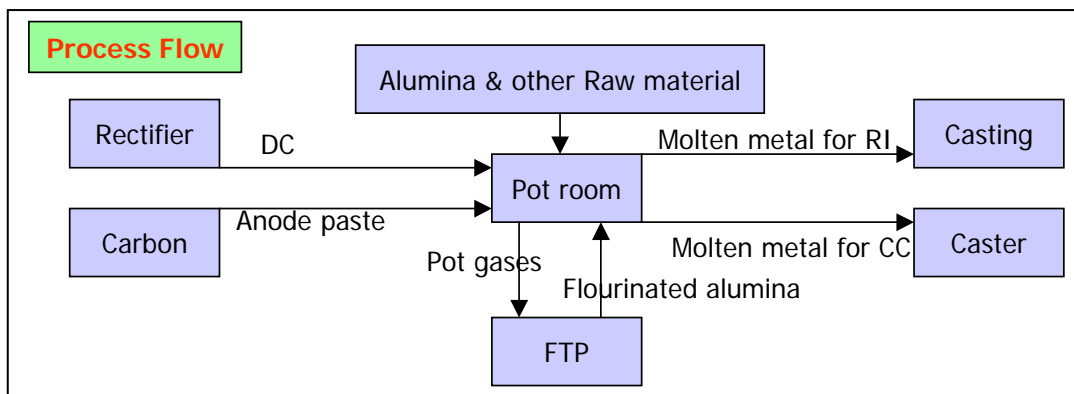


INDIAN ALUMINIUM COMPANY LIMITED

Hirakud Smelter (Orissa)

Unit Profile:

The unit is engaged in production of primary aluminum (purity 99.6%) and is presently operating at 65000 MT capacity. Although the HSS technology has become obsolete the Unit maintains high standard of performance and operates at its peak efficiency. The lining life of pots and paste consumption factor are some of the key performance parameters where the Unit has its own benchmark. 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 Electric power. Hirakud Smelter gets alumina from INDAL's Muri Works and electricity from its own Power Plant and also from State Grid . The Plant is supported by well-equipped Research & Development department. Hirakud metal in form of RI and cast coil is preferred for all downstream specialty products because of its purity and quality adding high value to the entire aluminium business of INDAL and maintaining the market leadership.



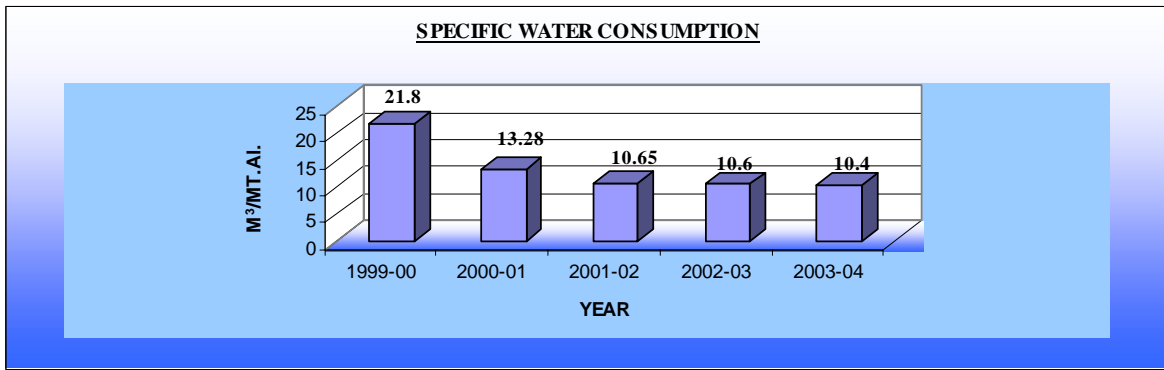
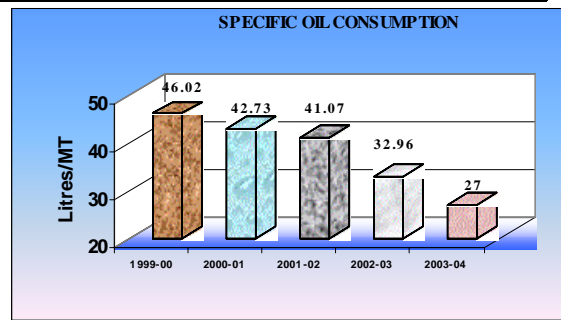
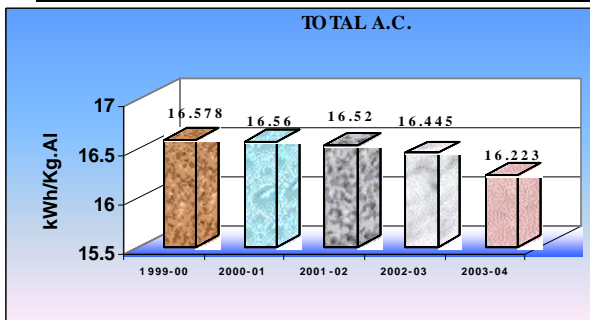
Energy Consumption:

DESCRIPTION	UNIT	2001-2002	2002-2003	2003-2004
Annual production	Tonne	30248	57200	60868
Total electrical energy consumption /annum	Lakhs Kwh	4998	6494	10333
Specific energy consumption (electrical)	Kwh/Tonne	15403	15375	15346
Total thermal energy consumption /annum	MKcals	11329	11152	14987
Specific energy consumption (fuel)	Litres/Tonne	41.07	32.96	27.00

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YEAR	ELECTRICITY		THERMAL(FUEL)	
	Consumption kwh/MT	% reduction over 2001-02	Consumption Litres/MT	% reduction over 2001-02
2001-2002	15403	-	41.07	
2002-2003	15375	0.182	32.96	19.75
2003-2004	15346	0.37	27.00	34.26

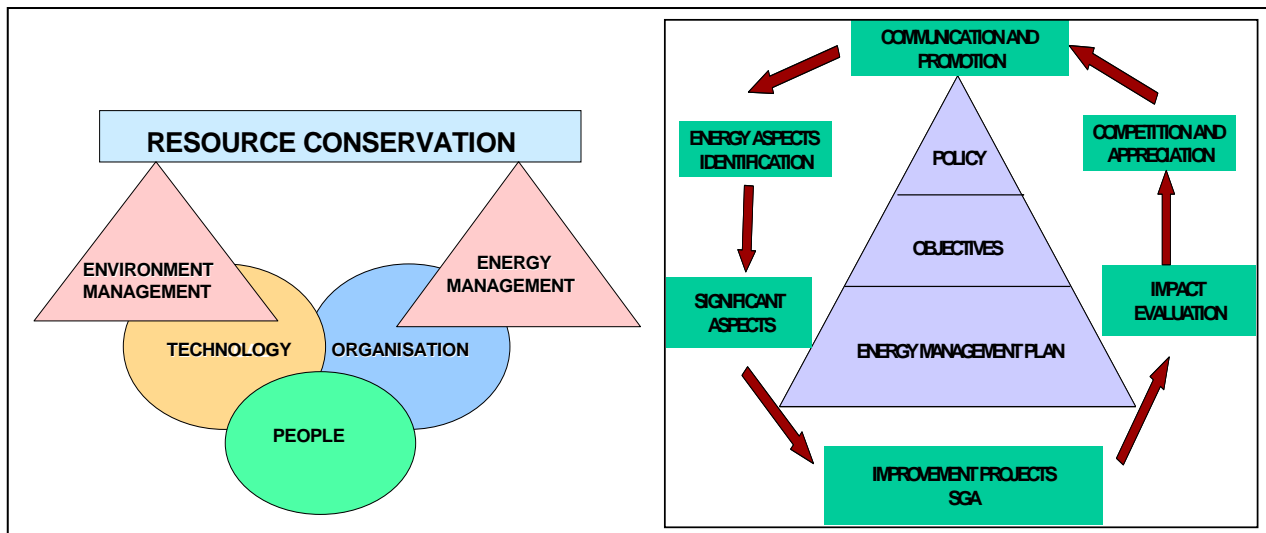


Energy Conservation Commitment, Policy and Set up

INDAL'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 Conservation (E&RC) cell** which primarily focuses on energy conservation in addition to environmental issues. Joint President is the Chairman of this cell. Also E&RC cell is headed by full time energy manager, who acts as the convenor of this cell. The activities of E&RC 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.

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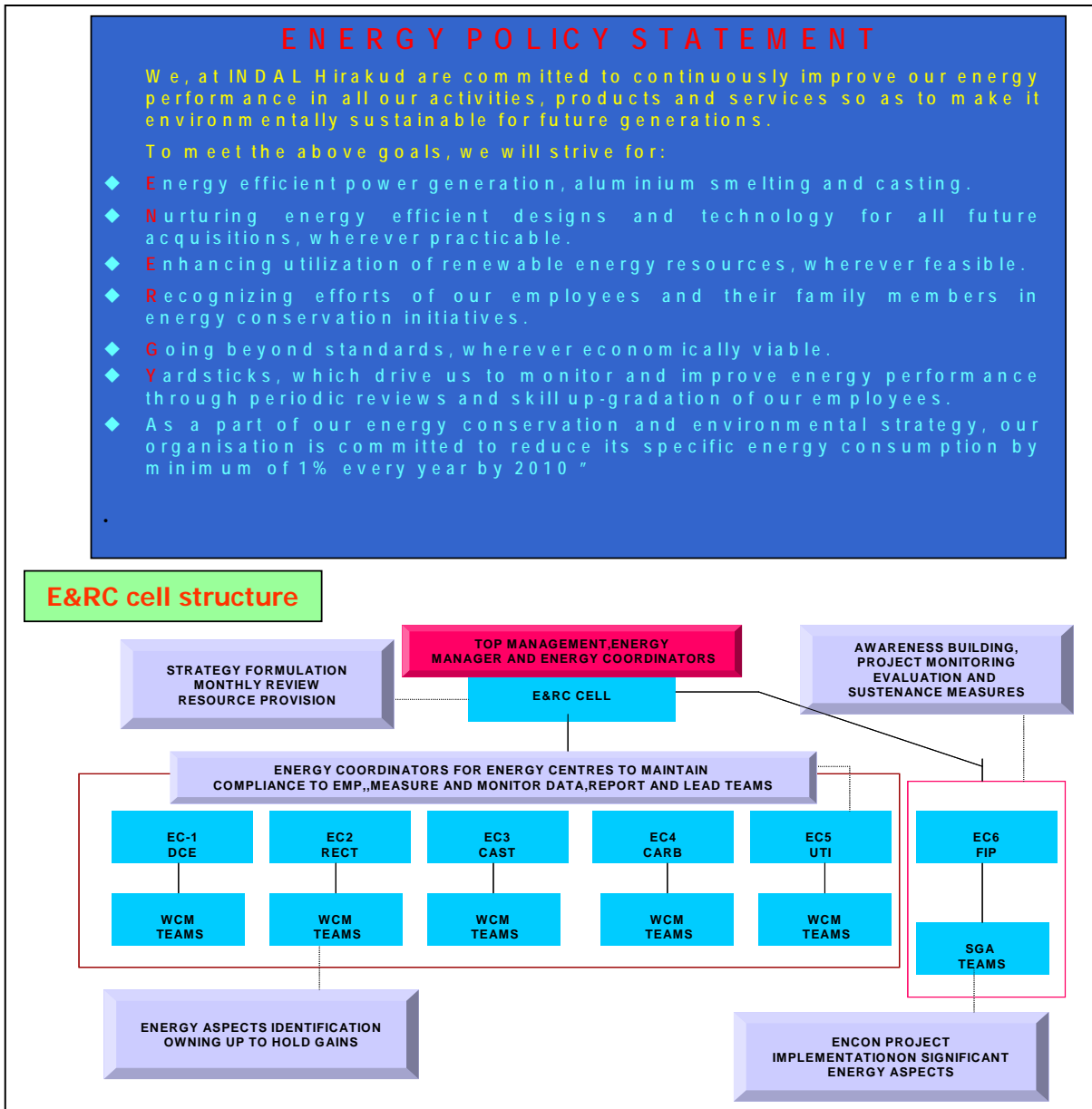
In an unending endeavor to improve the energy efficiency and capacity utilisation, the Unit has adopted SGA approach and has successfully integrated the same with ongoing Business Excellence initiative of WCM (World Class Manufacturing). Steps are being taken to make the Energy Management System a part of ISO 14001 Environment Management System so that it becomes a certified and externally audited documented system. The approach, policy, structure etc are depicted pictorially below. Energy aspects identification has already formed part of ISO14001 documented system.

Some key **best practices** of Hirakud Smelter are highlighted under:

- First to formulate a comprehensive **Energy Policy** in aluminium sector in India.
- Adopt **SGA as an integrated effort** to achieve sustained energy savings.
- Integrate SGA concept to ongoing WCM business excellence model and empowered employees working in teams to effect continuous improvement.
- **Propagate SGA learning** through experience sharing in Aluminium Task Force meets.
- Provided **exposure to renowned industries** (RIL, TISCO, SECL etc) through supporting plant visits and interaction with its SGA teams.
- Celebrate 14-21 Decemeber as Energy Conservation week every year with full rigour involving community around, chool children ,employees and colony ladies in various **knowledge sharing events, exhibition and competitions**.
- Tied up with Indian Railways to arrange **Fun & Learn Tour** for school children of Westen Orissa and teach them tips on energy conservation on board through multimedia projections and making the trips memorable for them.
- **Share the learning** of SGA projects and other initiatives with all employees over **intranet** for onward replication.
- **In house expertise** developed to train teams on mass, energy, water balance and loss calculation.
- **Various awards** have been instituted to motivate employees. The teams are also sent for participation in **state and national level competition** with their projects. For its pioneering efforts Hirakud Smelter Unit was selected to be filmed by BEE-GTZ to promote energy conservation in industries in 2004.

INDIAN ALUMINIUM COMPANY LIMITED

Hirakud Smelter (Orissa)

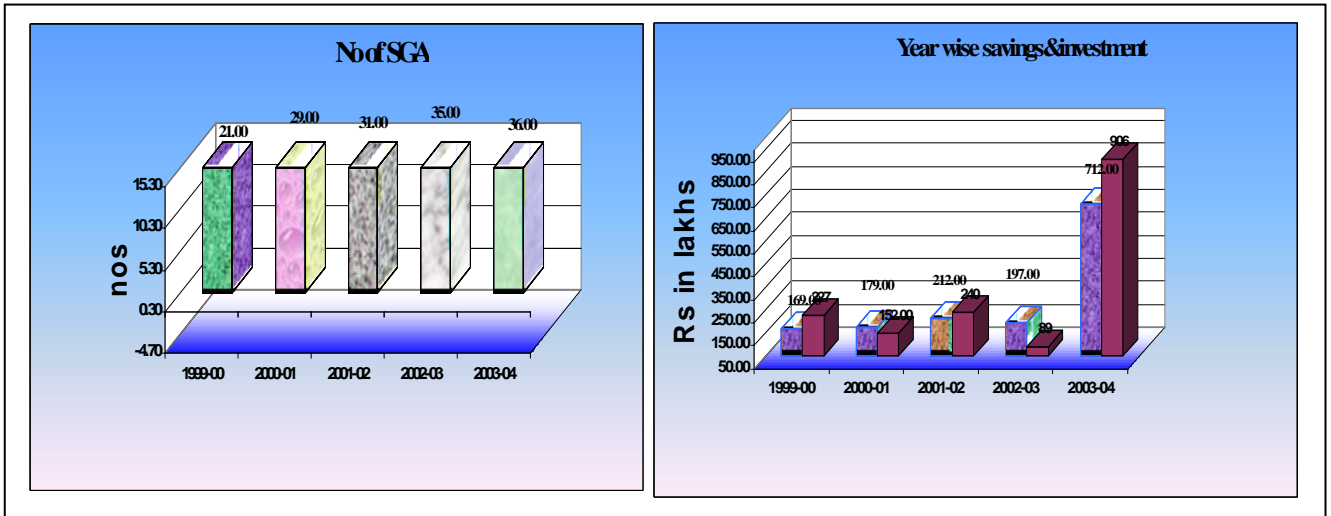


Energy Conservation achievements:

Hirakud Smelter has achieved the **highest ever savings** of **Rs 1121.86 lakhs per annum** in the year 2003-04 through an investment of **Rs 1236.36 lakhs (90.7% return)** resulting in an energy saving of **483.995 lakh Kwh** of electrical energy and **1242.73 KL of furnace oil**. In the last five years, we have been able to implement **152** energy saving projects.

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Year	No of SGA projects	Investment in Rs lakhs	Savings in Rs lakhs	Simple payback period(months)
1999-2000	21	227	169	16
2000-2001	29	152	179	10
2001-2002	31	240	212	13.5
2002-2003	35	89	197	5.5
2003-2004	36	806	712	13.5
TOTAL	152	1514	1469	12.3

List of Innovative SGA projects:

Through the SGA concept the Hirakud Smelter teams have carried out a number of innovative projects in last five years. Few of them are listed under.

- Compressor automation developed in-house for real time switch off
- Converting old transformer to a dedicated lighting transformer for plant lighting load
- Temperature based switch off of cooling tower draft fan
- Development of oil water separator in-house

INDIAN ALUMINIUM COMPANY LIMITED Hirakud Smelter (Orissa)

- Adopting hot pitch sourcing from local suppliers to bring down FO consumption
- Reduction of idle time running of thermic fluid heater through in-house control system
- Development of thyristor based control system in-house for carbon plant vibrating screens
- Auto logic system in-house for main pump house
- Auto logic system in-house for roto blast to reduce idle time running
- Auto temperature controller in-house for baking furnace
- Optimisation of fuel firing in caster furnace through burner control
- Inhouse development of guide vane damper for A-20 fan

Beside these there are a number of process optimisation projects carried out by the inspired SGA teams to reduce equipments running through in house modification in process piping,layout and set up.All these SGA projects are done with little and no investment and has been instrumental in building a high degree of ENCON awareness among employees.

The SGA projects were reviewed by BEE-GTZ during their visits and also in the aluminium taskforce meets.These platforms also have helped to energise the spirit of Hirakud SGA teams.

Over the years, the SGA teams of Hirakud have grown up in skill and have matured in identifying energy saving opportunities by themselves.With the support and inspiration by the top management every year SGA projects are launched and completed to make Hirakud Smelter a Energy Conscious Unit.

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Major Energy Conservation Projects (2003-04):

1. Electrical Heat Tracer in carbon plant:

Electrical heat tracing system, capable of producing heat up to a temperature of 230 deg. C was planned and adopted for the entire pitch line and the thermic fluid line. The boiler was rendered idle.

This is for the first time used in the country for similar application like heating of pitch.

Before EHT installation oil consumption= 22 litre/tonne

After EHT installation oil consumption= 12 litre/tonne

Saving due to heat tracer = Rs 62.5 lakhs

Investment made= Rs 17 lakhs



Heat tracer with panel

2. VFD in Rectifier Station Cooling Tower:

The hot well pump motor of rectifier cooling tower runs continuously to pump water to the cold well tank. It was observed that there was unnecessary wastage of electrical energy due to valve throttling. Hence suitable VFD is installed which reduced the RPM of pump.

Before VFD power consumption= 73 Kw

After VFD power consumption= 18 Kw

Saving due to VFD= Rs 9.6 lakhs

Investment made= Rs 3.5 lakhs



VFD in cooling tower

3. Furnace oil consumption reduction in caster plant by increasing throughput:

Through in house efforts the set up time was brought down by changing certain work practices. It was taken up with the customer to place higher batch size orders and higher width orders through cast coil route. With this the caster furnace utilization was optimized.

Set up time before= 6 hrs
Volume before= 7200 Tonne
Oil consumption before= 70 litres/Tonne

Set up time after= 4 hrs
Volume after= 9600 Tonne
Oil consumption after= 52 litres/Tonne
Savings= 22.6 lakhs
Investment= nil



Cast coil

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4. In house design & development of TP-10 PLC based Thermopac Control System:

The old relay based control system was upgraded to the new PLC based system , **developed in house**, the feature of firing modulation was included. As a result of this feature the fuel consumption of TP-10 thermopac has reduced by 5 % . resulting in a saving of 16.848 KL per annum.

Oil consumption before= 340 KL/year
Oil consumption after= 323 KL/year
Saving due to new control system = Rs 2.2 lakhs/-
Investment made= Rs 0.17 lakh

5. Replacement of copper pipe in pot door mechanism to arrest leakage of compressed air:

The copper pipes were replaced with **temperature resistant rubber hoses** with clamps in all 468 pots thus eliminating chances of air leakage in the pneumatic cylinders. This resulted in switching off one 550 cfm compressor(90kw) in our compressor house.

Saving due to compressor switch off = Rs 12.6 lakhs
Investment made= Rs 0.65 lakh

6. Bringing down Rod to Stud drop in pot line through ownership concept among operators:

The entire potline was divided into 4 groups through the ongoing WCM activity and a focused attention and data monitoring was started to reduce this. For monitoring the drops shift wise a data logger was hooked up and connected to the in-house developed PEAS (Pot Room Efficiency Analysis System). Performance monitoring of individual operator is done in a visually depicted result sheet and competition among 4 groups was started with weekly appreciation of the winner. The rod to stud drop was reduced by 10 mV per pot by the above process of assigning team ownership.

Saving due to reduction of RS drop = Rs 45.1lakhs
F) Investment made= Rs 0.1 lakh



Thermopac control panel



Pot line



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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 of now.

- Mathematical modeling of pots to design new efficient cathode and pot lining.

Investment planned: Rs 32 lakhs Estimated Savings: Not estimated

- Lithium trial in pots to improve current efficiency.

Investment planned: Rs 10 lakhs Estimated Savings: Rs 40 lakhs/annum

- Point feeders installation in all 468 pots to reduce Anode Effect Frequency and increase current efficiency.

Investment planned: Rs 691 lakhs Estimated Savings: Rs 150 lakhs/annum

- Semi graphitic blocks for all pots to realize less voltage drop.

Investment planned: Rs 880 lakhs Estimated Savings: Rs 450 lakhs/annum

Environment and Safety:

Indal, 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 Indal, 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, Indal has been listed among the **top ten green companies** in India in a 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, Indal's 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

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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.
- A new spent pot lining storage facility is being built for storing cathode residues with an investment of Rs 80 lakhs.
- Dry Scrubbers are installed for further reducing the environment pollution load with an investment of Rs49 Crores.
- Point feeders are being installed in order to reduce the fluoride emissions by reducing the anode affect frequency.
- Improved pot doors being installed in the pots to reduce the fugitive emissions at source.
- A massive plantation drive over a period of last three years from 2001-02 to 2003-04 has resulted in the plantation of 53,000 trees with a investment of Rs 11.56 lakhs and steps taken to ensure a minimum survival rate of 80%.
- 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.

Awards and Accolades:

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

- Excellence award from MOP for energy conservation in 2003
- 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 4.97 million accident free manhours till date
- First Plant in Indal to get OHSAS 18001 accreditation in 2001
- ISO 14001 recertification by BVQI in 2004.
- ISO 9001:2000 certification by BVQI

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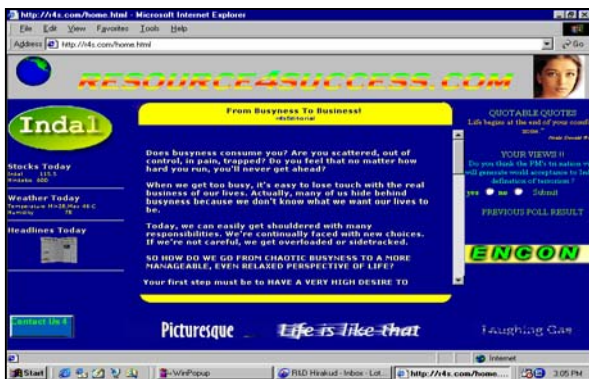
- Bagging coveted 5 star grading (94.6%) from British Safety Council in 2002 and also British Sword of Honour.



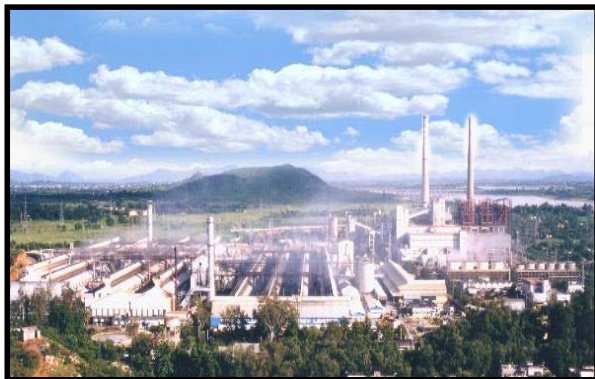
Fume treatment plant



Recognition to SGA teams



ENCON directory in Intranet



Hirakud Complex-2004