10 dumpers at a time can be done inplace of 5 dumpers unloading at a time.	12.02		Sept' 04
32	Installation of Sewage treatment Plant for treating the sewage water of residential water and to use this water for plant process.	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

Hindalco was the first large industry in India and one of the first in the world in Aluminium sector to receive ISO 14001 Certification for its entire process at Renukoot, power plant at Renuagar and Lohardaga Mines. A regular surveillance audit is being carried out every 6 months by Moody International Certification Ltd U.K. apart from the internal audits being carried out quarterly in each department by IEMA qualified auditors. The Company has developed and implemented 560 Operational Control Procedures. It has also successfully completed about 100 Environment Management Programs till March 2003 to achieve its environmental goals. 18 new programmes are still continuing.

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. Green house 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 can 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 Company has been adjudged as the best in Safety in the world by the prestigious International Aluminium Institute (IAI) 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

BRIEF WRITE-UP OF PROJECTS / MEASURES IMPLEMENTED DURING 2003-04

ALUMINA PLANT

1. ACID SHOOTING FACILITY FOR EVAPORATION I, II & III LIQUOR HEATER

BACKGROUND & OBSERVATION

In Evaporation area liquor is heated up to 135°C & subsequently flashed in successive evaporator bodies through calendrias. These heater tubes & calendrias used to be scaled, thereby reducing heat transfer coefficient in turn, performance of the heater & evaporation rate. And this problem aggravated to such an extent that live steam heater tube replacement period has come down to 20 days, which was very short & tight time span for mechanical cleaning crew. Hence, an alternate scheme of chemical cleaning through H₂SO₄ solution is evolved.

This facility doesn't require mechanical cleaning of earlier magnitude. Moreover, due to better cleaning, performance of evaporation improved. Besides above savings we have saved replacement cost of new tube bundle in LSH after every 20 days.

TECHNICAL & 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

INVESTMENT MADE

Spared tank of the process is utilized.

IMPLEMENTATION

Implemented during the financial year 2003-04.

2. REDESIGN OF LINING PATTERN OF REFRACTORY IN FLS CALCINER VESSEL

BACKGROUND & OBSERVATION

Calciner vessels are lined with refractory material to withstand the high temperature, protect the outer metallic shell and to resist the heat passes through wall.

To protect the heat losses through refractory wall, one additional insulating thickness introduced between existing refractory wall and metallic shell without changing the any vessel geometary & sizes resulting surface temperature of vessel reduced to the extent of 10 to 12%.

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

INVESTMENT MADE

= Rs.1.0 Lakh

IMPLEMENTATION

Implemented in PO3 and PO4 Vessel of FLS Calciner.in year 2003-04

3. CONVERSION OF EXISTING VANADIUM SLUDGE RECOVERY PROCESS FROM BATCH TO CONTINUOUS

BACKGROUND & OBSERVATION

Vanadium is a byproduct of Alumina Plant which is recovered from the Bayer's process liquor after recovery of Alumina hydrate. This recovery plant was based on Batch, which consisted small tanks for process liquor cooling with intermediate pumping stations. It was thought to convert the plant from batch to continuous process, which enabled us to eliminate intermediate pumping of the process liquor and thus stoppage of 60 HP motor.

TECHNICAL & FINANCIAL ANALYSIS

HP of motor stopped	= 60
Energy saved due to stoppage of motor	= 60*0.746*0.77*24*355 = 293643 kWh/Year = Rs.4.346 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during the financial year 2003-04.

4. REPLACEMENT OF MERCURY VAPOUR LAMP WITH SODIUM VAPOUR LAMP

BACKGROUND & OBSERVATION

125 Watt mercury vapour lamps have been replaced with 70 Watt sodium vapour lamps in Alumina Plant street light

TECHNICAL & FINANCIAL ANALYSIS

No. of lamps replaced	=20
Average glowing lamps	=11 Hours
Energy saving per lamp	=55 Watt
Annual Energy Saving	= $55*20*11*365/1000$ =4416.50 kWh/Year =Rs.0.0654 Lakh/Year

INVESTMENT MADE

Taken out lamps is being used in other places as replacement against failure hence assuming no investment.

IMPLEMENTATION

Implemented in the financial year 2003-04.

5. REPLACEMENT OF HIGHER WATTAGE TUBE LIGHTS WITH LOWER WATTAGE TUBE LIGHTS IN TOILETS

BACKGROUND & OBSERVATION

All the toilets of Alumina Plant have 36 Watt tube light, which has been replaced with 18 Watt tube light.

TECHNICAL & FINANCIAL ANALYSIS

No. of tube lights replaced	=10
Average glowing lamps	=24 Hours
Energy saving per lamp	=18 Watt
Annual Energy Saving	= $18*10*24*365/1000$ =1576.80 kWh/Year =Rs.0.0233 Lakh/Year

INVESTMENT MADE

= Rs.0.08 Lakh

IMPLEMENTATION

Implemented in the financial year 2003-04.

6. REPLACEMENT OF HIGHER WATTAGE EXHAUST FANS WITH LOWER WATTAGE EXHAUST FANS IN TOILETS

BACKGROUND & OBSERVATION

Most of the toilets of Alumina Plant have 85 Watt, 15/18" Exhaust fan , which has been replaced with 45 Watt, 9" Exhaust Fan.

TECHNICAL & FINANCIAL ANALYSIS

No. Exhaust fan replaced	= 15
Average glowing lamps	= 24 Hours
Energy saving per lamp	= 40 Watt
Annual Energy Saving	= $40 \times 15 \times 24 \times 365 / 1000$
	= 5256 kWh/Year
	= Rs.0.0778 Lakh/Year

INVESTMENT MADE

= Rs.0.22 Lakh

IMPLEMENTATION

Implemented in the financial year 2003-04.

7. INSTALLATION OF CAPACITOR BANK IN ALUMINA PLANT MCC FEEDERS

BACKGROUND

In the recently completed brown field expansion of alumina refinery a substantial quantity of higher KW rating motors driven through variable frequency drives have been installed on existing transformer feeders. Many of these feeders had capacitor banks installed for power factor correction. Addition of VFD loads on these feeders have rendered the capacitor banks redundant due to following reasons:

Power factor of VFD's is almost unity and doesn't need power factor correction. Harmonics generation due to resonance effect with capacitor banks.

It was therefore decided to re-use these capacitor banks on feeders having

Mostly DOL loads

Long feeder cables

No power factor correcting devices.

Following 5 nos. MCC's were selected for providing capacitor banks based on above criteria

I- Dig-II Emergency MCC

II- Hammer Mill # 7 MCC

III -Ball Mill # 6 MCC –ml-412001/412002

IV- Tippler MCC # ML-411002

V-New Drum filter MCC # 1,2,3,4

TECHNICAL & FINANCIAL ANALYSIS

Cable losses before installation of Capacitor bank	=19.4 kW
Cable losses after installation of Capacitor bank	=14.3 kW
Saving due to reduction in losses	=5.10kW
	= $5.10 \times 24 \times 365$
	=44676 kWh/Year
	=Rs.0.661 Lakh/Year

INVESTMENT MADE

Taken-out capacitors have been utilized.

IMPLEMENTATION

Implemented in the financial year 2003-04.

8. REPLACEMENT OF HIGHER RATING (150HP) MOTOR WITH LOWER RATING (100HP) MOTOR

BACKGROUND & OBSERVATION

During the measurement of loading of motors it was found that motor of Ball Mill # 5 primary Cyclone Pump is less than 50%. Hence it decided to replace the motor with lower rating available motor to reduce the Iron Losses.

TECHNICAL & FINANCIAL ANALYSIS

Original Motor HP:	= 150 (110 KW)
Taking motor iron losses as 2 % of rated kW	= 0.02 * (110- 75)
Reduction in iron losses	= 700 WATTS
	=0.7*24*350 kWh/Year
	=5880 kWh/Year
	=Rs.0.0870 Lakh/Year

INVESTMENT MADE

Available 100 HP motor is utilized.

IMPLEMENTATION

Implemented in the financial year 2003-04.

9. REPLACEMENT OF 20 HP VENTILATION FAN WITH 85 WATT EXHAUST FAN

BACKGROUND & OBSERVATION

In Clarification A series MCC, ventilation fan having 20 HP motor is used to run continuously. This ventilation has been replaced with 85 Watt exhaust fan.

TECHNICAL & FINANCIAL ANALYSIS

Power consumption with ventilation fan	=20*0.746*0.60*24*365
	=78419.5 kWh/Year
Power consumption with exhaust fan	=85*24*365/1000
	=744.6 kWh/year
Energy saving	=77675 kWh/Year
	=Rs.1.149 Lakh/Year

INVESTMENT MADE

=Rs.0.015 Lac

IMPLEMENTATION

Implemented in the financial year 2003-04.

10. REPLACEMENT OF 25 HP VENTILATION FAN WITH 85 WATT EXHAUST FAN

BACKGROUND & OBSERVATION

In Old Precipitation MCC, ventilation fan having 25 HP motor is used to run continuously. This ventilation has been replaced with 85 Watt exhaust fan.

TECHNICAL & FINANCIAL ANALYSIS

Power consumption with ventilation fan	= $25 \times 0.746 \times 0.60 \times 24 \times 365$ =98024.4 kWh/Year
Power consumption with exhaust fan	= $85 \times 24 \times 365 / 1000$ =744.6 kWh/year
Energy saving	=97280 kWh/Year =Rs.1.439 Lakh/Year

INVESTMENT MADE

=Rs.0.015 Lac

IMPLEMENTATION

Implemented in the financial year 2003-04.

11. STOPPAGE OF DUPLICATE EQUIPMENT RUNNING

BACKGROUND & OBSERVATION

Homo liquor pumps of Evaporation –III are used for pumping caustic from Homo liquor tanks to Digestion area test tanks. The maximum requirement of caustic flow is 720 m3/hour. Each pump is rated for 733 m3/hour, which is sufficient for meeting process requirements. But due to some process bottlenecks both pumps used to run continuously. This was resulting in higher energy consumption due to:

- Under capacity loading of pumps
- Under loading of motors

After removing process bottleneck only single pump is running. Power measurements taken with both pump running and single pump running (as tabulated below).

EQUIPMENT	MOTOR RATED KW	ACTUAL RUNNING LOAD (1 pump running)	ACTUAL RUNNING LOAD (2 pumps running)
Homo liquor pump (N)	110	85	54
Homo liquor pump (S)	110	86	56
	TOTAL	85.5	110

TECHNICAL & FINANCIAL ANALYSIS

Power consumption with both running	=110*24*350 kWh/Year
	=924000 kWh/Year
Power consumption with one running	=85.5*24*350 kWh/Year
	=718200 kWh/Year
Energy saving	=205800 kWh/Year
	=Rs.3.046 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented in the financial year 2003-04.

12. REPLACEMENT OF 10 W INCANDESCENT TYPE INDICATION LAMP WITH LED

BACKGROUND & OBSERVATION

In Alumina Plant there are number of control panels on which 10 Watt filament type indication lamp are provided. These indication lamps have been replaced with 2 watt LED to save the energy.

TECHNICAL & FINANCIAL ANALYSIS

No of Lamps replaced	=200
Power consumption with Incandescent lamp	=200*10*12*365/1000
	=8760 kWh/Year
Power consumption with LED	=200*2*12*365/1000
	=1752 kWh/Year
Energy saving	=7008 kWh/Year
	=Rs.0.104 Lakh/Year

INVESTMENT MADE

=Rs.0.16 Lac

IMPLEMENTATION

Implemented in the financial year 2003-04.

13. DIRECT TRANSFERING OF GOOD CONDENSATE FROM DIGESTION # 1 LIVE STEAM HEATER CONDENSATE POT TO FLASH VESSEL

BACKGROUND & OBSERVATION

Indirect steam heaters condensate disposal pump was used to pump high temperature condensate from the heater to Condensate flash vessels. It was stopped because of the high pressure profile of the condensate itself, which did not require any pumping station for transferring condensate to flash vessel.

Stoppage of pump resulting in elimination of 5 HP motor running

TECHNICAL & FINANCIAL ANALYSIS

HP of motor stopped	= 5
Energy saved due to stoppage of pump	= $5 \times 0.746 \times 0.8 \times 24 \times 355$
	= 26140 kWh/Year
	= 0.387 Lakh/Year

INVESTMENT MADE = NIL

IMPLEMENTATION

Implemented in the financial year 2003-04.

REDUCTION PLANT

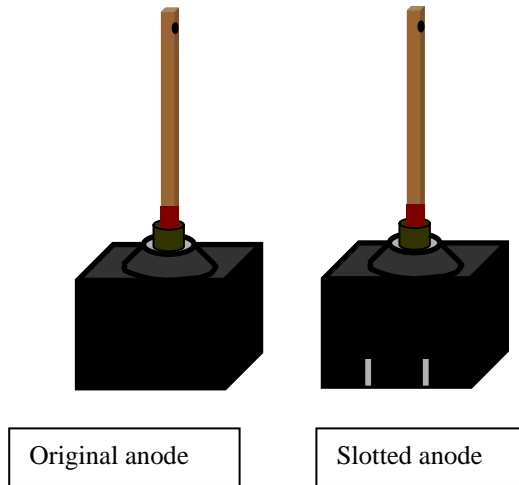
1. USE OF SLOTTED ANODE IN POTROOM SMELTER

BACKGROUND & OBSERVATION

The electrolytic production of aluminium in Hall - Herault cells is energy –intensive process accounting for nearly 40 % of aluminium production cost. Reduction in energy consumption can be achieved in two ways: improvement in current efficiency & reduction in cell voltage. The latter has the greater potential; since current efficiency in modern cells has already exceeded 94 %, while actual cell voltage exceed the thermodynamic minimum of 1.60 V by almost a factor of 3 due to ohmic voltage drops.

The largest part of the cell voltage is a voltage drop of about 2.0 V caused by passage of current through the molten electrolyte between the carbon anode and the metal pool which is essentially the cathode. This anode-to-cathode distance (ACD) is around 4.5-5 cms. Reducing this ACD, to reduce voltage thereby decreasing energy consumption is not adopted in practice because of the danger of loosing stability & workability of cell and current efficiency. As the voltage drop across the ACD depends upon bath resistivity & bubble resistance, other better idea to reduce pot voltage is reduction in bubble resistance.

We had the concept in mind that slots in bottom of anodes can reduce the bubble resistance but no actual trials were conducted till 1999. Configuration of slots was also not very clear, but we took initiative and decided to conduct few experiments. Earlier we started with 2 slots of height only 10 Cm along the width of anodes. Making slots was also a problem, we could create slots in few anodes manually and started experiment on 2 pots. Results were encouraging and slot height increased to 12 Cm. Later we managed to produce such anodes through Anode Hydraulic Presses by putting two plates of required slot dimension and started experiment in 18 pots, and slowly lowered the pot voltage. We operated these pots for around 2 years and established saving of 146 units/MT Al. We wanted to make slots along the length but it was not possible with Anode Hydraulic Presses and anode rejections were also very high with Anode Presses. Paste Plant modernization was under process by that time, so we made necessary changes in specifications of Vibratory Former to facilitate production of slotted anodes (along the length). On commissioning of Vibratory Former (Aug-03) we produced anodes with slots along the length and mass implemented their use in all the pots of 11 potlines. Pot voltage reduced from 4.495 (Oct-03) to as low as 4.388 (Mar-04).



TECHNICAL & FINANCIAL ANALYSIS

As derived from Faraday’s law, power consumption for aluminium electrolysis process is:

Power consumption (DC KWH/Kg Al) -	$\frac{298.06 \times \text{Pot Voltage}}{\text{Current Efficiency (\%)}}$
Energy saving	=348 kWh/T of Aluminum =348*323184 kWh/Year =112468032 kWh/Year =Rs.1664.53 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

2. INSTALLATION OF ENERGY EFFICIENT CENTRIFUGAL COMPRESSOR IN REDUCTION PLANT-1

BACKGROUND & OBSERVATION

Compressed air is used in Reduction plant for performing the different operation like tapping of molten metal, operating pneumatic cylinders of point feeder etc. To meet the compressed air requirement in Reduction Plant, numbers of reciprocating compressors are installed. Keeping in energy saving objective in the mind, two energy efficient centrifugal compressors of 6000 cfm capacity each were installed in last year.

TECHNICAL & FINANCIAL ANALYSIS

Actual energy saving achieved =5760 kWh/day
=5760*350 kWh/Year
=2016000 kWh/Year
=Rs.29.837 Lakh/Year

INVESTMENT MADE

=Rs.136.00 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

3. STATE OF THE ART BAKE FURNACE FOR ANODE BAKING

BACKGROUND & OBSERVATION

Hindalco Smelter has prebaked anode technology to produce 3,45,000 MT Aluminum from its available 2068 pot. Each pot has 24 / 26 prebaked anodes having a life of 25 days. Effectively, almost one anode is replaced in each pot every day. For optimum smelter operation it is mandatory that all anodes have identical properties in its green as well as, baked stage. Besides the control of green anode quality it is necessary to ensure that all anodes obtain the same heat treatment in a well-designed bake furnace

Baking of anode is the most expensive step in anode production process and requires a well designed horizontal Flue Ring Type Bake Furnace (also called 'OPEN TOP' furnace). Automatic firing control system is a prerequisite for optimum bake furnace operation. Achieving optimum heat transfer conditions results in the best possible anode quality with lowest cost, lowest energy consumption and minimum environment impact.

Subsequent to the Management decision for Brown field expansion of smelter, to increase aluminium production capacity by adding pot lines IX, X & XI it was realized that the present capacity of four bake furnaces was not sufficient to meet the increased demand of baked anodes. Hindalco entered into technology transfer agreement with Alcan Alesa Engineering Ltd. for acquiring a state of the art Bake Furnace # 5 & Bake Furnace control system (BPS) from R & D Carbon Ltd. The installation of new furnace reduced the fuel energy consumption below 3 GJ / T (Oil consumption 68 lts/T of GA) and increased the annual anode output by additional 289080 Baked Anodes with a total investment of Rs.118.5 Crores.

The Bake Furnace # 5 includes automatic firing system which has PLC based processor hardware of ALLAN-BRADELY, Conveyor transfer system, FTA & Stacker Crane, Baked Anode Cleaning Equipment, Fume Treatment Plant (FTP) besides Multi Purpose Machine – ECL Crane for loading & unloading of anodes, fire displacement, handling of packing coke for interlayer packing and suction at the time of un-packing the baking pits.

FINANCIAL ANALYSIS

Furnace Oil consumption in Old bake furnaces =72.2 Lt/ TGA
Furnace Oil consumption in Bake Furnace # 5 =68.0 Lt/ TGA
As Bake furnace # 5 produces 40% of anode
Overall furnace consumption is $(72.2*0.6+68*0.4)$ =70.5 Lt/T GA
Green anode production per year =210000 MT
Total furnace Oil saving per year =357 KL
Price of furnace Oil =10592.88 Rs./KL
Total Saving per year =Rs.37.816 Lakh

INVESTMENT MADE

=Rs.118.5 Crore

IMPLEMENTATION

The start up of Bake Furnace # 5 with an initial firing of fire # 1 & 2 commenced on Sept. 10, 2003.

4. INTRODUCTION OF VACUUM TAPPING IN PLACE OF OPEN CRUCE SYPHON TAPPING IN POTROOM

BACKGROUND & OBSERVATION

Metal produced in pots is tapped at regular intervals. Tapped metal is supplied to cast houses for Slab & Billet casting in molten form. Earlier, metal used to be tapped in open cruces with siphons. Radiation losses from open cruces results in temperature loss. To reduce the heat losses from open cruces and safe working, Vacuum tapping in close cruces is introduced, and implemented gradually in all pot lines.

Vacuum tapping resulted in reduction in temperature loss by around 45°C and hence reduction in fuel oil consumption in all fuel fired furnaces of Cast houses and Fabrication Plant.

TECHNICAL & FINANCIAL ANALYSIS

Reduction in Oil consumption due to reduced temperature drop	=0.8 Lit/MT
Total production of Billet & Slab	= 378 MT/day
Fuel oil Saving (LDO) taking 70% molten metal	= 378*0.8*0.7 KL/Year
	= 211.68 KL/Year
Monetary benefits (Rs in Lakh)	= 211.68*16199
	= Rs.34.290 Lakh/Year
Total production of Properzi, Caster & Pig Casting	= 283.9 MT/day
Fuel oil Saving (FO) taking 85% molten metal	= 283.9*0.8*0.85 KL/Year
	= 193.052 KL/Year
Monetary benefits (Rs in Lakh)	= 193.052*10593
	= Rs.20.450 Lakh/Year
Total fuel oil saved	= 404.732 KL/Year
	= 54.740 Lakh/Year*

INVESTMENT MADE

= Rs.64.20 Lakh

IMPLEMENTATION

Completed in all Pot lines during Sep-03

***In addition there will be reduction in dross formation, which can well compensate the maintenance expenses**

5. INSTALLATION OF SCRAP CHARGING MACHINE IN SLAB CASTING

BACKGROUND & OBSERVATION

Scrap charging machine has been installed for charging of scrap inside the furnace, which was previously being done through scrap table and forklift with pusher tool. The charging time has reduced by 15 minutes (from an average of 25 minutes to 10 minutes) and the burners, which were kept in operation during charging through forklift to maintain the furnace temperature, are now being stopped since the temperature drop during charging through charging machine is only 6 °C. This has resulted in saving of melt loss of 0.15 % on input solids and reduction of fuel oil (LDO) by 1 litre per ton.

TECHNICAL & FINANCIAL ANALYSIS

LDO saving by installation of Scrap Charging Machine	=1 Lt/MT
Slabs Production	=287 MT/day
Total Oil saving per year	=104.8 KL
Price of LDO	=Rs.16199.278 /KL
Total Saving per year	=Rs.16.977 Lakh

INVESTMENT MADE

=138.8 Lakh

IMPLEMENTATION

Commissioned during March-04

6. IMPROVEMENT IN CUTTING RECOVERY BY REDUCTION OF RAMP PORTION DURING CASTING

BACKGROUND & OBSERVATION

In Billet Casting when the billets are cast, start parameters are kept varying for certain time to produce a strong base for smooth casting. This length to which the casting parameters are varied is known as ramp and during cutting we have to cut the ramp portion and scrap it. To increase our cutting yield we have decided to work on reduction of this ramp portion. Reduction in ramp portion has led to an improvement of 1.1% in cutting recovery.

TECHNICAL & FINANCIAL ANALYSIS

Improved recovery leads to less scrap and thus	
Oil saving due to less solids melting	= 0.5 Lit/MT
Billet production	= 33215 MT/Year
Total oil saved (LDO)	= 16.6 KL/Year
	=Rs2.689Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

The change was incorporated in the month of May'03 with a view to save valuable metal from being scrap and reduce oil in melting the same.

7. INSTALLATION OF ELECTRONIC LOAD CELL IN METAL POURING MACHINE OF BILLET CASTING

BACKGROUND & OBSERVATION

Molten aluminum is poured into the furnaces of Billet Casting with the help of metal pouring machine. It is required to weigh the metal being poured into the furnaces but the weighing scale being situated 50 meters away causing temperature loss during transportation. To reduce this non-value adding activity it was planned to install load cells in the pouring machine itself. This modification has reduced cruce handling time by 50% (From 17 mins to 9 mins)

TECHNICAL & FINANCIAL ANALYSIS

Reduced temperature drop leads to savings in oil consumption	= 0.3 Lit/MT
Billet production	= 33215 MT/Year
Total fuel (LDO) saved	= 10.0 KL/Year
	= Rs.1.619 Lakh/Year

INVESTMENT MADE

= Rs 5.9 Lacs

IPLEMENTATION

Load cells were installed in the pouring machine in Apr'03 and have reduced cruce handling time leading to less temperature drop of molten metal.

8. STOPPAGE OF IDLE RUNNING OF SHOT BLAST MACHINE

BACKGROUND & OBSERVATION

In Butt & Rod cleaner machine's, blasting in blasting chamber occurs due to sensing of carriers by limit switch causing unnecessary blasting during passing of the empty carriers. To avoid the idle running of the blasting machine, location of the sensing device has been changed so that the blasting will occur only when the copper rod assemblies are loaded.

TECHNICAL & FINANCIAL ANALYSIS

Load of blasting machine	=23 kW
Empty Carrier passing	=200/day
Time to process these carriers	=2.2 Hours
Energy Saved	=23*2.2*365 kWh/Year
	=18469 kWh/Year
	= Rs.0.273 Lakh/Year
	= NIL

INVESTMENT MADE

IMPLEMENTATION

Implemented in Aug' 2003.

9. STOPPAGE OF IDLE RUNNING OF CONVEYORS, ID FAN & ROTARY AIR LOCK IN POTROOM PLANT-2

BACKGROUND & OBSERVATION

In Pot room, at each silo top Conveyor & dust collection system are used to convey the alumina powder and suck the alumina dust during conveyor run. 8 conveyors are used from line # 4 to line 11 for feeding the alumina in the respective Pot line silo. As the belt conveyors are on height causing continuous run of the entire conveyor, ID Fan & rotary air lock even if no alumina feeding is done in onward lines.

By doing automation by installing the PLC in the alumina conveying system, the idle time of the conveyor and dust collection system are reduced. The complete alumina conveying system is visible on SCADA (in one PC) and many types of alarms developed for close monitoring and interlocks to reduce equipment idle running.

TECHNICAL & FINANCIAL ANALYSIS

Connected loads and running hours of system is given in following table: -

Sl No	Area	Actual KW of conveyor motor	Actual KW of Dust collector fan motor	Actual KW of RAL motor	Total actual KW	Running hours before automation	Running hours after automation	Running hours saved per day	Energy saved per day (kWH)
1	Potline-4	14.7			14.7	24	24	0	0.00
2	Potline-5	4.4	5.9	0.3	10.6	24	21	3	31.8
2	Potline-6	4.4	8.8	0.3	13.5	24	18	6	81.0
4	Potline-7	4.4	5.9	0.4	10.7	24	15	9	96.3
5	Potline-8	4.4	5.9	0.4	10.7	24	12	12	128.4
6	Potline-9	7.4	5.9	0.3	13.6	20	9	11	149.6
7	Potline-10	7.4	14.7	0.3	22.4	20	6	14	313.6
8	Potline-11	7.4	5.9	0.3	13.6	20	3	17	231.2
	Total								1031.9

Energy saved

=1031.90 kWh/Day
 =1031.90*365 kWh/Year
 =376643.50 kWh/Year
 =Rs.5.574 Lakh/Year

INVESTMENT MADE

=Rs.60.00 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

10. REDUCTION IN 'ON' TIME OF ELECTRICAL FURNACE OF LAB

BACKGROUND & OBSERVATION

In our Chemical Lab, electrical heating furnaces are used to heat the samples for chemical analysis. All the analysis is performed during general shift. Minimum 2 hours is required to get the required temperature in furnaces. Hence the furnaces were being kept on during night also so that the during next day morning analysis can be started without delay.

Now the timer has been provide in control system of two furnaces of 5 kW & 3.5 kW rating to put ON the furnace at 6 AM and put off at 6 PM to save the energy.

TECHNICAL & FINANCIAL ANALYSIS

Idle ON time of furnaces	=12 Hours
Effective ON time of the furnace as there is thermostat is provided	=6 Hours
Power consumption in the furnace	=(5+3.5) kW
Energy saved after installation of timer	=8.5*6*365 kWh/Year
	=18615 kWh/Year
	=Rs.0.276 Lakh/Year

INVESTMENT MADE

= Rs.0.05 Lakh

IMPLEMENTATION

Implemented in Feb 04.

11. CONNECTION OF ALUMINA CONVEYING AIR SLIDE WITH POT AIR SLIDE FAN IN POT LINE # 4

BACKGROUND & OBSERVATION

3 Blowers of 5 HP are continuously running for fresh & enrich alumina conveying through air slide in DSS line-4 (Phase-I, Phase-II & Pilot plant).

After monitoring the parameter It is found that there is scope of for adding the additional load on Pot air slide fan of line # 4. Hence all the alumna conveying air slides has been connected with Pot air slide fan in place of 3 blower, which were running continuously.

TECHNICAL & FINANCIAL ANALYSIS

Blowers stopped	=3
Motor HP of removed blower	=5 HP
Power saved	=5*0.746*3*0.8 kW
	=8.952 kW
	=8.952*24*365 kWh/Year
	=78419.52 kWh/Year
	=Rs.1.161 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented in April 03.

12. REPLACEMENT OF 75 HP MOTOR WITH 60 HP MOTOR IN POT LINE # 9

BACKGROUND & OBSERVATION

During internal audit it was found that two motor of 75 HP of filter fluidization blower & air slide blower in Pot line –9 is under loaded. Hence these two higher rated motor have been replaced with in house spare 60 HP Motor.

TECHNICAL & FINANCIAL ANALYSIS

Actual drawing current of 75 HP motor	=78 Amp
Actual drawing current of 60 HP motor	=67 Amp
Voltage	=415 Volt
Power factor	=0.8
Energy saved	= $1.732 \times 415 \times (78-67) \times 0.8 / 1000$ kW
	=6.325 kW
	= $6.325 \times 24 \times 365$ kWh/Year
	=55407 kWh/Year
	=Rs.0.820 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

13. REPLACEMENT OF 250 WATT MV LAMP WITH 125 & 150 WATT SODIUM LAMP

BACKGROUND & OBSERVATION

In the Paste plant most of the roof light have 250 Watt MV lamp. These lamp have been replaced with 150 Watt & 125 Watt son lamp.

TECHNICAL & FINANCIAL ANALYSIS

No of MV Lamp replaced	=50
Wattage of MV lamp	=250
Total wattage of MV lamp	= 250×50
Installed son lamp wattage	= $(26 \times 150 + 24 \times 125)$
Energy saved	= $(12500 - 6900)$ Watt
	= $5600 \times 24 \times 365 / 1000$ kWh/Year
	=49056 kWh/Year
	=Rs.0.726 Lakh/Year

INVESTMENT MADE

Taken out lamps is being used in other places as replacement against failure hence assuming no investment.

IMPLEMENTATION

Implemented during financial year 2003-04.

14. OPTIMIZATION OF ROOF LIGHT ON TIME OF POT LINE # 9 TO 11

BACKGROUND & OBSERVATION

Pot line # 9,10 and 11 Pot room roof lights were switched 'ON/OFF' in manual/auto only from MCC. During red cell checking in B/ C shift and cloudy whether, these lights were controlled from MCC by doing manual/ auto switch to manual. This was not normalized later, after being proper illumination.

Modified the control circuit of Pot line # 9, 10 and 11 Pot room roof lights and provided toggle switches on offices wall for easiness in approach of operation personal. There is expected saving of approximate 1 hour daily in roof light glow time.

TECHNICAL & FINANCIAL ANALYSIS

Connected roof lighting load in Pot line # 9 to 11	=183.36 kW
Expected reduction glowing of lamps	=1 hour/day
Energy saving	=183.36*1*365 kWh/Year =66926 kWh/Year =Rs.0.991 Lakh/Year

INVESTMENT MADE

= Rs.0.05 Lakh

IMPLEMENTATION

Implemented in Dec' 2003.

15. INSTALLATION OF CAPACITOR BANK IN THE POWER CIRCUIT OF SPRAY WATER PUMP TO IMPROVE THE POWER FACTOR

BACKGROUND & OBSERVATION

After providing the capacitor bank in the power circuit of spray water pump has improved the power factor to 0.987 from 0.893.

TECHNICAL & FINANCIAL ANALYSIS

Energy consumption before implementation

Voltage	=415 Volt
Current	=157 Amp
Power factor	=0.893
Energy consumption	=1.732*415*157*0.893*10 WH/Day =1007.74 kWh/Day =1007.74*245 kWh/Day =246896 kWh/Year

Energy consumption after implementation	
Voltage	=415 Volt
Current	=139 Amp
Power factor	=0.987
Energy consumption	=1.732*415*139*0.987*10 WH/Day
	=986.12 kWh/Day
	=986.12*245 kWh/Day
	=241598 kWh/Year
Energy saved	=(246896-241598) kWh/Year
	=5298 kWh/Year
	=Rs.0.0784 Lakh/Year

INVESTMENT MADE

Spare capacitor bank taken out from disposed off equipment has been utilized.

IMPLEMENTATION

Implemented in March' 2004.

16. MODIFICATION IN THE SLAB CUTTING MACHINE LAYOUT TO REDUCE THE CYCLE TIME

BACKGROUND & OBSERVATION

The butt end of slab ingots has to be cut by slab cutting machine before sending it to our internal customer Rolling Mill. The slab cutting machine was running at its rated capacity (72 slab's cut / day).

As we have seen that the capacity of slab cutting machine to cut slabs was only 72 slabs/day, whereas capacity of our casting system is to produce 120 slabs/day. At the same time customer requirement is continuously increasing (more than 72 slabs/day) and keeping in view of future increase in demand, it became necessary to increase the productivity of slab cutting machine or purchase a new slab cutting machine.

Therefore we have decided to change the layout the cutting machine to reduce the cycle time. This has resulted reduction in cycle time by 40%.

TECHNICAL & FINANCIAL ANALYSIS

Reduction in movement of work table	=6 Min/Cycle
No of slab cutting	=72 slab/day
Running of work table motor saved	=72*6 Min/Day
Power consumption by motor of work table	=10*0.746*0.8 kW
Energy saved	=42.9696 kWh/Day
	=42.9696*365 kWh/Year
	=15684 kWh/Year
	=Rs.0.232 Lakh/Year

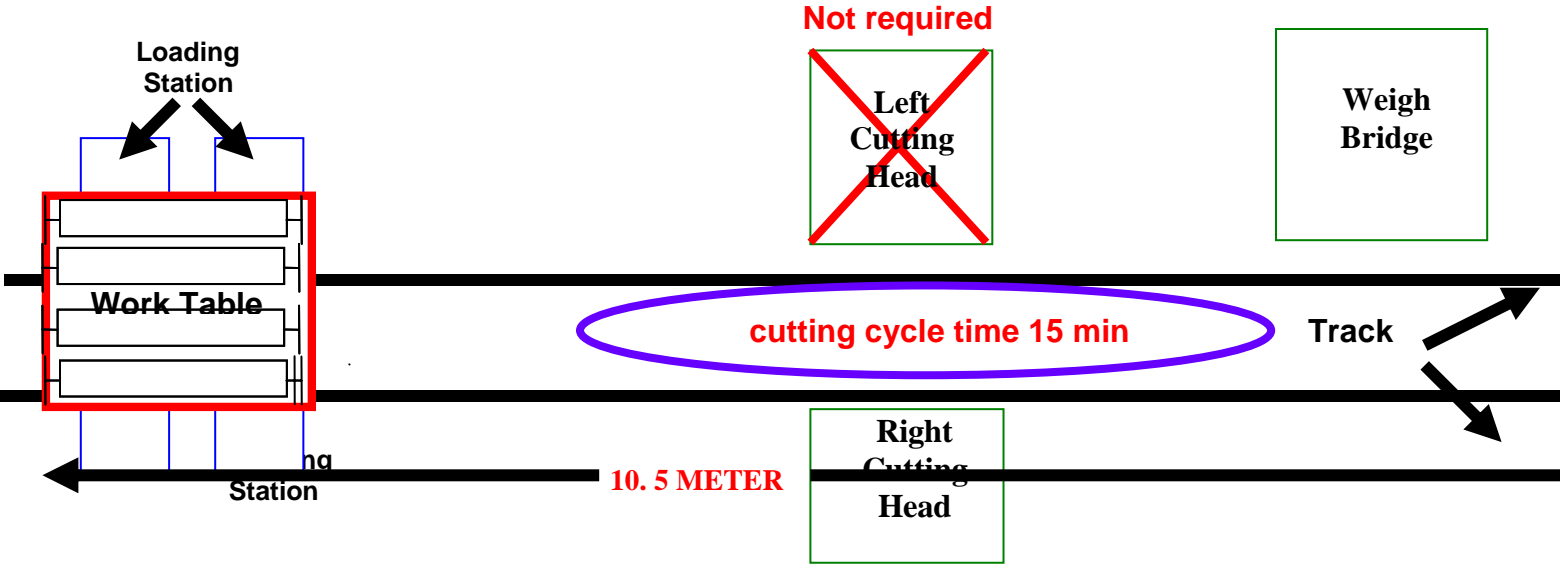
INVESTMENT MADE

=Rs.0.45 Lac

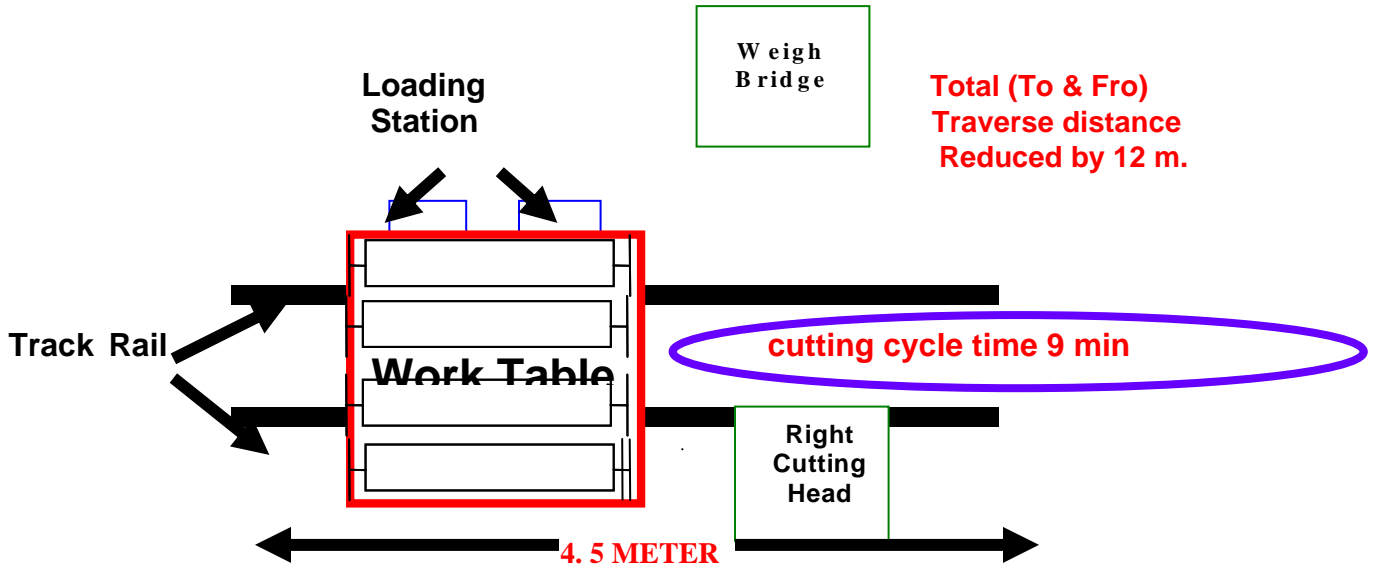
IMPLEMENTATION

Implemented in July' 03.

BEFORE CHANGE IN LAYOUT



AFTER MODIFIATION



17. CONNECTION OF WATER SPRAY SYSTEM OF POT LINE # 9 TO 11 WITH THE WATER SPRAY SYSTEM OF POT LINE # 4 TO 8.

BACKGROUND & OBSERVATION

Water spray system is used to cool the atmosphere of pot room area for which two separate pump of 120 kW are installed, one for line 4 to 8 and second for line 9 to 11. These pumps were running during whole summer season for nearly 1150 hours in year.

To save the energy pipe line of the systems have been connected and one pump totally stopped.

FINANCIAL ANALYSIS

Power consumption with stopped pump	=120 kW
Power consumption assuming 60% loading	=120*0.6
	=72 kW
Yearly running of the pump	=1150 Hours/Year
Annual energy saving	=1150*72 kWh/Year
	=82800 kWh/Year
	=Rs.1.225 Lakh/Year

INVESTMENT

= NIL

IMPLEMENTATION

Implemented in Sept'03

18. CONNECTION OF POT AIR SLIDE FAN HEADER WITH SILO DISCHARGE AIR SLIDE FAN IN POT LINE # 6 & 8

BACKGROUND & OBSERVATION

In Pot room, pot air slide fan supplies air to all the pot air slides in pot line 6 & 8 and Silo discharge air slide fan supplies air to the air slide which carry alumina from enriched alumina silo to main air slide of Automatic alumina feeding system.

To save the energy, pipe header of pot air slide fan and silo discharge air slide fans of pot line # 6 & 8 have been connected and stopped the two silo discharge air slide fan.

TECHNICAL & FINANCIAL ANALYSIS

Motor HP of stopped fan motor	=20 HP
Fan stopped	=2 Nos.
Energy saved	=20*2*0.746 kW
	=29.84 kW
Assuming motor loading 65% & 350 days working	
Annual energy saving	=29.84*0.65*24*350 kWh/Year
	=162926 kWh/Year
	=Rs.2.411 Lakh/Year

INVESTMENT MADE

=0.05 LAKH

IMPLEMENTATION

Implemented in Jul' 03.

19. CONNECTION OF PIPE LINE OF SILO FLUIDIZING BLOWER WITH FILTER HOPPER BLOWER IN POT LINE # 8 DSS

BACKGROUND & OBSERVATION

One Silo fluidization blower is run continuously to supply fluidizing air to primary and enriched alumina silos of Pot line 8 DSS and filter hopper blower supplies air for fluidization of filter hoppers.

To save the energy, pipe lines of filter hopper blower and silo fluidization blower have been connected with a valve so that we can stop silo fluidization blower and give air from filter hopper blower. This enables to stop one 7.5 HP motor of silo fluidization blower.

TECHNICAL & FINANCIAL ANALYSIS

Motor HP of stopped fan motor	=7.5 HP
Fan stopped	=1 No
Energy saved	=7.5*0.746 kW =5.595 kW
Assuming motor loading 65% & 350 days working	
Annual energy saving	=5.595*0.65*24*350 kWh/Year =30549 kWh/Year =Rs.0.452 Lakh/Year

INVESTMENT MADE

=0.05 Lakh

IMPLEMENTATION

Implemented in Jul' 03.

20. CONNECTION OF PIPE LINE OF POT AIR SLIDE FAN WITH FILTER HOPPER FLUIDIZING BLOWER OF POT LINE # 9 TO 11.

BACKGROUND & OBSERVATION

Filter hopper fluidization blower of Pot line 9-11 supplies air to all air slides of DSS and Pot air slide fan supplies air to all the Pot air slides of automatic alumina feeding system of that particular pot line.

It is observed that requirement of pot air slides can be met from the header of filter hopper fluidization blower of that particular pot line i.e. Pot line 9, 10 & 11. For these purposes we have connected two pipe headers with a valve so that airflow into pot air slide pipeline could be controlled.

This enables us to stop the pot air slide fan having 25 HP motor in three pot lines # 9 to 11.

TECHNICAL & FINANCIAL ANALYSIS

Motor HP of stopped fan motor	=25 HP
Fan stopped	=3 No
Energy saved	= $25 \times 3 \times 0.746$ kW
	=55.95 kW
Assuming motor loading 65% & 350 days working	
Annual energy saving	= $55.95 \times 0.65 \times 24 \times 350$ kWh/Year
	=305478 kWh/Year
	=Rs.4.521 Lakh/Year

INVESTMENT MADE

=0.15 Lakh

IMPLEMENTATION

Implemented in Jul' 03.

21. CONNECTION OF PIPE LINE OF SILO TO MAIN AIR SLIDE WITH POT AIR SLIDE FAN IN POT LINE # 2.

BACKGROUND & OBSERVATION

Two fans of 11.25 kW runs continuously for line # 2 Mass System between silo and main air slide. It is observed that the existing pot air slide fan pressure will be sufficient for above air slide and pot air slide as well. Hence air connection to the air slide of mass system has been provided from pot air slide fan and stopped the fan of mass system air slide fan of 11.25 kW.

TECHNICAL & FINANCIAL ANALYSIS

Motor HP of stopped fan motor	=15 HP
Fan stopped	=2 Nos.
Energy saved	= $15 \times 2 \times 0.746$ kW
	=22.38 kW
Assuming motor loading 65% & 350 days working	
Annual energy saving	= $22.38 \times 0.65 \times 24 \times 350$ kWh/Year
	=122195 kWh/Year
	=Rs.1.808 Lakh/Year

INVESTMENT MADE

=0.05 Lakh

IMPLEMENTATION

Implemented in April' 03.

22. CHANGE IN SIZE OF CATHODE FLEXIBLE OF POT TO REDUCE THE VOLTAGE DROP

BACKGROUND & OBSERVATION

To reduce the voltage drop in collector bar to flexible, the size of the cathode flexible has been changed from 21.5" X 4.5" to 19" X 5" by increasing the width and reducing the length. After changing the size as stated reduction in collector bar to flexible drop is reduced to 22mV from 25 mV. During last year this has been changed in 179 pots in plant-1 and all the pots of three lines # 9, 10 & 11.

TECHNICAL & FINANCIAL ANALYSIS

Saving in energy with reduction of voltage drop	= 3.25 kWh/MT/mV
Production of pots which flexible has been changed	= 130146 MT/Year
Energy saved	= 130146*3.25*3 kWh/Year
	= 1268923.5 kWh/Year
	= Rs.18.780 Lakh/Year

INVESTMENT MADE = NIL

IMPLEMENTATION

Implemented during the financial year 2003-04.

23. FULL UTILIZATION OF UNDER LOADED COOLING TOWER AND REMOVAL OF ONE COOLING TOWER

BACKGROUND & OBSERVATION

In Reduction Plant-2, Compressor # 17, 18, 19 and Air Drier # 8, 9, 10, 13 were equipped with Cooling tower fan # 4 & 5 Hot well pump # 4, 5, 6; Cold Well pump # 4, 5, 6. At the time at least one of each equipment was running and consumes power of 10+15+30 = 55 HP (41KW). It is decided to connect the above compressors with water circulation system having cooling tower fan # 1, 2, 3, 6, 7 & 8 cold well pump # 1, 2, 3, 7, 8 and Hot well pump # 1, 2, 3 & 4. After giving the connection as decided, running of Cooling tower fan # 4 & 5 and the associated cold well & hot well pumps has been stopped to save the energy.

TECHNICAL & FINANCIAL ANALYSIS

Connected operating load with stopped cooling tower	=41 kW
Assuming 80% loading and 365 days running	
Energy saving	=41*0.8*24*365 kWh/Year
	=287328 kWh/Year
	=Rs.4.252 Lakh/Year

INVESTMENT MADE =0.05 Lakh

IMPLEMENTATION

Implemented in Feb' 04.

FABRICATION PLANT

1. CONTROLLING EXHAUST FAN BY A TIMER IN EXT. PRESS # 2 & 3 FINISH PRODUCT SAW M/C TO REDUCE THE IDLE RUNNING

BACKGROUND & OBSERVATION

In Extrusion Press # 2 & 3, 4 nos. 500-Watt Exhaust fans are running in each press to take out the fumes which is generated during cutting cycle. These exhaust fans are running continuously.

The material is extruded from Press and it is stretched and then fed to Finish Product saw m/c for cutting as per the required length. Before material is fed to the saw m/c it will be set and adjusted at belts. Sometimes it takes more time and fans are running.

These M/c are controlled by the PLC system. We provided a timer in PLC so that if saw cut cycle doesn't starts for 10 minutes then fans will switch OFF. In this way 6 hrs per day will be saved.

TECHNICAL & FINANCIAL ANALYSIS

We observed the timer value from PLC and find that we saved 6 hours per day.

Total Energy saving	= $500 \times 4 \times 2 \times 6 \times 365 / 1000$
	= 8760 kWh/Year.
	= Rs.0.129 Lakh/Year
	= NIL

INVESTMENT MADE

IMPLEMENTATION

Implemented during financial year 2003-04.

2. REDUCTION OF IDLE RUNNING OF STRETCHER MACHINE HYDRAULIC MOTOR OF EXT. PRESS # 1 & 3 BY PROVIDING OFF DELAY TIMER

BACKGROUND & OBSERVATION

At Extrusion Press # 1 & 3, one motor of 60 HP & 40 HP respectively is used to run the hydraulic pump of stretcher machine. It is observed that some time motor was running idle.

To reduce the idle running of the motor, timer has been provided to stop the motor after 5 minutes from the last stretching cycle.

No Load current of the 40 HP motor is 22 Amp while loading it is 30 Amp and for 60 HP it 27 & 30 Amp respectively. After provision of OFF delay timer we have saved appx.1-hour idle running of these two pumps per day.

TECHNICAL & FINANCIAL ANALYSIS

No Load current of these two pumps	= (22+27) Amp
Energy saving	= $1.732 \times 49 \times 415 \times 0.8 \times 1/1000$
	= 28.176 kWh/day
	= 10284 kWh/Year
	= Rs.0.152 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

3. REPLACEMENT OF INCANDESCENT LAMP OF CRANE BUS BAR INDICATION LAMP WITH LED.

BACKGROUND & OBSERVATION

In Properzi area 21 nos. of 15 W indication lamps are used for the indication of power supply ON in the cranes. These lamps have been changed with 3.22W LED.

TECHNICAL & FINANCIAL ANALYSIS

Wattage of replaced lamp	=15 W
Lamp replaced	= 21 Nos.
Power consumption with lamp	= $15 \times 21 \times 24 \times 365/1000$ kWh/Year
	=2759.4 kWh/Year
Power consumption with LED	= $3.22 \times 21 \times 24 \times 365/1000$ kWh/Year
	=592.4 kWh/Year
Energy saving	=2167 kWh/Year
	=Rs.0.032 Lakh/Year

INVESTMENT MADE

=Rs.0.14 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

4. REDUCTION IN RUNNING HOURS OF SCRUBBER UNIT OF CONFORM MACHINE.

BACKGROUND & OBSERVATION

Conform M/c east Scrubber Unit Fan & Pump used to run all the time. Scrubber unit was being kept OFF for four months i.e. from November to February. Rest 8 months it used to remain in service.

Now this scrubber unit has been interlocked with take up unit of Conform Machine, which runs on an average 12 Hrs per day.

TECHNICAL & FINANCIAL ANALYSIS

Fan Motor H.P	=10 HP
On Load current	=7.0 Amps
Pump motor H.P	=10 HP
On load Current	=9.0 Amps
Fan motor actual power	= 4.206 kW
Pump motor actual power	= 5.498 kW
Total actual power consumption	= 4.206+5.498 = 9.704 Units
Running hours saved	=12 Hours/day
Energy saved	=9.704*12*240 kWh/Year =27947.52 kWh/Year =Rs.0.414 Lakh/Year = NIL

INVESTMENT MADE

IMPLEMENTATION

Implemented during financial year 2003-04.

5. INCREASE IN CHARGE WEIGHT IN SOAKING PIT BY MODIFICATION IN SPACER TO REDUCE THE SPECIFIC ENERGY CONSUMPTION

BACKGROUND & OBSERVATION

Soaking pits are electrically heated furnaces utilized for preheating of the slabs used in the hot rolling. Slabs are loaded in the pit in the horizontally vertical position with round **spacers** of 3003 alloy.

Each pit is having 16 heater banks with total capacity of 1152 kW. Soaking pits are provided with re-circulating type of fans, which is used to maintain uniform temperature gradient inside the furnace.

Original design of the pit is for 14 slabs loading with spacer thickness of about 2-2.5 inches. It was thought to decrease the spacer thickness to 1.5 inch so as to accommodate 16 slabs in a pit maintaining the uniform temperature gradient. Closer monitoring of the temperature gradient of the slabs throughout cross section as well as length was taken and no abnormalities were observed.

Major gain is the fact that now in six pits we are able to load 96 slabs while earlier in six soaking pits we were loading 84 slabs only.

This implies that without any extra investments we have made capacity for one extra soaking pit. This has helped us in utilizing one pit for DDQ loads, which takes 48-50 hrs minimum for rolling after it is charged.

TECHNICAL & FINANCIAL ANALYSIS

Energy consumption for the period (Apr'03 to Sept'03)	= 221.62 kWh/MT
MT/Charge for the period (Apr'03 to Sept'03)	= 53.47
Energy consumption for the period (Oct'03 to Mar'04)	= 208.29 kWh/MT
MT/Charge for the period (Oct'03 to Mar'04)	= 60.50

Total tonnage loaded in the pit in the year 2003-04	= 98528.69 MT
Average load for a month	=8210.72 MT
Reduction in energy with increased no. of slabs	=13.33 kWh/MT
Hence Total energy saving	=109448.90 kWh/month = 1313386.8 kWh/Year = Rs.19.44 Lakh/Year = NIL

INVESTMENT MADE

IMPLEMENTATION

Implementation of above practice is done from the month of October 2003 in order to reduce the specific energy consumption of the products to ultimately lower the manufacturing cost.

6. REPLACEMENT OF 100W INCANDESCENT LAMP OF CRANE BUS BAR INDICATION LAMP WITH 15W LAMP.

BACKGROUND & OBSERVATION

In Fabrication Plant –2 area, 72 nos. of 100 W indication lamps are used for the indication of power supply ON in the cranes. These lamps have been changed with 15 W lamp.

TECHNICAL & FINANCIAL ANALYSIS

Wattage of replaced lamp	= 100 W
Lamp replaced	= 72 Nos.
Power consumption with 100 W lamp	= 100*72*24*365/1000 kWh/Year = 63072 kWh/Year
Power consumption with 15 W Lamp	= 15*72*24*365/1000 kWh/Year = 9461 kWh/Year
Energy saving	= 53611 kWh/Year = Rs.0.793 Lakh/Year

INVESTMENT MADE = NIL

Taken out lamps is being used in other places as replacement against failure hence assuming no investment.

IMPLEMENTATION

Implemented during financial year 2003-04.

7. INSTALLATION OF NEW SMALL CENTRALISED COOLING TOWER FOR ANNEALING FURNACE & CTL CONTROL A/C UNIT TO SAVE THE PUMPING POWER.

BACKGROUND & OBSERVATION

In Fabrication Plant-2, two pumps having 15 HP and 7.5 HP motor are used for Annealing Furnace A/C & CTL A/C respectively. These pumps are connected with Cooling tower of Davy cold mill, which is quite far away from the A/C units.

Hence it is decided to install small cooling tower near A/c unit and pump the water by a single pump to both the A/C units.

TECHNICAL & FINANCIAL ANALYSIS

Power consumption before modification

Power consumed by 15 HP Annealing Furnace A/C pump	=1.732*415*0.85*16
Total power consumption	= 9.775 kW
Normal ON time	= 24 hrs.
Energy consumption in a year	= 9.775 * 24 * 365 kWh
	= 85629 kWh / year
Power consumed by 7.5 HP CTL A/C pump	= 1.732*415*0.85*4.1
Total power consumption	= 2.51 kW
Normal ON time	= 24 hrs.
Energy consumption in a year	= 2.51 * 24 * 365 kWh
	= 21987 kWh / Year
Total power consumption before modification	=107616 kWh/year

Power consumption after modification

After shifting the CTL A/C pump (7.5 HP) current increased to 6 A from 4.1 A

Power consumed by 7.5 HP CTL A/C pump	= 1.732*415*0.85*6
Total power consumption	= 3.66 kW
Normal ON time	= 24 hrs.
Energy consumption in a year	= 3.66 * 24 * 365 kWh
	= 32061 kWh / Year
Power consumption in installed cooling tower fan	= 1.194 kW
Normal ON time	= 24 hrs.
Energy consumption in a year	= 1.194*24*365kWh
	= 10459 kWh/Year
Total power consumption after modification	= 42520 kWh/year
Total energy Saving	= (107616-42520)
	= 65096 kWh/Year
	= Rs.0.963 Lakh/Year
<u>INVESTMENT MADE</u>	= Rs.0.75 Lakh

IMPLEMENTATION

Implemented in Oct' 2003.

8. REDUCTION IN IDLE RUNNING OF SLITTER MOTOR & PINCH ROLL MOTOR OF BLUE STAR SLITTING LINE

BACKGROUND & OBSERVATION

In Blue Star Slitting Line Pinch Roll and Slitter motor running continuously even when Slitter and Pinch Roll are disengaged during line run.

Now the software has been changed accordingly so that the Pinch Roll & Slitter Motor are stopped as soon as the line run command would come.

TECHNICAL & FINANCIAL ANALYSIS

Current taken by the field of Pinch roll motor before modification = 1.8 Amp
Current taken by the field of Pinch roll motor after modification = 0.1 Amp
Total power saved in field side = $1.732 \times 0.415 \times 1.7 \times 0.85$
= 1.03864 kW

Current taken by the armature of Pinch roll motor before modification = 6.9 Amp
Current taken by the armature of Pinch roll motor after modification = 0.0 Amp
Total power saved in armature side = $1.732 \times 0.415 \times 6.9 \times 0.85$
= 4.21564 kW

Current taken by the field of Slitter motor before modification = 1.8 Amp
Current taken by the field of Slitter motor after modification = 0.1 Amp
Total power saved in field side = $1.732 \times 0.415 \times 1.7 \times 0.85$
= 1.03864 kW

Current taken by the armature of Slitter motor before modification = 9.8 Amp
Current taken by the armature of Slitter motor after modification = 0.0 Amp
Total power saved in armature side = $1.732 \times 0.415 \times 9.8 \times 0.85$
= 5.98744 kW

Total power saved in Pinch roll motor (1.03864+4.21564) = $5.25428 \times 21 \times 352$
= 38840 kWh/Year

Total power saved in Slitter motor (1.03864+5.98744) = $7.02608 \times 18 \times 352$
= 44517 kWh/Year

Total energy saved = 83357 kWh/Year
= Rs.1.233 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

9. REDUCTION IN IDLE RUNNING OF HYDRAULIC MOTOR OF SOLUTION FURNACE

BACKGROUND & OBSERVATION

In Solution Furnace Hydraulic Motor 7.5 H.P was running continuously. Approximate 3 hours of Idle running per day of the motor has been stopped by providing a OFF delay timer

TECHNICAL & FINANCIAL ANALYSIS

No Load current of the motor = 8.0 Amp
On Load current of the motor = 9.0 Amp
Idle running hours of the motor = 3 Hours/day
Energy saved = $1.732 \times 0.415 \times 8 \times 3 \times 365$ kWh/Year
= 6296 kWh/Year
= Rs.0.093 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

10. STOPPAGE OF ONE SCRUBBER UNIT OF CASTER PLANT

BACKGROUND & OBSERVATION

The Caster Plant is equipped with 3 scrubber to maintain the working atmosphere in side the entire shed.

During audit it is observed that some of the opening provided in furnace area is not needed which can be closed. After closing the unwanted openings, it was felt that running of all the three scrubbers is no more required hence one scrubber out of the three have been stopped.

TECHNICAL & FINANCIAL ANALYSIS

Operating load of pump & fan of one scrubber	= 8.0 kW
Duration of operation	= 240 Days/Year
Energy saved	= 8*24*240 kWh/Year
	= 46080 kWh/Year
	= Rs.0.682 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented in May' 2003.

11. USING THE SLUDGE AS FUEL OIL, BEING GENERATED DURING RECTIFICATION PROCESS OF COOLANT

BACKGROUND & OBSERVATION

Recently, Achenbach supplied oil rectification unit is commissioned for rectification of coolant oil being used in rolling mill. During the rectification process residual oil or sludge is generated which is a waste. After studying various options of safe and healthy disposal of this waste oil it was decided to go for a trial to burn it in Caster furnace.

The trial and laboratory reports indicated that the calorific value is close to that of furnace oil and without any change being incorporated into the firing parameters.

Hence finally it is being used as a substitute to furnace oil on a regular basis and the same quantity of furnace oil is conserved which otherwise would have been consumed.

TECHNICAL & FINANCIAL ANALYSIS

Total residual oil/sludge consumed in last year in Caster furnace	= 36.988 KL
Cost of furnace oil	= Rs10593/KL
Furnace oil saved	= 36.988 KL/Year
	= Rs.3.918 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

12. SPEED OF DAVY COLD MILL HAS INCREASED TO INCREASE THE PRODUCTION AS WELL AS TO REDUCE THE SPECIFIC ENERGY CONSUMPTION

BACKGROUND & OBSERVATION

Rolling Mills facility in Hindalco includes a Hot Mill, a Continuous Caster, two Cold Rolling Mills and various down-stream machines as its main equipment. The Hot Rolling Mill equipment is a vintage of 1962. Revamped and modernized in 1997, the Hot Rolling Mill had an estimated capacity of 93,000 Tons per annum and is prime source of feedstock to the two Cold Rolling Mills. Also, the Bliss Cold Mill, again a vintage of 1960s, was revamped and modernized in the year 1997 to increase its speed to 900 MPM and to include Automatic Gauge Control and Automatic Shape Control systems. A second Cold Mill was installed in 1993. This was a new mill manufactured by Davy, UK. This mill had a maximum speed of 600 meters per minute. This mill also had fully automated Gauge & Shape control system. The Continuous Caster is a Pechiney machine and has a production capacity of 11,000 Tonnes per annum. Total installed capacity of the above Rolling Mills set-up was estimated as 70,000 Tonnes per annum as in FY02. A capacity shortfall was evident in Rolling Mills to take up even a part of the additional metal volume available for value-addition. It was therefore necessary to enhance the volume of Rolled Products' by increasing the capacity of existing constraint equipment and by adding capital equipment, wherever required.

After detailed exercise, speed of the Davy Cold Mill has increased from existing 600 MPM to 1200 MPM.

TECHNICAL & FINANCIAL ANALYSIS

Reduction in specific energy consumption = 55 kWh/MT

Reduction in specific energy consumption is mainly due to increase in production of rolled product even the input power is increased.

Production from Davy Cold Mill from Dec' 03 to March' 04	= 13035.8 MT
Annualized production	= 39107.4 MT
Energy saved	= 2150907 kWh/Year
	= Rs.31.833 Lakh/Year

INVESTMENT MADE

= Rs.1349 Lakh

IMPLEMENTATION

Implemented in Nov' 2003.

13. INCREASE IN CHARGE WEIGHT IN ANNEALING FURNACE # 2 BY MODIFICATION IN CHARGING RACK TO REDUCE THE SPECIFIC ENERGY CONSUMPTION

BACKGROUND & OBSERVATION

Annealing furnaces are electrically heated furnaces utilized for annealing of cold rolled sheets. Rolled coils are charged in the furnace keeping it on rack. The rack was designed to accommodate the 7 coils at a time, which has been modified to accommodate the 9 coils. This increased charge reduced the specific energy consumption of the furnace.

TECHNICAL & FINANCIAL ANALYSIS

Energy saving after use of modified rack	= 8 kWh/MT
Annealed coil through Annealing furnace # 2	= 1400 MT/Month
Energy saved	= 8*1400*12 kWh/MT
MT/Charge for the period (Oct'03 to Mar'04)	= 134400 kWh/Year
	= Rs.1.989 Lakh/Year

INVESTMENT MADE = Rs.2.00 Lakh

IMPLEMENTATION

Implementation of above practice is done from the month of October 2003 in order to reduce the specific energy consumption of the products.

BOILER & CO-GENERATION

1. INSTALLATION OF APRON COAL FEEDER IN PLACE OF RECIPROCATING COAL FEEDER.

BACKGROUND & OBSERVATION

Reciprocating Coal feeder is used to feed the coal to Boiler # 1, 3 & 4. Capacity of the coal feeder is 155 TPH whereas the coal requirement of these boilers is 2100 TPD. For feeding the 2100 MT of coal, we have to operate the coal feeder for 13.55 hours in day. Apron coal feeder having 190 TPH capacity has been installed in place of reciprocating feeder thus reducing the operating hours of coal feeder.

TECHNICAL & FINANCIAL ANALYSIS

Previous Coal feed rate	= 155 TPH
Feed rate apron feeder	= 190 TPH
Feed required for Boiler # 1, 3 & 4	= 2100 TDP
Saving in running hours	= 2.50 Hours
Load of coal feeder	= 200 kW
Energy saved	= 200*2.5*340 kWh/Year
	= 170000 kWh/Year
	= Rs.2.516 Lakh/Year
<u>INVESTMENT MADE</u>	= Rs.23.00 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

2. DIRECT TAPPING OF 50 PSI STEAM FROM BOTTOMING TURBINE EXTRACTION IN PLACE OF 600 PSI HEADER

BACKGROUND & OBSERVATION

8 TPH high-pressure steam of 44 Kg/Cm² (600 PSI) is sent to Paste plant for process use, which is primarily reduced to 35 Kg/Cm². From Paste plant header, 1.4 TPH steam is being fed to Remelt shop after reducing it to 50 PSI for oil heating.

Now a separate pipeline has been provided to Remelt shop oil heating job from the extraction-3 of bottoming turbine. From this extraction 50 PSI steam is being supplied to Remelt shop without reducing the pressure. This modification has been carried out to save the thermal energy, which is lost during different stages of pressure reduction.

TECHNICAL & FINANCIAL ANALYSIS

Enthalpy of 50 PSI Steam	= 707 Kcal/Kg
Enthalpy of 600 PSI Steam	= 793 Kcal/Kg
Steam consumption in Remelt shop	= 1.4 TPH
Energy saved	= 1.4*(793-707)*1000*24*365 = 1054704000 kCal/Year
CV of Coal	= 3761 Kcal/Kg
Coal saved	= 1054704000/3761 = 280431.8 Kg/Year = 280.4318 MT/Year
Cost of Coal	= Rs1044.195/MT
Money saved	= Rs.2.928 Lakh/Year
<u>INVESTMENT MADE</u>	= Rs.0.30 Lakh

IMPLEMENTATION

Implemented in Nov' 2003.

3. INSTALLATION OF SS PIPE LINE FOR TRANSFER OF HOT DM WATER FOR BOILER # 3.

BACKGROUND & OBSERVATION

Before feeding the DM water in to Boiler it is being heated by using the heat of bad condensate. There is two DM plant named old and new DM Plant. For heating the water, 3 plate exchangers are provided in old DM plant. Water of new DM plant is sent to old DM plant through a single SS pipe for heating the water in the heat exchanger. As there is only one pipeline in between old to new DM plant, continuous supply of hot DM to Boiler # 3 is not possible. Therefore a separate SS pipeline has been provided for continuous supply of hot water for Boiler # 3.

TECHNICAL & FINANCIAL ANALYSIS

Temp. of make up water for Boiler # 3 after modification	= 81°C
Temp. of make up water for Boiler # 3 before modification	= 62.3 °C
Quantity of make –up water for Boiler # 3	= 64.61 TPH
Duration of Cold DM transfer	= 5.3 Hrs/day
So, gain in thermal energy (64.61*(81-62.3)*1*5.3*1000)	= 6403497 Kcal/day
Enthalpy of Deaerator Steam	= 683000 Kcal/Ton
Gain in term of Steam	= 6403497 / 683000
	= 9.375 Ton / day
Actual steam saving for 355 days	= 3328.125 Ton/Year
Coal consumption	= 0.2229 MT/MT
Coal saved	= 741.839 MT/Year
Cost of Coal	= Rs.1044.195 / Ton
Money saved	= 741.839*1044.195
	= 7.746 Lakh / Year

INVESTMENT MADE

= Rs.3.63 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

4. INSTALLATION OF AUTO CHANGEOVER OF LUBE OIL PUMP TO AVOID THE TRIPPING OF BOILER # 1.

BACKGROUND & OBSERVATION

Pulverized coal to Boiler # 1 is fed after pulverizing it into the Ball Mill. Operation of the Boiler # 1 is interlocked with the operation of Ball Mill. There is a frequent problem of stoppage of boiler due to interruption in Ball Mill. It was observed that most of time Ball Mill got tripped due to oil pressure of the lube oil pump. Frequent ON/OFF of Boiler leads to higher oil consumption required during startup of Boiler. To reduce the frequent tripping of Ball Mill, Auto-changer system for lube oil pump of Ball Mill has been installed resulted reduction in tripping of Boiler thus saving of fuel oil.

TECHNICAL & FINANCIAL ANALYSIS

Outage of Boiler on Tripping	= 20 minutes
Oil consumption in Boiler for lit up in one time	= 2.5 KL
Cost of HSD oil @ Rs. 18825 / KL	= 2.5*18825
	= Rs.47062
No of tripping due to low oil pressure of lube oil pump	= 4/ year
Fuel oil Saved	= 4*2.5 KL/Year
	= 10 KL/Year
	= Rs.1.883 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

5. MODIFICATION OF IMPACTOR DISCHARGE CHUTE TO INCREASE THE COAL FEED RATE IN BOILER # 2 COAL BUNKER.

BACKGROUND & OBSERVATION

Vibro feeders are used in between crusher & Vibrating screen to control the feed rate to the screen. It is observed that Vibro feeder # 50 is running with 90% loading even though 25% opening of feeder outlet gate. As most of the coal is passing through a single feeder, thick bed is formed on vibrating screen resulting less screening to the belt and more rejection to the bucket elevator.

Modification in the opening of the discharge chute of coal feeder has been done so that crushed coal can be equally distributed in the Vibro feeders. This resulted increased feed rate of coal.

TECHNICAL & FINANCIAL ANALYSIS

Feed rate before modification	= 120 TPH
Feed rate after modification	= 140 TPH
Feeding of coal to the bunker	= 450 Ton/day
Time required to fill the bunker before modification	= 3.75 Hours
Time required to fill the bunker after modification	= 3.21 Hours
Running hours saved	= 0.54 Hours/day
Load of the circuit	= 530 kW
Running of the equipment	= 355 Days/Year
Energy saved	= 0.54*530*355
	= 101601 kWh/Year
	= Rs1.504 Lakh/Year

INVESTMENT MADE

= NIL

IMPLEMENTATION

Implemented during financial year 2003-04.

6. INSTALLTION OF EOT CRANE IN COAL PLANT TO REDUCE THE HSD CONSUMPTION BEING CONSUMED BY DOZER

BACKGROUND & OBSERVATION

Coal to the stockpile in coal yard is fed by the diesel operated Dozers. During the feeding of coal through dozer, some coal gets crushed causing generation of fines. Hence it is decided to install the EOT crane to reduce the fines generated due to operation of Dozer as well as to reduce the fuel consumption.

TECHNICAL & FINANCIAL ANALYSIS

Fuel oil consumption by the Dozer for coal feeding	= 4*15 Ltrs/Day
	= 60 Lts / day
Rate of Diesel	= Rs.18825/ KL
Cost of feeding through dozer	= 0.06*18825
	= Rs.1129.50 / day

Power consumption with EOT Crane for coal feeding	= 4*50 kWh / Day = 200 kWh / Day
Cost of power @ Rs. 1.48 / Kwh	= 200*1.48 = Rs.296 / day
Money saved	= Rs (1129.50 – 296)*350 = Rs. 2.917 Lakh / year
Energy consumption with Dozer	= 60*0.85*10600 = 540600 Kcal/Day
Energy consumption with EOT Crane	= 200*860 = 172000 Kcal/Day
Energy Saved	= 368600 Kcal/Day = 129.01 Mkal/Year

INVESTMENT MADE

= NIL

Spared EOT crane of process is utilized

IMPLEMENTATION

Implemented during financial year 2003-04.

RECTIFIER STATION

1. PROCUREMENT OF RECTIFIER UNIT OF POT LINE # 11 WITH OFWF IN PLACE OF OFAF HEAT EXCHANGER.

BACKGROUND & OBSERVATION

Rectifier unit of Pot line # 11 is procured having improved technology of cooling system to save the energy consumption.

TECHNICAL & FINANCIAL ANALYSIS

Rating of oil pump motor in Rectifier unit having OFAF cooling System	= 2.6 kW
No of Pumps running	= 4
Rating of oil cooler fan motor in Rectifier unit having OFAF cooling System	= 2.2 kW
No of cooler fan running	= 12
Total energy consumption with OFAF (2.6*4+2.2*12)*24*365	=322368 kWh/Year
Rating of oil pump motor in Rectifier unit having OFWF cooling System	= 9 kW
No of Pumps running	= 2
Total energy consumption with OFWF (2*9*24*365)	=157680 kWh/Year
Energy saved	=164688 kWh/Year =Rs.2.437 Lakh/Year

INVESTMENT MADE

Technologically upgraded Rectifier unit is purchased under Brown field expansion.

IMPLEMENTATION

Implemented during financial year 2003-04.

2. INSTALLATION OF LOGO FOR AIR CONDITIONING UNIT OF POT LINE # 9 TO 11 MCC & CONTROL ROOM.

BACKGROUND & OBSERVATION

MCC & Control rooms of Pot line # 9 to 11 are equipped with A/C unit to maintain the inside temperature of the room. These A/C units were controlled manually causing over running. Now a small PLC has been provided and ON/OFF time is programmed. With this provision of small PLC, running hours of two numbers of A/C unit of rating 37 kW & 45 kW has been reduced by 2 hrs/day & 4 hours/day respectively.

TECHNICAL & FINANCIAL ANALYSIS

Energy saved	= (37*0.9*2+45*0.9*4) kWh/Day
	= 228.6 kWh/day
	= 83439 kWh/Year
	= Rs.1.235 Lakh/Year
	= Rs.0.20 Lakh

INVESTMENT MADE

IMPLEMENTATION

Implemented during financial year 2003-04.

3. REPLACEMENT OF HIGHER WATTAGE LAMP WITH 8 WATT CFL.

BACKGROUND & OBSERVATION

Lamps and tube lights of Guest house, Renukeshwar temple & Aditya Birla Public School have been replaced with 8 Watt CFL and lower wattage lamps to minimize the power consumption. Light circuit of Renukeshwar temple is also modified.

TECHNICAL & FINANCIAL ANALYSIS

A)	Light replacement in Guest house,Renukeshwar temple & Aditya Birla Public School.		
	No. of Lamp	92	Nos.
	Wattage of each Lamp	40	Watt
	Wattage consumed before replacement	3680	Watt
	No. of Lamp after replacement	92	Nos.
	Wattage of each Lamp after replacement	8	Watt
	Wattage consumed after replacement	736	Watt
	Wattage saving	2944	Watt
	Per day Kwh saving (Running hours - 10 hrs./day)	29.44	KWH
	Kwh saved per year	10746	KWH
	Amount saved per year @ Rs. 1.48 per KWH	0.159	Lakh
B)	Modification done in lighting circuit of Renukeshwar temple		
	<u>Before Modification</u>		
a)	No. of Lamp fitting in Lawn	97	Nos.
	Wattage of each Lamp	25	Watt
	Wattage consumed	2425	Watt
	Per day Kwh consumed (Running hours – 12 hrs./day)	29.10	Kwh
	Per year energy consumption	10622	Kwh
b)	No. of post of Lantern fitting	6	Nos.
	Wattage of each Lamp	160	Watt
	Wattage consumed before Modification	960	Watt
	Per day Kwh consumed (Running hours – 12 hrs./day)	11.52	Kwh
	Per year energy consumption	4205	kwh
	Total Kwh Consumed before modification per year(a+b)	14827	Kwh
	<u>After Modification</u>		
c)	Installation of area light for security purpose	7	nos
	Wattage consumed for each security light	150	Watt
	Wattage consumed 7 nos security Light	1050	Watt
	Per day energy consumption for security light (Running hours - 8 hrs./day)	8.40	Kwh
	Per year energy consumption	3066	kwh
d)	Wattage consumed in Lawn Light	2425	Watt
	Per day energy consumption for security light (Running hours - 4 hrs./day)	9.70	Kwh
	Per year energy consumption	3541	kwh
	Total Kwh Consumed After modification per year(c+d)	6607	Kwh
	Energy saved per year	8221	kwh
	Amount saved per year @ Rs. 1.48 per Kwh	0.122	Lakh
	Total power saved per year	18966	KWH
	Total amount saved per year	0.281	Lakh

INVESTMENT MADE

= Rs.0.336 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

4. INSTALLATION OF SIGMA SEARCH LIGHT IN PLACE OF SODIUM VAPOUR LAMP.

BACKGROUND & OBSERVATION

In our 132 KVA switch yard 33 sodium vapour lamps are installed. These lamps have been replaced with 6 numbers Sigma Search light.

TECHNICAL & FINANCIAL ANALYSIS

Load of lamps removed	= 10*250 W+ 23*150 W
Power consumption with removed lamp	= 5950 Watt
Glowing hours	= 8 per day
Energy consumption	= 5.950*8*365 kWh/Year
	=17374 kWh/Year
Energy consumption with Sigma Search light	= 6*250 Watt
	= 6*250*8*365 WattH/year
	= 4380 kWh/Year
Energy saved	= 12994 kWh/Year
	= Rs.0.192 Lakh/Year

INVESTMENT MADE

= Rs.1.50 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.

UTILITIES

1. REPLACEMENT OF COPPER BALLAST WITH ELECTRONIC BALLAST

BACKGROUND & OBSERVATION

All the tube lights of our entire plant have copper ballast. We are changing approx. 500-600 ballast in year against failed ballast. In the early of last year it was decided to stop the procurement copper ballast against failed ballast and to use the electronic ballast to save the energy.

TECHNICAL & FINANCIAL ANALYSIS

Copper ballast replaced during 03-04	= 252
Energy saving per ballast	= 15 Watt
Energy saved (252*15*12*365/1000)	= 16556 kWh/Year
	= Rs.0.245 Lakh
<u>INVESTMENT MADE</u>	= Rs.0.96 Lakh

IMPLEMENTATION

Implemented during financial year 2003-04.