ENVIRONMENT, POLLUTION CONTROL, SOLID WASTE MANAGEMENT & ENERGY CONSERVATION

STEEL AUTHORITY OF INDIA LIMITED

Environment Management

There was improvement in environmental performance over the last year as evident through reduction in Particulate Matter Emission (18%), reduction in Specific Water Consumption (12%), reduction in Specific Effluent Discharge (7.4%) and increased recycle/reuse or commercial disposal of process solid wastes (over 70% utilisation).

Another important milestone is the partnership of SAIL with the Ministry of Environment & Forests. SAIL is one of the signatories to the National Charter on Corporate Responsibilities floated by Ministry of Environment and Forests whereby SAIL and other Indian steel players are to implement a time bound voluntary action plan for Pollution Control in the Steel Industry.

During the year, various environmental awareness programmes, afforestation drives, and observance of World Environment Day, Earth Day, International Ozone Layer Protection Day, Environment Month, Mines Environment & Mineral Conservation Week etc. have been organised in SAIL to mark the consciousness towards a better and cleaner environment. In addition, several training programmes have been organised to sensitise the SAIL collective on environmental issues.

Energy conservation efforts

SAIL recognises the importance of global warming and the need for greater energy saving measures, which will considerably reduce the CO2 emissions. In the last five years (1998-99 to 2002-03), there has been a significant reduction in the specific energy consumption, to the tune of 7.1%.

- In order to conserve energy and thereby reduce CO2 emission, various energy saving schemes are being undertaken in the steel plants of SAIL.

Greening efforts

Extensive plantation has been carried out in and around the SAIL plants and mines over the last decade. Over 12 million trees in over 9,000 ha. have been

planted so far in SAIL plants and mines. During the year, 2002-03 alone, about 84,600 saplings were planted at SAIL units covering an area of 59.475 Ha.

Afforestation

Environmental Plantation have played a significant role in the protection of environmental and ecological balance. Afforestation drive has been initiated at all units through various awareness programmes. All captive mines have developed their own nurseries to feed these afforestation drives on a regular basis. Approximately 18% of total land holding in SAIL is covered under afforestation. Around 17 million plants (upto April 2002) were planted over an area of around 9162 ha.

These efforts were continued during 2002-03, as is evidenced with the following data:

Greenery efforts at SAIL units (including mines)

Year 2002-03

PLANTS	AREA COVERED (Ha)	SAPLINGS PLANTED
BSP	22.0	30,000
DSP	5.0	5,000
RSP	12.0	26,791
BSL	-	15,000
IISCO	0.61	1,500
ASP	-	-
SSP	0.40	677
VISP	0.40	100
MEL	2.0	5,000

MINES	AREA COVERED (Ha)	SAPLINGS PLANTED
Barsua	0.57	700
Bhawanathpur	7.25	8,000
Meghahataburu	0.39	500
Kuteswar	2.5	2,800
Bhadigund	Naturally stabilized and afforested trees grown up covering all the areas	1,000
Purnapani	1.75	2,000
Dalli	14	15,500
Kemmangundi	0.25	200
Nandini	Fully rehabilitated	-

INDIAN IRON AND STEEL COMPANY LIMITED (IISCO)

Environment Management and pollution control has been given priority in all the activities of the Company. Ambient air stack emission and work environment quality are within specified limits of the statutory authority. As a result, nominal rebate of cess on water has been received from the State Pollution Control Board. Further, consent for air emission, effluent discharge and hazardous waste handling/disposal has been received from the State Pollution Control Board.

Industrial Water Consumption was limited per tonne of Crude Steel to 7.01 cum/tcs in 2002-03. No cess had to be paid to DVC because of less withdrawal of water from Damodar River than the permissible limit. Drinking water consumption in works was reduced by 5% compared to last year.

Consequent upon laboratory's recognition from CPCB and WBPCB, the company is rendering services to the nearby industries on a commercial basis.

MAHARASHTRA ELEKTROMELT LIMITED (MEL)

Environment Management and pollution control continued to get top priority in company's activities during the year. To keep environment clean for ecological protection, thrust was given in the areas of green belt development in and around the plant premises, solid waste management, monitoring of liquid and air effluent for various environmental parameters. In addition to the regular maintenance of existing teak trees and other trees, 5000 tree saplings were planted during the year.

Continuous steps were taken towards gainful utilization of High MnO Slag in SiMn Production, Lumpy SiMn Slag as rail ballast and Sale of SiMn Slag for road construction.

RASHTRIYA ISPAT NIGAM LIMITED (RINL)

At VSP, utmost priority is given to environment management. Several initiatives are taken to ensure a clean and green environment. Some of the salient features are:

- Ambient air parameters (SPM, SO_2, Nox) are maintained within the norms.
- Effluent parameters are by and large within the norms except ammoniac nitrogen, which was marginally higher than norm.
- Stack emissions are within the norms.
- Ambient noise levels are monitored as per consent and are within norms.
- Fugitive emissions from coke oven batteries are monitored and are within norms.

Afforestation

The afforestation programme has earned recognition from various quarters and VSP was awarded the prestigeous Indira Priyadarhsini Vrikshamitra Award as early as in 1994. An area of 3465 ha., which is 39% of the total acquired land of 8,827 ha., has been earmarked for extensive afforestation. A 500 m wide (1970 ha) green belt has been developed around VSP's acquired land boundary. Till March 2003, 3381 ha has been covered under plantation and 35.86 lakh trees have been planted. During 2003-04, 38,000 trees have been planted, covering an area of 45 ha.

Apart from large scale plantation, development of parks and horticulture works such as avenue plantation, landscaping around public buildings have also been done. Several parks, landscapes and fountains have been developed inside the steel plant to give an aesthetic appeal to the work environment.

Energy conservation

Specific energy consumption

At VSP, several steps are taken on continuous basis to reduce the specific energy consumption. As a result, there has been a steady decline in the specific energy consumption over the years.

Year	Gcal/tLS
2001-02	6.62
2002-03	6.13
2003-04 (Apr.-Sept.)	6.08

Future plans for reduction in energy consumption

- Usage of coke oven reversal pause gas
- Additional stream for LD Gas recovery at SMS
- Auxiliary fuel injection in BF

NATIONAL MINERAL DEVELOPMENT CORPORATION LIMITED (NMDC)

- Environmental monitoring studies for the year 2003-2004 have shown that all the environmental parameters are found to be within stipulated norms.

Details of action taken in the current year 2003-04 are as follows :-

(i) **Bailadila.14/11C Project, Kirandul, Dantewada Dt, Chhattisgarh**.

- 91 hectares area has been afforested in the forest blank areas of Mining leases of Bailadila Dep-14, Dep-14 NMZ and Dep-11 as per the MOU signed between Chattisgarh state forest department and NMDC in August 1999.
- 3 check dams over Nalla No.11C, have been constructed.
- Desilting of 2.0 lakh cu.m of material from tailing dam and nala at Bailadila 14/11C completed at a cost of Rs 68.40 lakhs during the period 2002-2003 and desilting of 10 lakh cu.m of material is in progress.
- Preparation of contour bunding at Dep-14 and Dep-11C mines.
- Maintenance of Effluent Treatment Plants (ETP's) at service center complex for removal of oil and grease in the effluent discharge.
- Regular use of completely automized dust suppression system installed right from the Dep-11C crushing plant till the loading yard for dust suppression.

(ii) **Bailadila. 5 Project, Bacheli, Dantewada District, Chhattisgarh.**

- Desilting of all check dams (25000cu.m silt/fines) and Nerli dam (25000cu.m silt/fines).
- Three new check dams have been constructed on the hill slopes of the mining areas in order to control runoff of fines material at Hill Top area.
- 2 No. of Effluent Treatment Plants have been constructed to remove oil and grease in the effluent discharge water at Auto shop at Bacheli and at Hill top HEM equipment service center.

(iii) **Donimalai iron ore project, Donimalai Township, Bellary Dt, Karnataka**

- Constructed two effluent treatment plants at auto shop and service center for removal of oil and grease from the discharge water.
- Planted 10,000 saplings with in mining lease area at Donimalai. 50,000 Agave bulbs were planted on non-active waste dumps in Donimalai M.L. Area.

- Constructed an earthen dam on Ubbalagandi nala, East of South block at Donimalai.
- 5 Girdle walls have been constructed below waste dumpsites both in North Block and South Block.
- Construction of pick up weir across the natural stream beside Govt. High school, Donimalai is completed.

(iv) **Diamond Mining Project, Majhgawan, Panna**

- Effluent treatment plant (ETP) for removal of oil & grease from discharge water at H.E.M Workshop premises has been constructed.
- Children Park has been developed in Majhgawan Township.
- 5,000 saplings have been planted during the current year.
- Construction of a new check dam along Kaimason nala has been completed.
- Desilting of material from tailing pond is in progress.

MANGANESE ORE INDIA LIMITED (MOIL)

Eco- Development and Environmental Preservation:

Mining of minerals, particularly by open cast method, adversely affects the environment, resulting in degradation of land on a large scale. Considering the nature and extent of problem and concern of conserving the environment, MOIL, took a lead in massive afforestation in the company's mines, with special emphasis on reclamation of mined areas and rehabilitation of soil dumps, supported by exhaustive research and development. This has helped to improve the mine environment.

The company's strategy towards eco-friendly mining encompasses the following,

- Scientific Mine Planning.
- Effective Pollution Control measures.
- Optimisation of resource utilisation.
- Regular monitoring.
- Biological reclamation.
- Rehabilitation of reclaimed areas.
- Rural and community development.

Strategy for Afforestation :

Eco-development and creation of massive green cover envisaged plantation of hard wood to meet the future timber needs of the country, besides restoration of ecology. Additionally, certain areas have been covered by shrubs and grass for a greening effect and checking erosion. The company's approach incorporates the following:-

a) General afforestation in and around mines with appropriate scientific techniques with species suitable for the area.

b) Specific aggorestation on mine spoil dump using integrated biotechnology.

c) Rejuvenation of mine dumps through IBA.

Status of Afforestation and Future Plans :

More than 12 lakh saplings have been planted upto the 2000-2001 plantation season, and the survival rate is 80%. The major species planted are Shishum, Cassia, Teak, Neem, Eucalyptus and Mangoes.

Almost three fourth of the total land available within the company's leasehold area and separable for plantation activity has already been covered under plantation. It is planned to cover the entire area available for afforestation within the coming 3 to 4 years, and also to ensure high survival rate of the existing plantation including re-plantation/ rejuvenation of the saplings wherever necessary.

MOIL, is also taking the initiative to arrange plantation in the nearby places such as local schools, along road side and even at Govt. Leased out land adjacent to lease hold areas.

Other Parameters affecting the environment :

i) **Water Regime** :

Only pure water is discharged to nearby nallas and agricultural land, after duly ensuring that the suspended solids are removed.

ii) Air borne Dust in Open Cast Mines :

To keep air free from dust, the company is sprinkling water on the mine roads in a regular and systematic manner. Regular monitoring of dust levels, Oxides, Nitrogen and SO2 are carried out.

iii) Noise :

Generally noise level in the mine is very much below the threshold limit and only at certain spots i.e. compressor house and drilling site, the noise level is high. To keep the level within the threshold limits, regular maintenance of machines is done. Employees at these sites are also provided with earplugs.

iv) Vibrations :

Regular R & D inputs in respect of heavy blasting, are done for reduction in blasting vibrations, improvement in regular fragmentation by engaging specialised research institutes and academic bodies such as CMRI and VRCE. Delay Action Detonators and restricted charge per hole/per delay are used to limit the ground vibrations due to blasting and its effects.

v) Solid Waste Management :

The process of mining generates huge solid waste to be dumped on the surface and incident of solid waste is very high in open cast mines. MOIL is now systematically dumping solid waste separately for magnaniferous rock and non-manganiferous rock so that in future when technology for utilising the low grade manganese ore is developed these magnaniferous dumps can be worked at much lessor cost to win low grade manganese ore.

SPONGE IRON INDIA LIMITED (SIIL)

All the provisions in the gazette notification dated 16.01.1991 and amendments thereof are complied with strictly. All the norms specified by A.P. Pollution Control Board/Central Pollution Control Board are strictly adhered to and all the parameters are being well maintained within the limiting standards stipulated. The local Pollution Control Board Officials carry out periodical inspection and as recommended by them from time to time necessary steps are taken to ensure that prescribed standards are maintained.

The waste land that is available is proposed to be levelled to develop greenery as a part of clean and green programme by planting saplings.

MECON LIMITED

Energy Conservation

MECON submitted a project report on the "Energy Efficiency Improvement in Steel Re-rolling Sector in India" which is a UNDP (United Nations Development Project)/GEF (Global Environment Facility) assisted project taken up by the Ministry of Steel, Govt. of India which is the executing agency with Development Commissioner for Iron & Steel as the implementing agency.

The objective of the study is to introduce energy efficient technology packages for the steel re-rolling units in India and thereby facilitate removal of barriers for energy efficiency and energy conservation in this sector. Steel re-rolling units were studied in depth to identify various energy wastage and/or deficiencies and technology gaps. This will give an opportunity to introduce low GHG (Green House Gas) emitting technology in this sector.

With the introduction of Energy Bill – 2000 in the Parliament on 24th Feb, 2000 Energy Audit has become mandatory for Power Intensive Industries. MECON has been registered as an Authorised Energy Auditor by the Ministry of Power, Industrial Development Bank of India and various State Governments.

BHARAT REFRACTORIES LIMITED

All units of the company have obtained/applied for valid "Consent" from the concerned State Pollution Board . Dedusting units have been installed at the Plants to control air pollution. The norms prescribed are strictly complied with.

Energy Conservation:-

Some of the steps taken for improvement in conservation of energy are as under :

a) Pre-heating of furnace oil is done for achieving better atomisation of oil in burners

b) Callibration of Fuel pump and nozzel of engines at regular intervals.

c) Adoption of appropriate setting pattern of green bricks

d) Use of recommended lubricating oil for engines

e) Switching off unwanted load for reducing electricity consumption

f) Conversion of Producer Gas Plant from Coke to Coal fired.

BIRD GROUP OF COMPANIES

Afforestation and Pollution Control

The Orissa Mineral Development Company Limited (OMDC) has covered 102.76 hects area under afforestation programme which covers avenue plantation, plantation under Government waste land along with stream course around workers colony etc. OMDC and BSLC have made arrangement for dust suppression through sprinkling of water over haul roads through pressurized nozzles as installed at the crusher plants. Environmental monitoring is being carried out on a continuous basis as per guidelines of the concerned Pollution Control Boards. The companies organize environment awareness programmes in order to create awareness amongst the employees and villagers as regards impact of pollution and its abatement.

TATA IRON AND STEEL COMPANY LTD.(TISCO)

Reclamation & Afforestation Measures

- Massive plantation in all the units of Tata Steel during Green Millennium Count Down started in 1998 to plant 1000 trees/day for 1000 days to greet new millennium with one million trees planted by Tata Steel.
- More than 3.76 million saplings were planted covering more than 400 hectares at Mines during 1997 to March 2003.
- More than 200 hectares of mined out areas have been reclaimed with plantation so far.
- Survival rates have been improved from 30% to 85% by providing protection to the saplings planted and watering the same during dry periods during past 10 years.
- Trials were conducted to identify the species to be planted during the Afforestation programmes during reporting period.
- In-house nurseries to develop the saplings for Afforestation. Total capacity to raise 0.4 million saplings every year through out the Company.
- Sir Dorabji Botanical Parks have been developed at West Bokaro, Noamundi and Joda during past 8-10 years. These parks house ornamental plants, fruit trees, more than 250 varies of cactus, 70 varieties of roses, rare flowering plants, rock gardens, spices, condiments, and medicinal plants.

Energy Conservation

Energy Consumption – Gcal/tonne of Crude Steel

Year	Plan / Target	Actual Performance	Improvement over previous year %
2001-02	7.303	7.260	3.16
2002-03	7.234	6.975	3.93
2003-04 (Apr-Sept.)	6.900	7.026	-0.73

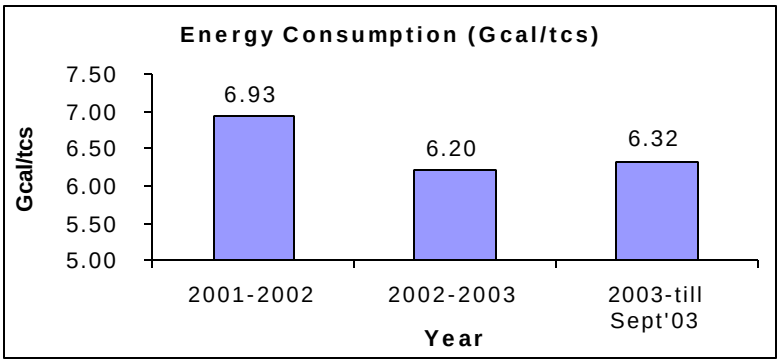
Electricity Consumption – Kwh/t of Crude Steel.

Year	Plan / Target	Actual Performance	Improvement over previous year %
2001-02	435	398	0.25
2002-03	402	371	6.78
2003-04 (Apr-Sept.)	384	375	-1.08

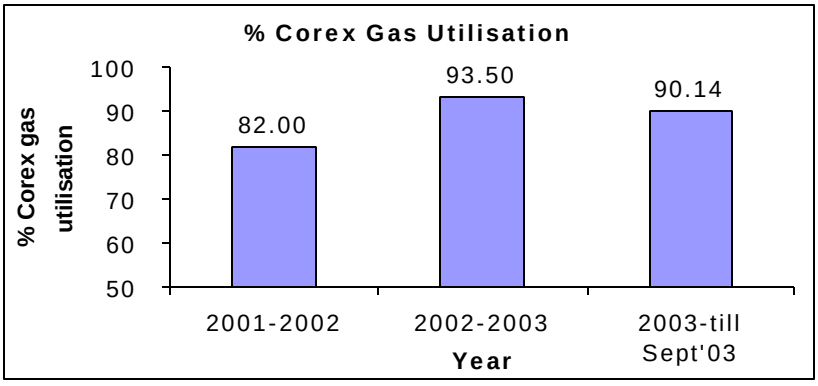
JINDAL VIJAYANAGAR STEEL LIMITED (JVSL)

Energy Cconservastion

Energy Consumption in Gcal/tcs:- Energy Consumption in Gcal/tcs at JVSL is
shown in the below figure,



Energy efficiency can be improved by increasing corex gas utilisation.
The trend of corex gas utilisation in JVSL is as shown in the figure



The following steps were taken to improve the corex gas utilisation

- Commissioning of Corex GasHolder in July '2001 which has improved supply of Corex gas at constant pressure and constant CV.
- Commissioning of SCADA system at Energy centre in Sept' 2001. This system has given a information based decision making tool to operator to optimally utilise the available gas depending on the Corex gas generation & consumption levels.
- Reduction of Petro fuel Consumption. The Petrofuel consumption has reduced from 4.49kg/tcs in 2000-2001 to 1.2kg/tcs in 2002-2003..

Reduction in Corex gas Consumption in HSM

Direct charging of hot slabs from Continuos Casting Plant to Hot Strips Mill (HSM) to re heating furnace has resulted in reduction of the specific corex gas consumption in HSM from 175Nm3/ton to 140Nm3/ton

Reduction in Power Consumption

Initially there were Corex gas boosters for the Pellet Plant & LCP for boosting the corex gas pressure to higher process for the process requirement. A modification at Corex was done to supply high-pressure Corex gas to the Pellet Plant & LCP, thus removing Corex gas boosters from the system. This has resulted in reduction of appx. 11-12kwh/tcs.

B. Future Plans to reduce the Energy consumption

Efforts are being made to further improve the corex gas utilisation to the level of >96% on yearly average basis. A cross-functional team have been formed to study the same in detail.

The company has taken the help of M/s. Tata Energy Research Institute, Bangalore for carrying out the Energy audit to find out the possible areas in JVSL where reduction in electrical energy consumption can be achieved. Some short-term measures are already implemented and other recommendations are to be implemented by taking into consideration the technological / process requirements & the immediate expansions of the plant.

ISPAT INDUSTRIES

Energy Conservation:

Plan for reduction of Specific Energy consumption and measures already taken :

- Ramping up of the HSM productivity/production from the present 1.8 MTPA to 2.4 MTPA quickly by stabilizing the Steel Melt Shop operation with CoJet Oxy-fuel lances (4 nos. on each shell). This will result in optimal utilisation of all the facility resulting in lower energy consumption.
- Optimisation of Tunnel Furnace (Roller Hearth Furnace) operation to optimise the LDO consumption.
- Usage of Coal as partial replacement of Coke through Tuyer injection along with Oxygen at Blast Furnace.
- Installation of Energy Conservation Transformers for Lighting: By reducing 10% voltage on Lighting circuits through energy efficient transformers, a saving of 20% energy is achieved.
- Stoppage of Cooling Tower Fans: The company has multi-cell Cooling Towers. The Cooling Tower fans are being stopped by continuous monitoring of the water temperature
- Savings on pumping energy: By continuous monitoring of Cooling Water temperature and by stopping / throttling the valves, the energy of the utility pumps is saved. Replacement of Metallic Blades by FRP Blades of Cooling Towers Fans: The metallic blades of the Cooling Towers have been replaced with FRP blades to save the energy.
- Conversion of Air-conditioning system to AHU system: The surplus capacity of Chilled Water has been utilised for AHU system and replaced Air-conditioners to save the energy. The Chilled Water is generated by waste heat.

SESA GOA LIMITED

Mine land reclamation:

Sesa Goa's afforestation and Environment Management efforts started in the sixties when the word "**Environment**" was not known in the true sense in this part of

the world. The plantation undertaken on the exhausted mine are now converted into the Horticultural Orchard, with rich harvest of cashew.

At Sesa Goa, planning for environmental management and mine operation go hand in hand. Mine land reclamation is one of the main criteria considered in planning for long term mine development. Computer models are used to design the mine in various pits/basins and ore from these basins is recovered in sequence. This practice ensures that the mine leases are systematically developed and reclaimed.

In Goa exhausted pits are initially used as tailing ponds and then ultimately for overburden disposal. Thus reclamation is undertaken concurrently with mining. At other Sesa Goa mines i.e. Karnataka and Orissa a sequential development approach is also adopted wherein a section of the mine pit is developed, the ore removed and then the section is backfilled and reclaimed before moving to the next section. Till date Sesa Goa has planted more than 15 million trees covering an area of more than 700 Ha. Most of the saplings are grown in the company's nursery by techniques called "**Root Trainers**".

The Company had undertaken a unique research project entitled "**An Integrated Bio-Technological Approach for Mine Land Reclamation**" at its Codli Mine, for mine land reclamation. The project was initiated in collaboration with National Environmental Engineering Research Institute (NEERI) Nagpur, the Department of Bio-Technology, New Delhi and the University of Lund, Sweden. The project has been successful and the technology developed is now being promoted for the reclamation of other mine sites in the region.

Company has signed a Research Project with the Goa University to undertake research on isolation, culturing and development of mycorrhizae that are best suited for the plant growth. The research project is co-ordinated by the microbiology department and company has sponsored a Research Project for laboratory as well as field trials.

Sesa Goa has also pioneered the use of "**Geotextiles**" (erosion control blankets) made up of coir and jute for controlling erosion on waste dumps for reclamation.

Sesa has developed an "**Agri-horticultural Approach**" for mine land reclamation wherein overburden dumps are converted into horticultural orchards while exhausted pits are developed into the pisciculture ponds.

Water management:-

At Sesa Goa, water conservation and efficient utilization is accorded a top priority. Plant tailings after ore beneficiation are disposed of into exhausted pits and are treated with flocculants to separate the solids and water. The water is recovered and recycled together with rainwater accumulated in the working pits for use in ore beneficiation. This practice ensures 100% reuse of water and zero discharge of effluents/tailings outside the mine lease.

At Sesa Industries and Coke Oven Plant, water used for cooling and quenching is treated in clariflocculator and settling to recover 70% water. Reverse Osmosis process is utilized at Sesa Industries and Sesa Kembla for desalination thus conserving ground water.

A separate Environment Cell exist and is equipped with the necessary laboratory facilities and instruments to monitor all relevant environmental parameters and to develop and implement mitigative measures and environmental enhancement procedures. The environment laboratory at Codli Mine is accredited by the Ministry of Environment and Forest.