

NATIONAL ALUMINIUM COMPANY LIMITED

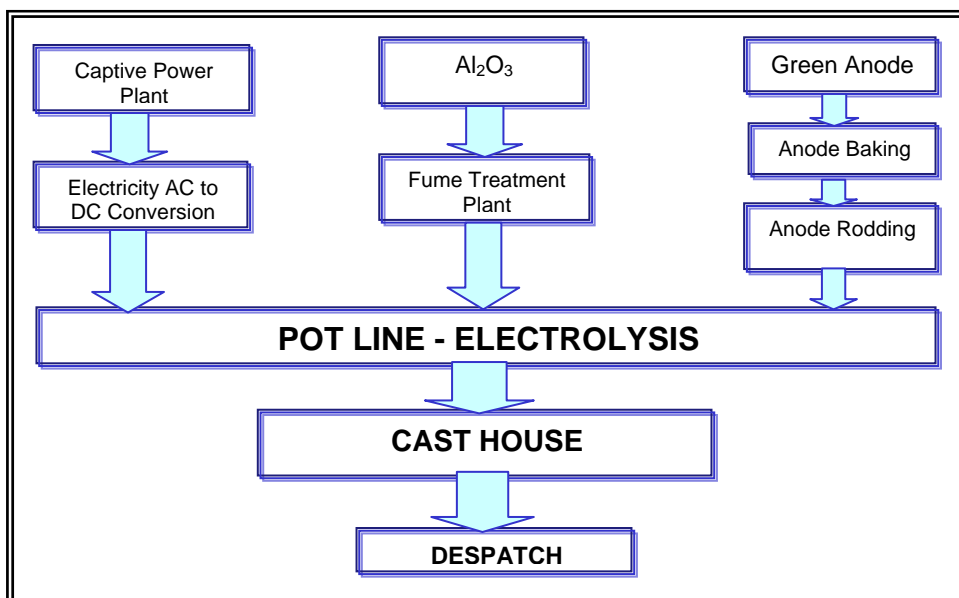
SMELTER PLANT, ANGUL, ORISSA

Unit Profile

National Aluminium Company Ltd. (NALCO) is one of the largest integrated aluminium complexes in Asia with activities of operations spanning from mining, refining, power generation to production of world-class aluminium metal. Since commencement of commercial operations in 1987-88, NALCO's Smelter Unit has constantly produced high quality products at competitive prices for both domestic and overseas customers and established itself in national and international market. NALCO has not only addressed to the need for self-sufficiency in aluminium, but also given the country the technological edge in producing this strategic metal to the best of world standards. Smelter Unit has now sales turnover of 2414 crores and has increased its capacity to 3,45,000 TPA.

NALCO's Smelter unit received Quality Management System (QMS) certificate ISO 9002, 1994 from RWTUV, Germany from 1995 to 2003 and subsequently received ISO 9001, 2000 (Revision) certificate by RWTUV, Germany, since 2003. It has also received Environment Management System (EMS) certificate ISO : 14001, 1996 from RWTUV, Germany, since May'1998. Smelter unit has made constant efforts to implement Total Quality Management by employee involvement through Quality Circles, QIP etc. Smelter Unit's Quality Circles have participated in various National and Internal level QC competitions and received many awards. NALCO's Smelter Unit is also recipient of many more awards such as: 1) Best Exporter Award for the year 98-99, 99-00 & 00-01, 2) FIMI environment award 2000-01, 3) State Pollution Control Excellence Award – 2002, 4) Indira Gandhi Paryavaran Award, 2000.

Process Flow Chart



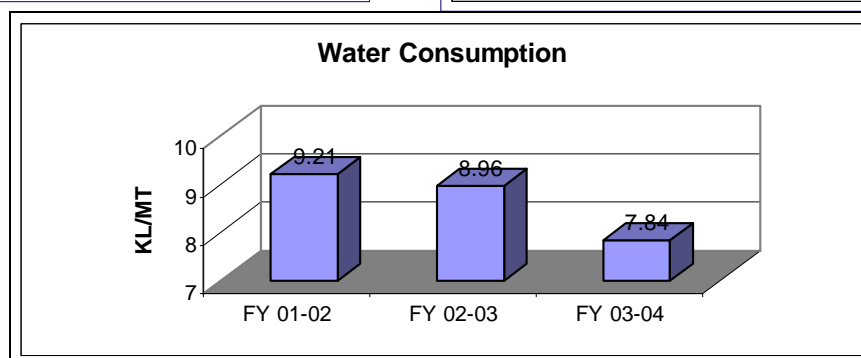
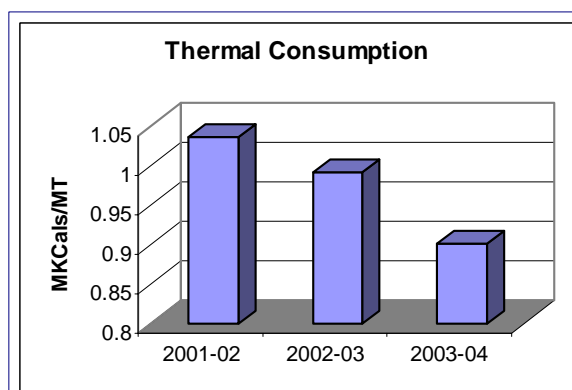
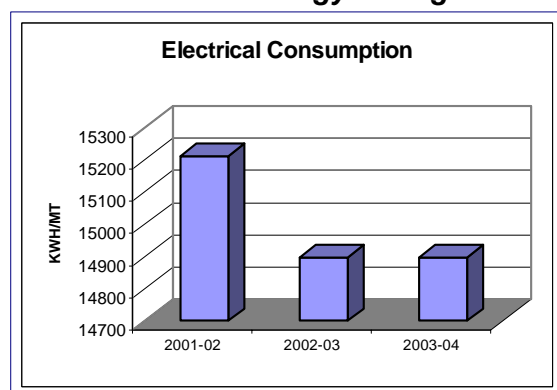
Energy Conservation

Smelter unit has made constant endeavor to reduce specific electrical and thermal energy consumption by improving several operating practices and adopting newer technologies. The energy consumption cost is around 37 – 38 % of total production cost.

DESCRIPTION	UNIT	2001-02	2002-03	2003-04
Total Production of Cast Metal	MT	231674	244708	298207
Total electrical energy consumption	Lakhs KWH	35242.25	36456.60	44423.90
Specific electrical energy consumption	KWH/MT	15212	14898	14897
Total Thermal (Fuel) Consumption / Annum	Million KCal/year	2399904.71	242498.50	269082.71
Specific energy consumption – for HFO & LDO	Million KCal/tonne	1.0355	0.9910	0.9023
Energy Cost as % of Manufacturing cost	Percentage	37.04 %	38.1 %	37.76 %

Year	Electricity		Thermal (Fuel :HFO + LDO)	
	Consumption (Kwt/MT)	% Reduction over 2001-02	Consumption (MKCal/MT)	% Reduction over 2001-02
2001 – 2002	15212	-	1.0355	-
2002 – 2003	14898	2.06%	0.9910	4.30 %
2003 – 2004	14897	2.07%	0.9023	12.86 %

Trend of water & energy savings:



Energy Conservation Commitment, Policy and Organizational Set up

Smelter unit has constituted an Energy Conservation Cell (ECC) under the Chairmanship of General Manager (O&M). A senior DGM has been nominated as Energy Manager. Members of ECC have also been nominated from various cross functional departments. The ECC members meet regularly to discuss various strategies and action plans to implement energy conservation measures in line with NALCO's energy conservation policy and objectives. Apart from that small group activities (SGA) are encouraged involving employees from various functions and levels. The small groups identify scope for improvement and implement energy conservation projects in a time bound manner. Seminars, presentations are carried out from time to time to create awareness among the employees and action is formulated to achieve target of energy conservation. Main functions of ECC are as follows:

- ❖ Preparation of annual activity plan in line with energy policy & strategy, target setting and responsibility assignment.
- ❖ Ensure proper measurement of different types of energy.
- ❖ Calibration of measuring equipments.
- ❖ Reporting on various kinds of energy consumption.
- ❖ Conducting training programmes, seminars, presentations on energy conservation.
- ❖ Encouraging improvement projects through SGA (Small Group Activities).
- ❖ Development of auditors for system audit.

Energy Policy of NALCO

- ❖ Energy is the key factor to economic development. In recognition to same Nalco emphasizes on energy conservation and cost effective utilization of energy in all its areas of operation.

Strategy

- ❖ Adopting Energy efficient technology and to increase investment in all cost effective energy saving measures.
- ❖ To encourage a positive awareness within the company of the need and benefits of energy conservation.
- ❖ To promote and provide for efficient use of energy while protecting human health safety and the environment
- ❖ Efficiency improvement in Generation and Capacity utilization
- ❖ Identifying the Energy conservation opportunities to reduce Technical Losses
- ❖ Contribute to Green House Gas abatement by energy saving measures.
- ❖ Continual effort for improvement in Specific Energy consumption.
- ❖ Conducting Energy audit and management review to initiate actions for improvement.

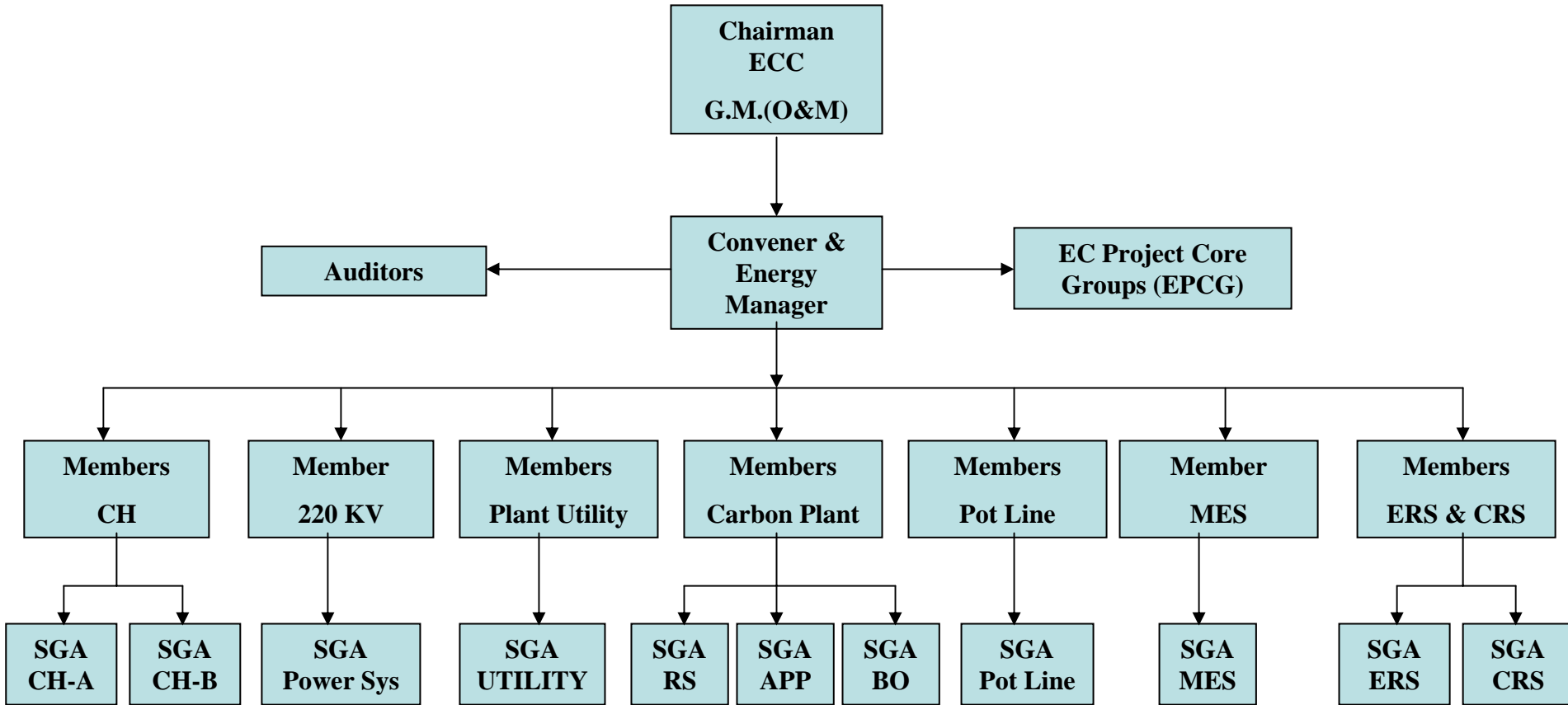
Monitoring and Measuring Functions

Monitoring of Energy consumption patterns is done on Daily, Monthly and Yearly basis. The formats are prepared by Technical Services (MIS) Dept. and Electrical Power Distribution Department.

Energy Conservation achievement during the year 2003 – 04

- Automatic control of cooling tower fans through temperature controllers
- Automatic switching ON/OFF of shop floor and substation lights.
- Stopping of idle running of hydraulic hook rotation drives in metal pouring crane and cooling blowers in Ingot Casting Machine through PLC programming in Cast House.
- Replacement of multiple solid metal charging doors with single door in Cast House furnaces.

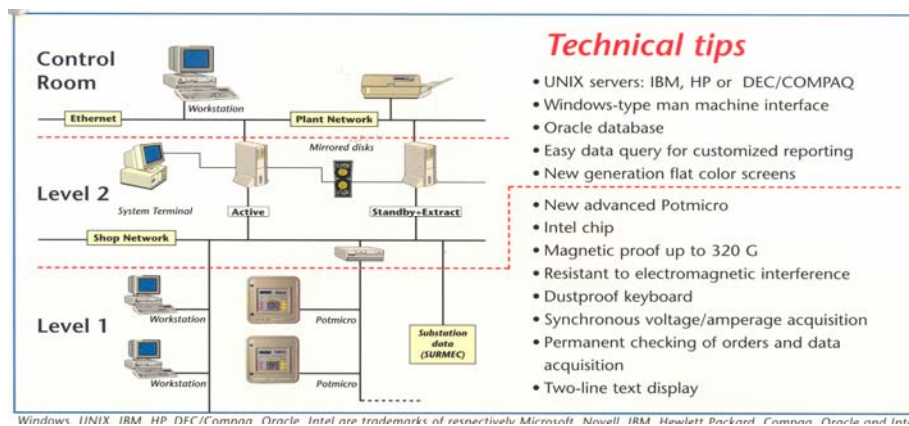
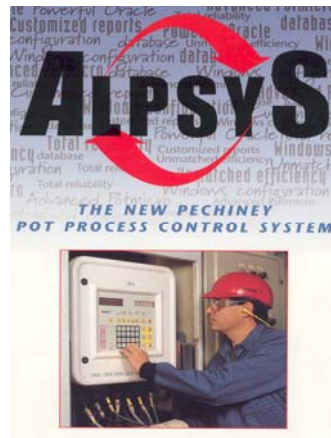
Organization Chart for Energy Conservation Cell



SGA : Small Group Activities, EPCG : Energy Conservation Project Core Group,

Major Energy Conservation projects implemented during the year 2003 – 04:

- Advanced Pot Regulation system (ALPSYS) in Pot Line – 3.
 - In the old technology system the electricity consumption was =
 - In the new system the electricity consumption =
 - Total Electricity savings in Lakhs KWH = 179.1
 - Total savings in electricity = Rs.216.71 lakhs



- Advanced PLC controlled heat regulation system of Bake Oven with improved furnace design and layout.
 - Total Fuel oil savings = 1049.69 KL.
 - Total Calorific value of fuel oil savings = 10271.02 Million K Cal
 - Total savings = Rs.192.82 Lakhs
 - Total investment in project = Rs. 571 Lakhs

Energy Conservation Plans and Targets

Major energy conservation projects planned.	Anticipated Savings(Rs. Lakhs)	Approx. investment (Rs. Lakhs)	Project completion year
Implementation of launder heating and covering system in Strip Casting Plant.	4.58	6.25	FY 2005 - 06
Advanced Pot Regulation System ALPSYS in Pot Line - 2.	423.01	5700	FY 2006 - 07
Replacement of 4 nos. semi graphitised pots with graphitised pots.	3.12	20	FY 2006 - 07

Environment & Safety

NALCO's Smelter unit is committed to protection of environment. Various pollution control measures are incorporated in the unit to achieve continual improvement. Some of the highlights of these measures are as follows:

- ❖ Dry scrubbing process has been adopted by NALCO for efficient removal and recycling of fluorides. Emissions from all dry scrubber stacks are regularly monitored to determine gaseous fluoride levels on a regular basis for particulate matter, which is extremely low. The dry scrubbers are more than 99.8% efficient in removing fluoride and particulate.
- ❖ Equipment have been installed in eight nos. of crushed bath silos in Potlines to effect automatic shut-down of loading of crushed bath once the silo is full, thus preventing loss of bath.
- ❖ Two nos. of concrete pits have been constructed to dispose used filter paper from emulsion pit of Cast House.
- ❖ Fogging system in Rodding Shop was made operational to reduce dust pollution.
- ❖ Several measures taken to reduce the generation of surface water i.e. from about 140 m³/hr to about 50 m³/hr.
- ❖ Smelter plant has a modern defluoridation plant using ion-exchange technology to remove fluoride from the wastewater. The treated water is then discharged to a construction water storage reservoir of 25,000 m³ capacity from where water is taken out for horticulture or construction purpose as and when required. Thus near zero discharge condition is achieved for surface water generated inside the plant.
- ❖ The sewage generated in toilets of the plants are taken through a separate network of sewers to a sewage treatment plant of 650 m³/day capacity. There it is treated by means of activated sludge process. The treated water is discharged to outside the plant boundary. The digested sludge is used as manure for horticultural purposes inside the plant.
- ❖ Planting of 45,330 saplings around Smelter Plant has been done during 2003-2004 for creation of green belt.

Write up on projects completed in 2003 - 04

A. Bake Oven:

With improved heating regulation system and Bake Oven furnace design it is possible to operate with minimum excess air.

Modifications made:

Design Modification:

1. Earlier head wall opening was there to place blowers on furnace. Now with improved design, no head wall opening is there and blowers are placed directly on the peephole.
2. Continuous control of furnace draft is possible as per requirement through variable frequency drives thus saving fuel and electrical energy.
3. Earlier three layers cross over was there to interconnect the two bays of baking furnace. Now there is single circular duct with less refractory work there by saving fuel oil during baking process.
4. Modified exhaust manifold design to restrict cold air infiltration into the system. Photo attached. The legs are flexible and inserted into the peephole. Where as in the old design the legs were placed above the flue wall for which there was scope of air ingress.

Change in Operating Procedure:

1. Level 2 automation system was incorporated for better system monitoring and control.
2. Heating curves were modified to suit requirement.
3. On line fire changing is possible without interrupting the baking process.
4. Mechanised cleaning of flue wall brushing is done.

B. Advanced Pot Regulation system (ALPSYS) in Potline-3 :

In Potline-3 advanced Pot Regulation system (ALPSYS) has been used. It has many advanced features compared to the old system in use in Potline-1 & 2, which reduces energy consumption, as well as consumption of AlF₃. The main features compared to old system are as follows:

1. Excellent Alumina control in the liquid bath, which avoids sludging of pots. Low sludging reduces pot voltage.
2. Anode effect control is excellent, thereby drastically reducing anode effect frequency. Anode effect is sensed from the slope of Alumina concentration and so action is initiated before actual anode effect appears.
3. It has got separate software for thermal control. In case of hot pots, automatic cut in effective resistance is made, which reduces pot voltage.

4. Improved thermal control gives judicious Aluminium Fluoride charging, which indirectly avoids unnecessary fluoride charging, thereby reducing instability / pot voltage.
5. Resistance added during Anode changing is step by step.
6. It has got a huge database, which is used, for judicious and faster control of Pot parameters and Anode to Cathode distance.
7. Less anode effects, instability and proper control of Anode to Cathode distance has got a direct influence on Current efficiency and productivity of the pots. This in turn reduces specific energy consumption.
