



## **HINDALCO INDUSTRIES LIMITED**

**HIRAKUD SMELTER, SAMBALPUR (ORISSA)**

### *Unit profile*

HINDALCO industries limited (Hindustan Aluminium Company limited) is the largest manufactures of primary aluminium in India and also one of the largest manufactures in the world. Earlier the company was known as Indian Aluminium Company Limited, popularly known, as 'INDAL' is one of the largest private sector companies of India. As a subsidiary of 'ALCAN' Canada, INDAL was incorporated on 17<sup>th</sup> December 1938 under the name of Aluminium Production Company of India Limited. In 1944, the name changed to Indian Aluminium Company Limited. INDAL has pioneered in the production and marketing of alumina, aluminium metal and semi-fabricated products. INDAL has 14 plants and 10 offices spread across the country. INDAL is vertically integrated through every stage of the industry including bauxite mining, alumina refining, alumina smelting, semi-fabricating (sheets and foils), product development and captive power generation.

INDAL joined the Aditya Birla Group in June 2000 when Alcan, the original promoter, divested its entire stake of 54.62% and another 20% were acquired through an open offer from other shareholders. INDAL is a dominant player in alumina and has significant strengths is the downstream product segment. These strengths coupled with Aditya Birla Group's dominance in metal and competitive cost structure makes the INDAL- Aditya Birla Group combine a major force is the Aluminum Industry. In April 2005 INDAL merge with HINDALCO and also operate with the name HINDALCO industries limited.

One of the smelter plants of HINDALCO is located at Hirakud in Orissa. Hirakud smelter plant pursues production of primary metal, which is based on electrolytic reduction process through the primitive horizontal stud soderberg (HSS) technology. The major raw materials used for the primary aluminium production are alumina, cryolite, aluminium fluoride and electrical power. The smelter that was started in January 1959 with 10 KTPA capacity has undergone expansion in stages to reach the present level of capacity of 65 KTPA. Expansion and modernization project for increasing the smelting capacity to 146 KTPA presently going on and expected to commission by January of 2008. For meeting the extra power requirement the captive power plant at Hirakud is also expanding from 67.5 MW to 367.5 MW. Presently the CPP capacity has already reached at 267.5 MW. HINDALCO Hirakud smelter has also taken a coal mine

known as Talabira mines near Jharsuguda district of Orissa for meeting the coal demand of it's power plant. The smelter plant is presently adding new prebaked pots it bringing drastic reduction in DC energy for electrolysis.



(HSS POT LINE OF HIRAKUD SMELTER)



(NEWLY ADDED PREBAKED POTS)

### *Energy Consumption*

Smelting of Aluminium is done by reduction method by the well known **Hall Heroult** process. Production of primary aluminium involves two important raw materials Alumina and Electrical energy. Electrical energy itself constitutes around 50% of the total production cost of producing aluminium through the smelting process. Upto late 80's, the plant was meeting its requirement for electrical power through purchasing power from the Orissa State Electricity Board. But, due to the continuous hike in tariff structures coupled with the problem of non uniform supply pattern of electrical power , the company had to establish its own captive thermal power plant (67.5 MW) in the year 1993-94 with an investment of 212 Crores. To meet the electrical power requirement of the 65 KTPA expanded smelter, another 100 MW expansion of the captive power plant was done in Mar 2005. Another power plant of 100 MW power plant was added in this year.

DESCRIPTION	UNIT	2003-04	2004-05	2005-06
Annual production	MT	60868	65620	<b>66347</b>
Total electrical energy consumption/annum	Lakhs Kwh	10333	10930	<b>11020</b>
Specific energy consumption (electrical)	Kwh/tonne	15346	15213	<b>15006</b>
Total thermal energy consumption	Mkcal	14987	14340	<b>19108</b>
Specific energy consumption (fuel)	Litres/Tonne	27.00	21.23	<b>19.21</b>

## SPECIFIC ENERGY REDUCTION

DESCRIPTION	UNIT	2003-04	2004-05	2005-06
DC energy for electrolysis	Kwh /Ton	15153	15009	<b>14942</b>
Electrical energy for Rolling ingot	Kwh/Ton	35	32	<b>28.62</b>
Thermal energy for rolling ingot	M Kcal /Ton	0.096	0.095	<b>0.1043</b>
Electrical energy for cast coil	Kwh/Ton	174	142.7	<b>135.97</b>
Thermal energy for cast coil	M Kcal/ Ton	0.509	0.49	<b>0.48</b>
Electrical energy for carbon paste	Kwh / Ton	34.5	29.75	<b>22.03</b>
Thermal energy for carbon paste	M Kcal/ Ton	0.143	0.1	<b>0.9</b>

### Energy conservation commitment and policy set up

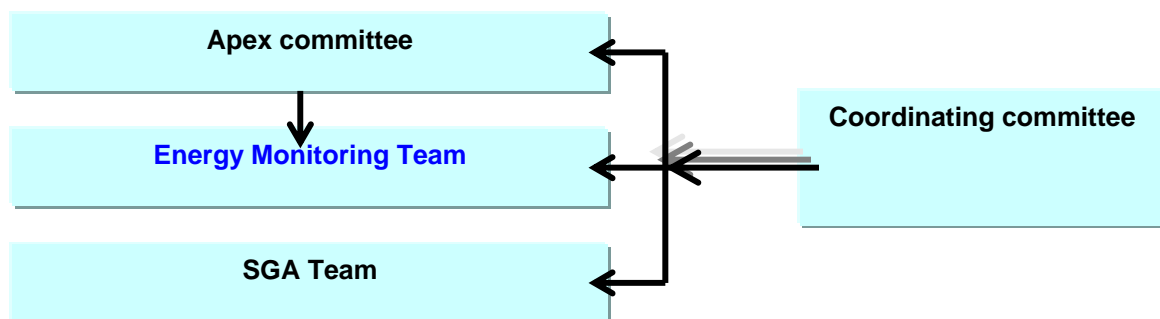
HINDALCO's Hirakud Smelter management believes that energy and resource conservation are the two building blocks for Hirakud Smelter's sustainable development. The Plant has an **Environment and Resource Management (E&RM) cell** which primarily focuses on energy conservation. The activities of E&RM cell are reviewed once a month. Measurement, monitoring, managing and implementing new small group activities / in-house projects/new technologies for energy conservation are the functions of this cell. The new proposals for energy conservation projects are discussed in the E&RM cell. Key issues like conducting energy audit through external agencies and financial approval for identified energy conservation projects also constitutes the agenda of the meeting.

In an unending endeavor to improve the energy efficiency and capacity utilisation, we have constituted an apex body namely **World Class Manufacturing (WCM) Steering Committee** which is headed by the Vice President. The World Class Manufacturing is a holistic approach which incorporates the key features of contemporary initiatives and guides to excel in the field of energy conservation, waste reduction and optimisation of resource consumption. Under this concept, excellence and competitiveness go hand in hand which facilitates and encourages all the employees to maintain abnormality free environment and operating conditions. WCM Steering Committee constitutes of 12 WCM sub committees under which there are 48 operating teams across the entire cross section of the plant.

As a continued effort towards achieving excellence in the field of energy conservation, a **Specific Energy Policy** has been formulated for Hirakud Complex, which reflects the commitments of the top management towards conservation of energy, resources and environment. We are in fact the first Indian Company in the aluminium sector to have formulated the energy policy. **The said policy was also made public by publishing it in one of the national newspaper "The Times of India" on 23 August 2002.**

Having formulated the Energy Policy & involving people through SGA approach, the next priority for the Plant is the consolidation of the fundamentals of the Small Group Activities (SGA) at the grass root level which is a challenge being faced by the Hirakud Smelter's management. For reaping the advantages and the benefits of a

concept or a practice in order to add on to the bottomline of the company, the concepts and the practices adopted need to be streamlined in the form of a well adopted system. Having established and maintained three effective and internationally recognised systems viz Quality Management System ISO 9001, Environment Management System ISO 14001 and Occupational Health and Safety Assessment Series (OHSAS) 18001 at our Hiralud Smelter, we are in process of amalgamating the best practices of all the three systems and thereby evolving a new common system which will cater to the needs of all the three established systems besides the **Energy Conservation and Management** at Hindalco Hiralud Smelter. The energy management structure at Hindalco Hiralud is given bellow-



### ENERGY POLICY

- Energy efficient power generation, aluminium smelting and casting
- Nurturing energy efficient designs and technology for all future acquisitions, where ever practicable
- Enhancing utilization of renewable energy resources, wherever feasible
- Recognizing efforts of our employees and their family members in energy conservation initiatives
- Going beyond standards, wherever economically viable
- Yardsticks, which drive us to monitor and improve energy performance through periodic reviews and skill up-gradation of our employees.

### **Energy conservation achievements:**

Year	No of SGA	Investment (Rs lakhs)	Savings (Rs lakhs)
1999-2000	21	227	169
2000-2001	29	152	179
2001-2002	31	240	212
2002-2003	35	89	197
2003-2004	36	806	712
2004-2005	35	476	496
2005-2006	30	15048	888.56

During the year 2005-06 a total of 30 numbers major energy saving projects are done at Hiralud smelter, which have resulted in a saving of 888.56 Lakhs of rupees. Few of major energy saving projects are discussed here.

## 1. VVFD for A\_43, A\_20, A\_47 Fan motors of Carbon plant.

### Before Installation:

All these fan motors are running with Y/D starter. For the control of flow manual dampers/motorized are provided in the inlet of the fan.

### Motor Capacity & Energy Consumption:

A\_43 : 75 kW : 3.68 lakhs kWh  
A\_47 : 45 kW : 1.81 lakhs kWh  
A\_20 : 45 kW : 2.15 lakhs kWh

### After Installation of VVFD

Power consumption in all fans reduced. The total saving out of the project is 9.5 lakhs with investment of 2.0 lakhs



## 2. Bypassing of screw conveyor by vibrating type Conveyor

### Situation Before

The screw conveyor was running to transfer the material from bucket elevator to the storage bins. The screw was driven by an 18.5 kW gear motor

### Situation After

The screw conveyor was bypassed by an in-house developed vibrating conveyor. The motor used in the conveyor is 3.7 kW. The total saving was 1.4 lakhs.



adjusting motor frequency. The total saving from the project is Rs 4.0 lakhs per annum

## 3. Installation of VVFD in cast House-II cold well pump motor

### Situation Before

The 60 kW motor of cold well pump was running with throttling valve to adjust the required flow for different mould size.

### Situation After

Two numbers VVFD is fitted and flow is now being control by

## 4. In House Modification of Compressor

The load unload circuit of 10 numbers reciprocating compressors are modified from analog control to digital control to save energy of Rs 19.27 lakhs per annum.

## 5. Counter flow Cooling tower In-place of cross flow cooling tower

The FTP compressor-cooling tower was replaced from cross flow type to counter flow type cooling tower. As a result the capacity of the draft fan was reduced and there was energy saving of 1.6 lakhs per annum



## 6. In house design modification of Compressor house II and III cooling tower

The cooling tower of compressor house II and III are modified to regulate the flow of water, on/ off control of the fan. Automatically adjust make-up water. As a combine result the total monetary saving out of the project was 1.5 lakhs



## 7. Operation of Prebaked pots

Hindalco Hirakud for the first time has started the prebaked pots. As the energy consumption by the operation of prebaked pots are less, there is a huge saving in electrical energy. The approximate saving derived is

### The other energy saving projects include: -

- Variable frequency drive for furnace blower
- Variable frequency drive for EOT crane
- Optimization of DC power in pot room
- Development of software to monitor pot voltage variation
- Use of transparent sheet in Cast House-I
- Use of other cleaning material in-place of diesel
- New 132 kV rectifiers for reduction of conversion loss
- Bypassing of alumina handling system cooling tower
- Use of MCCB replacing HRC fuse
- Optimization of F.O consumption in carbon plant and caster

### **ENERGY CONSERVATION PLANS AND TARGETS:**

The following energy conservation related projects have already been identified for implementation in the Plant. Progress has already been made in few of these cases as on now.

- Addition of 64 pre baked pots with 85 kA current rating
- Conversion of existing 468 pots to pre baked technology
- Installation of 4 numbers VVFD in all pump motors
- Installation of auxiliary energy management system for monitoring of auxiliary energy

The targeted DC consumption by the end of 2008 is 13500 kWh/ ton of aluminium from the present figure of 14942 and targeted AC by the same time is 15000 kWh / Ton of aluminium from the present figure of 15561

### **ENVIRONMENT AND SAFETY :**

HINDALCO, Hirakud Smelter subscribes to eco-efficiency. In other words, it entails manufacturing products and providing services in a manner that conserves natural resources, minimises wastes and ensures pollution control. Because of the above approaches, we have been certified by BVQI for **ISO 9001:2000** in November 2001. Better environment management at HINDALCO, Hirakud Smelter has enabled us to contain our production cost. At Hirakud Smelter an unending quest for environment excellence is demonstrated through implementation of Environment Management System 14001. We have been certified for **ISO 14001 by DNV**, New Delhi on 27 December 2000. Yet another major landmark in the field of Occupational Health and Safety has been implementation of OHSAS 18001. We have been certified for **OHSAS 18001** on 26 July 2001. In recognition of our energy conservation endeavors, we have been listed among the **top ten green companies** in India in a recent survey done by Business Today magazine and TERI in the year 2001. We have also been adjudged as the **best operating smelter** by International Primary Aluminium Institute three times in a row for the year 1999, 2000 and 2001. Our plant has already achieved **6.40 million accident free man hours** land mark.

Also we have won the **Shrestha Suraksha Puraskar** award for the National Safety Award for the year 1999 given by National Safety Council of India. Most recently, HINDALCO Hirakud Complex has qualified for the coveted **5 star grading** with a score of 94.6% from the **British Safety Council** for its excellent safety management practices.

Following are the major environmental initiatives few of which have already been implemented and some are planned for the future :

- We have implemented Environment Management System ISO 14001 in the smelter plant.
- A new effluent treatment plant for the colony sewage is being put with an investment of around Rs 60 lakhs.
- Installation of water meters for monitoring of water consumption has lead to a reduction of specific water consumption from 252.32 m<sup>3</sup>/MT of Al in 1996-97 to a level of 10.66 m<sup>3</sup>/MT of Al in 2001-02.
- A massive plantation drive over a period of last three years from 1999-00 to 2004-05 have resulted in the plantation of 1,50,000 trees with a investment of Rs 25 lakhs

Major pro-active steps under taken on the safety front include strict adherence to the Work permit system for overhead jobs, confined space jobs and electrical jobs,100% usage of personal protection equipments by all the employees, conduction of mock drills, demographic studies for accident prevention, safety audits by the third parties and the corporate teams, HAZOP studies etc..

HINDALCO Hirakud Smelter Plant has the rare distinction of achieving various milestones in energy, safety and system implementation fronts. Few of these significant accolades are –

- Special award on Energy Conservation from Ministry of Power, Govt. of India with first prize in National energy Conservation in Aluminium sector consecutively in 1999, 2000 & 2001
- National Energy Efficient Unit award from CII in 2001
- Longest accident free manhours recognition by IPAI, UK in 1999 & 2000
- National Award for *Shrestha Suraksha* Unit by National Safety Council (NSC) in 2001
- Achieving 6.4 million accident free manhours till date
- First Plant in Indal to get OHSAS 18001 accreditation in 2001
- ISO 14001 certification by DNV
- ISO 9001:2000 certification by BVQI
- Bagging covetous 5 star grading (94.6%) from British Safety Council in 2002

- Special prize for energy conservation (second time in row) from MOP GOI
- National safety award for longest accident free man hour 2004
- National award for lowest accident frequency rate 2004