Annexure 'A' to Directors' Report

PARTICULARS REQUIRED UNDER THE COMPANIES (DISCLOSURE OF PARTICULARS IN THE REPORT OF THE BOARD OF DIRECTORS) RULES, 1988.

A. CONSERVATION OF ENERGY

a) ENERGY CONSERVATION MEASURES TAKEN :

i) Conversion of boiler no. 5 & 6 stroker coal fired boilers at Power House No. 3 into by-product gas fired boilers.

ii) Commissioning of 2nd LD Gas holder to enhance LD Gas Recovery.

iii) Phasing out of old and inefficient coal fired boilers at Boiler House No. 1

iv) Upgradation of E blast furnace to high top pressure operation thereby reducing blast furnace fuel rate.

b) ADDITIONAL INVESTMENTS AND PROPOSAL FOR REDUCTION OF CONSUMPTION OF ENERGY :

i) Modification of two numbers of stroker fired boilers into by-product gas fired boilers at Power House No. 3 to reduce boiler coal consumption.

ii) Installation of Top recovery turbine at 'G' & 'H' Blast Furnace.

iii) Recovery of sensible heat of coke by installation of Coke Dry Quenching system in Batteries 5, 6 & 7 at Coke Plant.

iv) Phasing out of inefficient boilers and replacement of old and inefficient Blast Furnace blowers.

v) Use of lean by-product fuel at re-heating furnaces by adopting regenerative burner technology.

c) IMPACT OF THE ABOVE MEASURES :

Energy Conservation measures during 2006-2007 has resulted in achieving:

i) Lowest ever Plant Specific Energy Consumption of 6.717 Gcal/tcs.

ii) Lowest ever boiler coal consumption of 66.77 kg/tss.

iii) Lowest ever Plant Power Rate of 398.52 kwh/tss.

iv) Higher LD Gas Recovery of 55.51 NM^3/tcs.

v) Lower specific oxygen consumption of 54.55 Nm^3/tcs at steel melting shops.

vi) Reduction in process steam condensate loss of 23.12 tonnes per hour.

vii) Higher combine boiler efficiency of 81.48%.

Form - A

Form for disclosure of particulars with respect to Conservation of Energy : 2006-2007

Particulars	2006-2007	*2005-2006*
A. POWER AND FUEL CONSUMPTION		
1. ELECTRICITY		
a) Purchased		
Units (M. KWH)	**1,980.45**	*1,871.27*
Total Amount (Rs. Lakhs) #	**52,287.26**	*50,028.41*
Average Rate/Unit (Rs./KWH)	**2.64**	*2.67*
b) Own Generation		
i) Through Diesel Generator		
Units (M. KWH)	**22.68**	*12.96*
Units per litre of Diesel Oil (KWH)	**3.97**	*3.91*
Average Cost/Unit (Rs./KWH)	**10.31**	*13.50*
ii) Through Steam Turbine/Generator		
Units (M. KWH)	**955.05**	*1,018.88*
Units per tonne of Coal (KWH)	**2,364**	*1,410*
Average Cost/Unit (Rs./KWH)	**1.94**	*1.75*
(*This includes generation of PH 4 in MKWH which is operated on by-product gases upto 95%)	**355.61**	*454.99*
2. COAL		
i) Coking Coal & Cookeries		
Quantity (Million Tonnes)	**3.30**	*3.65*
Total Cost (Rs. Lakhs)	**103,068.32**	*109,982.50*
Average Rate (Rs./Tonne)	**3,121.05**	*3,017.19*
ii) Blast Furnace Injection Coal		
Quantity (Million Tonnes)	**0.42**	*0.38*
Total Cost (Rs. Lakhs)	**24,240.75**	*16,798.99*
Average Rate (Rs./Tonne)	**5,752.30**	*4,456.57*
iii) Middling Coal and ROM		
Quantity (Million Tonnes)	**0.34**	*0.64*
Total Cost (Rs. Lakhs)	**3,170.98**	*5,857.00*
Average Rate (Rs./Tonne)	**942.33**	*911.55*
3. FURNACE OIL		
Quantity (Kilo Litres)	**12,079.17**	*11,160.68*
Total Amount (Rs. Lakhs)	**2,031.59**	*1,655.92*
Average Rate (Rs./KL)	**16,818.94**	*14,837.08*
4. OTHERS		
L.D.O.		
Quantity (Kilo Litres)	**9,238.63**	*7,093.81*
Total Cost (Rs. Lakhs)	**2,610.45**	*1,626.78*
Average Rate (Rs./KL)	**28,255.85**	*22,932.43*
L.P.G.		
Quantity (Tonnes)	**3,835.40**	*3,387.25*
Total Cost (Rs. Lakhs)	**1,219.36**	*942.79*
Average Rate (Rs./Tonne)	**31,792.24**	*27,833.47*
NG		
Quantity (Tonne)	**2,814.56**	*2,823.46*
Total Cost (Rs. Lakhs)	**254.95**	*244.08*
Average Rate (Rs./Tonne)	**9,058.26**	*8,644.72*

Excludes electricity duty paid on purchases

Form for disclosure of particulars with respect to Conservation of Energy : 2006-2007

B. CONSUMPTION PER UNIT OF PRODUCTION

Particulars	Steel (per tonne)	Tubes (per tonne)	Bearings (per no.)	F.A.M.D. (per tonne)	Rings & Agrico (per no.)	Growth Shop (per tonne)	CRC West (per tonne)	Wire Div. (per tonne)	CRM SISODRA (per tonne)
Electricity (KWH)	398.52	97.00	0.73	3632.90	1.23	457.35	151.23	220.71	349.95
	(425.00)	*(96.00)*	*(0.72)*	*(3698.07)*	*(1.20)*	*(813.02)*	*(159.97)*	*(211.94)*	*(323.23)*
Furnace Oil (Litres)						15.68		23.09	
						(16.24)		(23.58)	
Coking Coal (Tonnes)	0.72								
	(0.82)								
Others :									
Light Diesel Oil (Litres)	1.29						—	8.02	52.65
	(0.71)						*(9.00)*	*(8.19)*	*(44.69)*
High Speed Diesel Oil (Litres)									
L.P.G. (kg)							13.23	10.29	0.35
							(13.05)	*(9.23)*	*(1.07)*
NG. (kg)								24.54	
								(24.26)	

Form - B

Form for disclosure of particulars with respect of Technology Absorption 2006-07

RESEARCH AND DEVELOPMENT

1. SPECIFIC AREAS IN WHICH R & D WAS CARRIED OUT BY THE COMPANY.

Research was carried out in the areas of raw materials including iron ore, coal, coke, ferro chrome and titania, blast furnace productivity, Steelmaking, product development, process improvement, coatings.

2. BENEFITS DERIVED

In order to address challenges, seven thrust area projects were taken up :

1. 8% ash in coal maintaining yield
2. Complete beneficiation of iron ore
3. Improving blast furnace productivity
4. Lowering phosphorus in Steelmaking
5. Flat Products for automobiles
6. Ferro chrome – reduction in power cost
7. Coatings

Progress on thrust area projects

The progress achieved in the above thrust areas are briefly described below.

1. 8% ash in coal without reducing yield

The strategy for this project has been two fold. First, to thoroughly characterise our coal and to modify existing technology to suit our coal. Through this approach, a new design for dense medium cyclone has been developed, which has been patented. Pilot trials will take place by May 2007 in Australia. Similarly, a new frother chemical has been developed for improving the efficiency of flotation. The new frother has the potential to deliver near-theoretical yield at low(<10%) ash levels. This chemical is planned to be tried in the West Bokaro washeries in April 2007. The second strategy was to develop an entirely new technology, based on chemical leaching, to derive value out of the rejects of the above processes and the middlings. This technology has been demonstrated at 2 kg scale to give < 8% ash with nearly 80% yield. A 500 kg pilot plant for the new technology is being planned to be put up by November 2007.

2. Complete beneficiation of iron ore

Detailed characterisation of ore bodies, fines and slimes is in progress along with the assessment of performance of all existing technologies. This work is being carried out at three different laboratories in India.

3. Improving productivity of blast furnaces

Work has been carried out to model burden distribution and to predict the change in gas flow pattern with change in burden. A detailed experimental study has been carried out to establish the effect of decreasing blast furnace slag volume, through higher basicity, on slag viscosity and sulphur carrying capacity. Knowledge gained for this work has contributed to the lowering of slag volume to around 255 kg/t of hotmetal. Slag basicity has been increased from an earlier level of 0.90 to 1.05 without any adverse effect on viscosity.

4. Lowering phosphorus in steel making

Experimental work on the optimum lime content of slag and its phosphorus capacity is being carried out at the Royal Institute of Technology, Sweden. In a separate work aimed at increasing the kinetics of dephosphorisaiton, a new lance tip has been designed. It is scheduled to be tried in operations in April 2007.

5. Flat Products for automobiles

The aim under this thrust area is to develop a steel grade with 1000 MPA strength and 50% elongation. In a recent breakthrough, for the first time in India, a new steel grade has been hot rolled whose tensile strength is above 850 MPA and elongation is >20% A 7mm thicksheet of this grade can withstand 180 degree fold. Through fundamental research carried out precipitation and recrystallisation behaviour in rephosphorised grades of IF steels, operating regimes have been identified that can give extremely high formability (r-bar > 2) to high strength interstitial free steels.

6. Ferro chrome – reduction in power cost

Chromite ore is refractory in nature and therefore difficult to reduce. Current process uses submerged electric arc furnace for reduction of ore. After studying the structure and oxidation state of the ore, a new process for the production of ferro chrome has been developed in the laboratory. This process uses a preoxidation step and subsequent reduction in a rotary hearth furnace. A scale-up to 500kg level will be ready by February 2008.

7. Coatings

Work on coatings is progressing along three streams. First is in the area of metallic coatings. Second is in the area of polymeric and nano coatings to replace harmful hexavalent chromium. The third is aimed at replacing zinc itself. In the area of metallic coatings, a galvanizing and galvannealing simulator is being installed that has been designed in-house. This will be operational by May 2007. A coating based on nanosilica has been developed and applied on A4-size steelsheets that gives 8 to 10 times more protection than chromium on zinc. This can potentially replace hexavalent chromium.

3. FUTURE PLAN OF ACTION

The challenges ahead are :
Rapid growth
Multiple locations – how to share learnings
Concentrate on "high end" – new technology
Raw materials – best use of captive resources

4. EXPENDITURE ON R & D

(a)	Capital	6.40
(b)	Recurring	26.85
(c)	Total	33.25
(d)	Total R & D expenditure as a percentage of total turnover	0.24

TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

Efforts made

On the Process Front …

Adoption, Absorption and Innovation of Technology – FY 2007

Raw Materials

Pilot plant trials of pneumatic flotation of fine fraction coals of West Bokaro and Jamadoba indicate that there is considerable reduction in ash percentage with good improvement in overall yield.

Development of new frother chemical bears good promise for high yield at low ash level in coal washeries. A newly developed chemical leaching process is found to give consistently low levels of ash without the loss of carbon during the treatment of coal rejects and middling.

Pilot plant studies using Log Washers and Counter current attritors show reduction in alumina in Iron ore to the level of 0.5%.

Iron Making

Work was carried out to model burden distribution and gas flow pattern in blast furnace with change in burden. The nomogram developed between the liquidus temperature and the slag viscosity has helped in reducing the BF slag volume and also achieving the optimised slag composition with high Sulphur bearing capacity.

There was a reduction in coke rate from 511 to 488 kg / thm. There was increase in injection of coal and tar from 63 to 91 kg / thm.

Reduction in CaO of sinter from 9.36 to 9.0 resulted in considerable saving of limestone. Use of BF dust in sinter making helped in recycling of waste material.

Steel making

New configuration of bottom tueyers and differential flow pattern of the inert gas have been developed to achieve low turn down 'P' in BOF vessel.

The trials with the modified design of the slab caster tundish have been successful. The modified tundish can hold up to 34 t.

Caster 2 of LD – 1 shop stabilised during the year. It could achieve the rate of one million tonne in the eleventh month from the start up.

Use of Magcarb brick for the BOF lining has helped in improving the lining life to beyond 3000 heats.

LD-1 shop eliminated the use of hot metal mixers and switched over to receipt of hot metal by only torpedoes.

Converter 1 of LD-2 shop was upgraded to 160 t capacity. The job of upgrading the other two converters will be completed by October 2007. Use of Magcarb brick improved the converter lining life to over 3000 heats. In one campaign, the lining life was 3415 heats.

Rolling

Online flaw detector was installed in Wire Rod mill for continuous feedback on surface quality

New Rebar mill achieved the rated capacity in the first year of commercial production. It attained the rolling speed of 36 m/min, which is the highest for a slit rolling mill. The mill achieved good surface quality and 100% negative weight tolerance in a close band

To improve the performance of Merchant mill, bar alignment rolls in cooling bed, temperature measuring system in roughing stand, and bar counter in cold shear were installed.

Product Development – Long Product

Obtained approval as 'Global Vendor' from ESAB international for the supply of WR3 (M) for CO2 welding application.

36 mm Fe-500 Tiscon rebars were rolled for the first time in merchant mill.

Successfully produced high carbon steel with low nitrogen (less than 60 PPM).

Commercialised super ductile rebar for earthquake applications and galvanized rebars for improved corrosion life.

Product Development – Flat Product

IF and IFHS grades

Increased overall strike rate in IF from 64% to 73%.

Reduction in rework - As Cast IF.

Development of super EDD (Equivalent of SPCX for Side Outer).

Development of IFHS-350 grade with improved R bar (1.8min) and low planar anisotropy (known as Isotropic steel).

Development of IFHS-390 for applications in Tata motor.

Reduction in chemistry diversion and carbon pick up in IF grades by through process measures.

Increase in secondary cooling water in segment '0' and '1' to improve the surface quality of IF steel.

EDD grade

By through process improvements, internal rejection of EDD on account of mechanical property was brought down from 2.5% to 0.25%

High Strength Steel

Development of BH 180 and 220 with good shelf life and bake hardening property.

Development of Rephosphorised steels with Tensile 350 MPa and 390 MPa. They have higher R bar value than normal IFHS grades.

Development of HS 800 grade with good fatigue and stretch flange ability for the long member of Truck of Future. This is a hot rolled steel with nano size carbide precipitates.

ATM grade with high tensile (700 MPa) for Godrej.

Development of HSLA 240 grade for structural members.

Resolution of spring back problem in E 46 by reduction of the YS value.

Reduction in edge slivers in Yst 38 grade.

Use of nitrovan to improve the mechanical properties of thin gauge Hot rolled steel.

Reduction of mould cooling water in peritectic composition to reduce the cracks.

Electrical Steel

Development of process for Steel with low core loss and high permeability for electrical application – Ultra low carbon steel containing antimony.

Coated Steel

By proper characterisation of the coating, excess powdering arising out of over alloying was reduced.

Development of 'T' coat, which was essential for the approval of critical large size components such as 'Door Inner'. The coating improves the formability, reduces the powdering and corrosion performance. The product has been patented.

Development of GPSP for applications such as bus body panel and drum.

In-house passivation chemical to reduce the fretting corrosion and also to improve the corrosion resistance.

Steel with Magni coat was developed. The coating is being assessed for weldability and corrosion life. The product will be tried for four wheeler fuel tanks for the first time in India.

Customer Approval/accolade

HMIL approved 25 sizes of GA. 'T' coat panel also was approved.

SPCEN and SPRC 35 approvals for skin panels have come from HMIL.

Overall rejection at HMIL was brought down to 1700 PPM against the previous year figure of 3200 PPM.

Honda R & D, Japan has approved our 'IF' grade for external and internal application after a rigorous testing of steel for mechanical properties, weld ability and paintability.

We have received the best supplier award for the second year in succession from Honda.

By product solution at the customer place, the rejection at Whirlpool was brought down to 35 ppm.

Technology Absorption, Adaption and Innovation

In Tubes Division the following efforts are made to improve operational efficiency :-

a. Solid state welder in 2" Precision Tube Mill :

Oscillator valve type welder installed in 1992-93 was used for welding of tubes. This welder has been replaced with a solid state welder with diagnostic features for ease in fault finding. This facility was not available in existing oscillator valve type welder. Efficiency of solid state welder is 85% as compared to 55% of oscillator valve type welder. Maximum voltage in solid state welder is 400 volts which is safe and easy during maintenance. Oscillator valve type welder operates on 14000 volts. Power consumption is also low in solid state welder as compared to oscillator valve type welder. With new solid state welder, reduction in rejection due to weak weld, increase in availability of mill, reduction in frequency of stoppage of mill due to welder and reduction in electrical power consumption has been achieved.

b. Automatic Continuous pickling line :

Tubes for galvanizing were pickled by dipping tube bundles in open tanks containing sulphuric acid. This process was very unsafe and unhygienic. The old system has been replaced with a modern continuous hydrochloric acid pickling line of 100000 tpa capacity. Engineering has been supplied by M/s. Loeco of Germany. Based on their design, equipment have been manufactured indigenously. New pickling line has 23 tanks and tubes are fed one by one. These tanks are covered completely and fume extraction system with wash tower has been installed. When compared to sulphuric acid, hydrochloric acid has the advantage of longer active life, active at ambient temperature and more benign removal of oxides. Throughput of pickling has been enhanced by 42500 tpa.

c. Restoration of damaged column of pickling shed :

Sulphuric acid in open tanks were used for pickling tubes before sending for galvansing. Due to open tanks, acidic fumes generated from the tanks and also spillage of acid from open tanks penetrated in the soil over a period of time. This resulted in uplifting of some of the shed columns by about 300 mm making the shed unsafe and also caused frequent breakdown of EOT cranes in the area. Soil investigation, fabrication of supporting girders etc. were done. The columns and the crane gantry were brought back to normal level without affecting the production of pickling plant.

d. New 4" Precision tube mill :

A most modern state of art 4" Precision Tube Mill with cold draw, normalising furnace has been commissioned. The new mill has installed capacity of 40,000 tpa in the size range from 31.75 mm to 114 mm OD.

e. Tube transfer table from new pickling line to Galvanising bath No. 1 :

Tubes after pickling from the new pickling line have to be fed in to galvanizing bath nos. 1 and 2. M/s. Loeco, supplier of design of new pickling and galvanizing bath 2, had given design for direct transfer of tubes from pickling line to galvanizing bath no. 2. To save on cost, design & manufacturing of transfer table from pickling line to galvanizing bath no. 1 has been done in-house. This is working satisfactorily.

Efforts for Energy Conservation at West Bokaro

(1) AUGMENTATION OF STEAMING CAPACITY FROM 62TPH TO 75 TPH THROUGH PERFORMANCE OPTIMISATION OF FBC UNIT, WEST BOKARO

1.0 BACKGROUND :

Two independent Fluidised Bed Combustion(FBC) boiler based units, each capable of generating 10MW captive power by utilising Washery rejects were conceived at West Bokaro during 1992-93. Designs of the boilers were basically reliability centric investment and efficiency were not the topmost priority. The Boiler bed was devoid of Bed tubes necessitating excess air to the tune of 100% in order to maintain the Bed temperature. This resulted in inefficient combustion and heat loss. The basic purpose of not having bed tubes was to eliminate tube failure due to highly abrasive fuel. However, in due course it was observed that tube failure due to erosion had shifted downstream and affected the Economiser tubes due to higher volume and velocity of flue gas. Thus the basic purpose of not having the Bed tubes was lost.

2.0 NEED AND NATURE OF PROPOSED MODIFICATION :

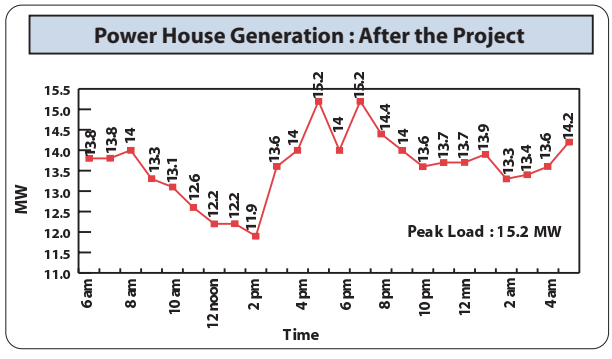
The FBC units at West Bokaro are in operation for over a decade and have logged about 100,000 hours. The operating personnel have gained valuable experience through all types of maintenance and operating problems - generic and routine. Different maintenance modules were evolved both condition based and preventive to avoid unplanned outages of the boilers. Thus the primary considerations for a conservative, reliability-centric design no longer hold good, and should be optimised wherever feasible. Also, the units are still young, having residual life of over 20 years. This is perhaps the right time to make good use of the excellent in-built features and associated investment. Hence the possibilities of upgrading one of the FBC boilers to augment steam generation within justifiable cost were explored. The modified boiler is expected to be more efficient, reliable, and safe compared to existing ones.

With the present setup with one boiler and two turbines, the peak load attained was 12 MW. Both the Boilers could not be operated parallely since its commissioning due to various infrastructure deficiencies, e.g.: Coal Handling Plant, DM Plant, Ash Evacuation system, Maintaining load on Sundays and Holidays, etc. Moreover, additional loads due to new installation of SEB Project further necessitated optimisation of the installed assets.

2.1 Modification

The modification essentially involves in putting additional heat transfer surfaces in the bed and linking the Low Temperature Super Heater (LTSH) to the existing economiser – LTSH now will be part of economiser. Modified boiler can utilise existing fuel system to generate about 20-25% extra steam utilising excess capacity of FD/ ID fans, furnace (area) and feeders.

This has been done first time in India by any company.



2.2 Benefits:

Post-modified boiler is similar to the standard BHEL configuration of FBC steam generators. The additional steam generated has helped attaining a peak load of 15.2 MW, thus an increment of 3.00 MW. The investment has a pay back period of less than a year. Thus with an incremental cost of Rs. 2.0 crores, additional load of 3 MW could be attained. This has optimised the existing Plant Load factor and utilisation of idle asset of the company. This is saving Rs. 2.50 crores/ year.

Key Performance indicators	Before	After
Combustion efficiency (%)	74	79
Specific coal consumption (Kg./KWH)	2.6	2.4
Furnace temp. (°C)	1000-1050	900-950
Exit Flue gas temp (°C)	140	120
Peak Load (MW)	12	15.2
Unit Generated/month (LKWH)	71.3	84.0
Unburnt in Fly Ash (%)	6.6	4.5
Fluidizing air (M3/Hr)	115000	102000

Sweating of Asset by Performance Optimising

- **Saving in purchased Power Bill by Rs. 2.5 crores/Annum for years to come**
- **Additional Generation of 150 LKWH/Annum with the same work force**
- **Attain Peak Load of 15.2 MW from 12 MW**

(2) CAPACITOR BANK- POWER FACTOR COMPENSATION UNIT

West Bokaro division mainly consists of mining and coal beneficiation loads which is mainly inductive loads causing low power factor. To improve power factor and in turn energy saving, four numbers capacitor bank, four sets of reactor along with VCB panel were installed in 33KV Receiving substation and Captive power plant. Thus a power factor improvement from 0.75 to 0.80 was achieved causing energy saving. Moreover an estimated demand of 1.5 MVA was saved from DVC by installation of capacitor banks.

Expenditure incurred for installation of capacitor banks, reactor etc. 70 lakhs.

Benefits of above :

a) Tangible benefit of 65.64 lakhs/annum.

b) Voltage improvement of supply system.

c) Reduction in transmission loss by 12.7%.

d) Better utilisation of electrical energy.

Compensation unit installed at receiving substation

(iv) Energy Conservation Achievements:

1. Installation of energy efficient equipments :

   a) Tailings (fine coal particles with high ash – approximately 30-40%) of coal is sent to tailings pond after dewatering. Earlier this dewatering used to be achieved by using Solid Bowl Centrifuges. But this process was not efficient because large quantity of water was required and for this, three Motors of capacity 184 KW (One stand by) were used. Availability of machines was poor and also maintenance cost was high.

   Now, the High Frequency Screen driven by two 4.8 KW unbalance motors is being used for dewatering. In this process consumption of water and energy is remarkably low. Availability is high and maintenance is low and also easier to operate.

   The project cost was Rs. 95 lakhs. By eliminating the obsolete Centrifuge system, the saving on energy works out to be 11.33 lakh KWH per annum, which amounts to Rs. 27.20 lakh per annum. The impact on implementation is- simple system, low operation cost and higher efficiency.

   b) Reciprocating Compressors at different locations have been replaced by Screw Compressors.

   Four numbers of 22.5 KW reciprocating Compressors have been replaced by energy efficient Screw Compressors in Ropeways.

   c) Pump Motors required for processing Coal have been replaced by suitable Size Motors.

   Before the initiative : 02 Nos. 132 KW Motors were in use.

   After the initiative : 02 Nos. 110 KW Motors are being used.

2. Use of Energy efficient Light Fittings :

   40 Nos. Fluorescent Tube Light Fittings of Offices, Control Rooms and Conference Rooms have been replaced by energy efficient CFL light Fittings.

3. Reducing fuel consumption by using BEML Rear Dumper for Over Burden Production:

4. Using of Steaming Capacity from 62tph to 75 tph through Performance optimisation of FBC.

   Unit:

   The modification essentially involves in putting additional heat transfer surfaces in the bed and linking the Low Temperature Super Heater (LTSH) to the existing economiser – LTSH now will be part of economiser. Modified boiler can utilise existing fuel system to generate about 20-25% extra steam utilising excess capacity of FD/ID fans, furnace (area) and feeders.

5. Use of Solar Lights in two places on trial basis . 11 W solar Lights installed in two places. Saving is Rs. 300 approx. per month.

6. Other Areas of Energy Saving:

   - 04 Nos. Reciprocating compressors required for Ropeway Drive Stations and Return Stations have been replaced by energy efficient Screw Compressors. Energy saved is Rs. 24,000 approx. per month.
   - Two nos 132 KW Pump motors have been replaced by 110 KW Motors after load study. Energy saved is 64,000 KWH per annum.
   - Use of CFL lamps in offices and control rooms has brought savings of 3,150 KWh per annum.
   - Use of Variable Frequency Drives in Two Nos. 30 KW Conveyor Belt Motors. Energy saved 18,700 Kwh. per annum.
   - Jatropha (Bio-diesel plant has been planted on overburden dumps.

Particulars of technology imported during last five years :

Steel Division

		Absorption	Implementation
a)	Electrolytic cleaning line (SMS Demag, Germany)	2003	Commissioned
b)	Upgradation of 'G' blast furnace (SMS Demag, Germany)	2004	Commissioned
c)	Upgradation of HSM	2004	Commissioned
d)	Upgradation of billet caster - 1 at LD1 (Concast, Zurich)	2004	Commissioned
e)	Ladle furnace-2 at LD1(SMS Demag, Germany)	2004	Commissioned
f)	New Rabar Mill (Morgan, USA)	2004	Commissioned
g)	Upgradation of caster at LD2 (Voest Alpine, Astria)	2004	Commissioned
h)	Imported design and engineering for hot metal desulphurisation unit at LD1 (Kuettner GmbH)	2005	Commissioned
i)	Supply of imported engineering for new induced draught fans, electrics & accessories for the LD Converter GCP at LD1 (Ebara Corporation)	2005	Commissioned
j)	Adequacy checking BOF converters for augmentation of heat size at LD2 (SMS Demag, Germany)	2005	Commissioned
k)	Imported design and engineering for upgradation of Caster 2 & 3 at LD2 (VAI, Astria)	2005	Commissioned
l)	Imported design and engineering for hot metal desulphurisation unit 2 & 3 at LD2 (Kuettner GmbH)	2005	Commissioned
m)	Imported design and engineering for capacity increase of slab reheating furnace nos. 1 & 2 of HSM (Techint)	2005	Commissioned
n)	Supply of design and engineering and training for 150 tph walking beam furnace to Rebar Mill (Bricmont)	2005	Commissioned
o)	Imported design and engineering (Mother well Bridge - Clayton walker)	2005	Commissioned
p)	Supply of imported design and engineering for LD gas boosters (Howden Power Ltd., U.K.)	2005	Commissioned
q)	Supply of imported design and drawing for Technology control system at HSM (SMS Demag, Germany)	2005	Commissioned
r)	Supply of imported design and drawing for Basic level automation at HSM (Alstom, USA)	2005	Commissioned
s)	Supply of imported design and drawing for dual zinc pot at CRM (CMI, Belgium)	2005	Commissioned
t)	Supply of imported design and drawing for BAF, CRM (LOI, Germany)	2005	Commissioned
u)	Supply of imported design and drawing for 4th Stove of 'G' Blast Furnace (Paul Wurth Italia, Italy)	2006	Under Implementation
v)	Supply of imported design and drawing for 'H' Blast Furnace (Paul Wurth Italia, Italy)	2006	Under Implementation
w)	Supply of imported design and drawing for Sinter Plant No. 4 (Outokumpu Technology, Germany)	2006	Under Implementation
x)	Supply of imported design and drawing for LD2 expansion project. (SMS Demag, Germany)	2006	Under Implementation
y)	Supply of imported design and drawings for convertor gas cleaning plants in LD shop 1 & 2 (SMS Demag, Germany)	2006	Under Implementation
z)	Facility for quantitative estimation of minerals through Scanning Electron Microscope (Intellection Pty. Ltd., Australia)	2006	Commissioned
aa)	Polarising Microscope with Photometer and Imaging at R & D (Leica Mikrosysteme Vertrieb GmbH, Germany and PRESI S.A., France)	2006	Commissioned
ab)	Variable Frequency Drive for Descaling Pump Motor at Hot Strip Mill (ABB, India)	2007	Commissioned

Annexure 'B' to Directors' Report

Statement pursuant to Section 217(2A) of the Companies Act, 1956 and the Companies (Particulars of Employees) Rules, 1975

Sr. No.	Name	Age (Years)	Designation/ Nature of Duties	Gross Remuneration Rs.	Net Remuneration Rs.	Qualifications	Total Experience (Years)	Date of Commencement of Employment	Last employment held Designation – Period for which post held
1.	Baijal A.D.	59	Vice President (HR)	54,59,875	38,79,975	B.Sc. Engg. (Met.), P.G.D.B.M.	37	13-12-69	—
2.	Chatterjee Koushik	38	Vice President (Finance)	51,11,367	36,29,959	B.Com., (Hons), F.C.A.	11	01-08-03	Tata Sons Ltd. - General Manager - Corporate Finance — 4 years — 7 months
3.	Chaturvedi U.K.	57	Vice President (Long Products)	57,10,345	40,46,136	B.Sc.	37	25-10-69	—
4.	Gupta Capt. Bhagwat Das	65	Pilot Officer	26,21,647	18,92,423	M.Com., LLB (Part 1)	36	17-06-06	Uttaranchal Govt. — Govt. Pilot — 7 months
5.	Jha Varun Kumar	55	Vice President (Chhattisgarh Project)	44,27,452	31,59,028	B. Tech. (Hons) P.G.D.B.M.	34	03-10-72	—
6.	Kharkar Hemant C.	50	Vice President (CSI & TQM)	29,98,341	21,85,027	B.E., P.G.D.B.M.	27	22-01-80	—
7.	Makashir WG. CD. S.	60	Chief Aviation	33,24,910	23,54,444	M.Sc. (Defence Studies)	39	02-09-97	Indian Air Force, Wg. Commander – 12 years
8.	Misra Abanindra M.	55	Vice President (RM)	40,81,588	29,38,638	B.E., M.B.A.	33	29-12-73	—
9.	Mukherjee Dr. T.	64	Deputy Managing Director (Steel)	1,68,16,905	1,16,29,612	B.E. (Met.), M. Met. (Sheffield), Ph. D. (Sheffield)	39	17-05-71	British Steel Corpn., Asst. Manager, New Products Dev., — 1 year – 6 months
10.	Muthuraman B.	62	Managing Director	1,97,83,038	1,32,06,681	B. Tech. (Met.), P.G.D.B.M.	40	14-11-66	—
11.	Narayan Om	56	Vice President (Safety & Services)	30,36,992	22,05,252	B.Sc. (Engg.) (Mech.), P.G.D.B.M.	32	03-10-74	—
12.	Nerurkar H.M.	58	Vice President (Kalinganagar Project)	61,48,162	42,66,089	B. Tech. (Met)	35	01-02-82	U.M.I. Ltd., Manager (QC) – 5 years
13.	Prasad Avinash	59	Vice President (Industrial Relations)	42,55,755	30,42,081	B.E. (Met)	35	14-06-71	—
14.	Sen Anand	47	Vice President (Flat Products)	43,85,381	30,28,114	B. Tech. (Hons.) Met Engg., P.G.D.B.M.	25	27-07-81	—
15.	Sengupta D.*	61	Advisor to MD	46,72,161	29,83,946	B.E. (Electrical)	39	30-12-67	—
16.	Singh A N.	60	Deputy Managing Director (Corporate Services)	1,21,05,100	83,28,722	B.A. (Hons) Pol. Science	36	05-10-90	Deputy Inspector General of Police, Bihar — 6 years
17.	Singh R.P.	62	Vice President (Engg. Services & Products)	58,23,127	41,25,316	B.Sc. Engg. (Mech.)	41	01-03-96	SAIL & RINL, General Manager (Projects) – 30 years
18.	Venugopal Dr. T.	54	Chief Technology Officer	25,07,411	18,67,523	B. Tech (Met Engg.), M. Tech (Ind. Metallurgy with Metal Casting Specialisation), Ph.D (Metallurgical Engg.)	29	04-05-01	Ispat Ind. V.P. (Technical Services) – 4 years

Notes : (1) Gross remuneration comprises salary, allowances, monetary value of perquisites, commission to the Directors and the company's contribution to Provident and Superannuation Funds but excludes contribution to Gratuity Fund on the basis of actuarial valuation as separate figures are not available.

(2) Net remuneration is after tax and is exclusive of company's contribution to Provident and Superannuation Funds and monetary value of non-cash perquisites.

(3) The nature of employment in all cases is contractual.

(4) None of the employees mentioned above is a relative of any Director of the company.

* Indicates earnings for part of the year.

On behalf of the Board of Directors

RATAN N. TATA
Chairman

Mumbai, 17th May, 2007.