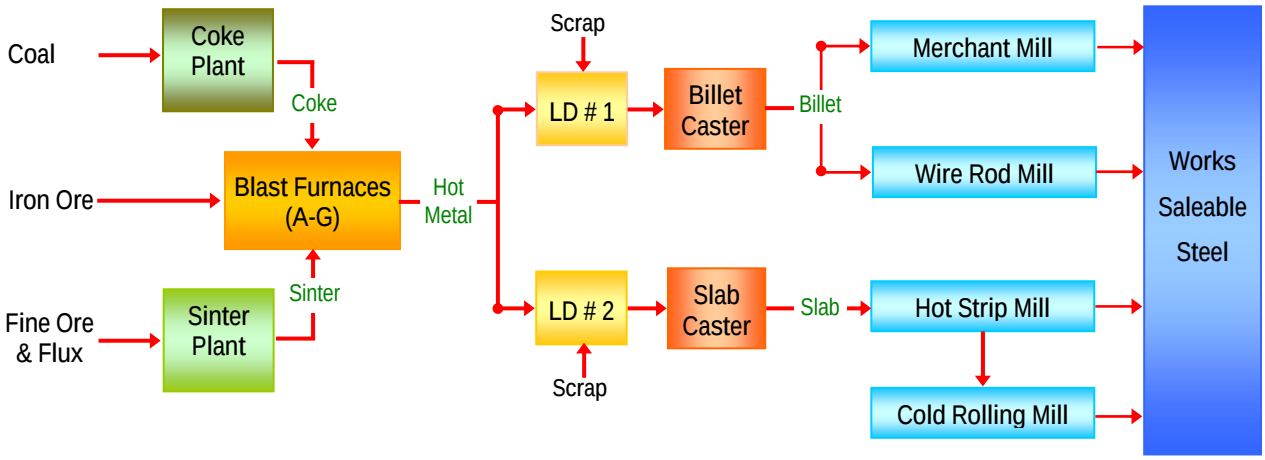
A simple schematic diagram showing the production process of the entire units



The raw materials including iron ore and coal arrive to our Works Division at Jamshedpur by rail and trucks. Blended coal is first heated in coke ovens to produce coke by the process called carbonization. The gas produced during carbonization is extracted and used for fuel elsewhere in the steelworks. Fine-sized ore is mixed with coke and fluxes and heated in a sinter plant. The high temperatures generated fuse the ore particles and fluxes together to form a porous clinker called sinter. Iron ore lumps and pellets, coke, sinter are charged into the blast furnace. Hot air (1100 degrees C) is blasted into the bottom of the furnace through nozzles called tuyeres. The oxygen in the air combusts with the coke to form carbon monoxide gas, and this generates a great deal of heat. The carbon monoxide flows up through the blast furnace and removes oxygen from the iron ores on their way down, thereby leaving iron. The heat in the furnace melts the iron, and the resulting liquid iron (or hot metal as it is called in the industry).The hot metal is mixed with recycled steel and other alloys in the converters at the Basic Oxygen Steelmaking Shop and a water-cooled lance is lowered into the vessel through which very pure oxygen is blown at high pressure. The oxygen, through a process known as oxidation, combines with the carbon, and with other unwanted elements, separating them from the metal, leaving steel.

The molten steel form the converter is further refined at the Ladle Metallurgy Facility where the chemistry and temperature are finely adjusted before casting into slabs and billets.

In a continuous casting machine, molten steel is poured into water cooled mould where the outer shell of the steel becomes solidified. The steel is drawn down into a series of rolls and water sprays, which ensure that it is both rolled into shape and fully solidified at the same time. At the end of the machine, it is straightened and cut to the required length. Fully formed slabs and billets emerge from the end of this continuous process.

Semi-finished products called billets and slabs are transported from the steelmaking shops to the rolling mills. Semi-finished products are first heated in a re-heat furnace until they are red hot (around 12000 C) and then they are rolled into strips or rods at the Hot Strip Mill and the Wire Rod Mill / Merchant Mill.

The hot rolled coils are sent for further processing such as pickling, galvanizing, tempering & annealing at the Cold Rolling Mill.

Plant Specific Energy Consumption in Million kCal per tonne of crude steel

Year	Million kCal/tcs
2001 - 2002	7.260
2002 - 2003	6.975
2003 - 2004	7.065

12. Pant current specific energy consumption with the best specific energy consumption

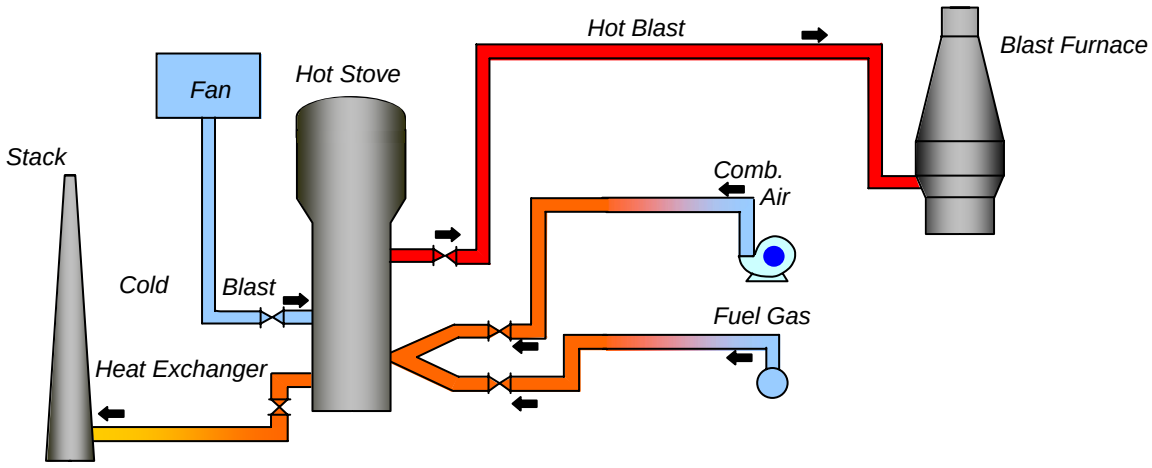
Product	Plant Current (2003-04) Specific Energy Consumption		* Best Sp. Energy Consumption reported at the			
			National Level		International Level	
	Kwh/tonne	Million Kcal/tonne	Kwh/tonne	Million Kcal/tonne	Kwh/tonne	Million Kcal /tonne
Crude Steel	374.30	7.065	322.61 (02-03) Durgapur Steel Plant. *RDCIS – Ranchi for (02-03)*	6.86 (03-04) Bhilai Steel Plant *RDCIS – Ranchi for (03-04)*	302.44	4.597
					IISI Ref. Plant Committee on Technology Brussels 1982.	

The brief write-up of the energy saving projects for the year 2003-04.

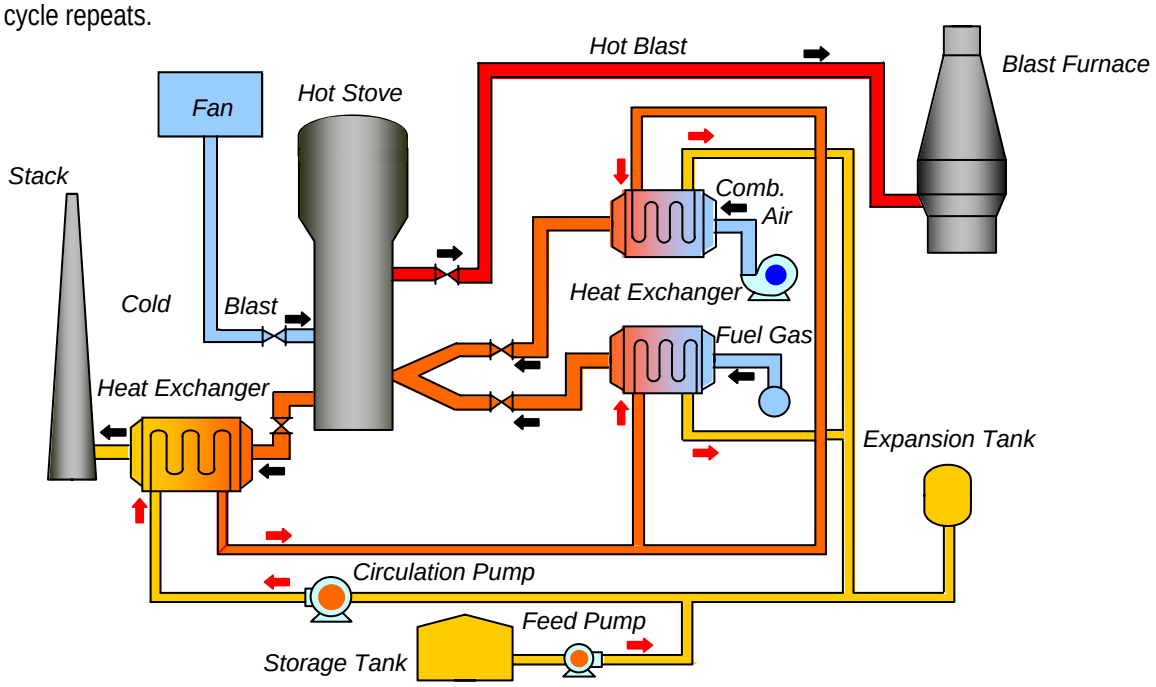
a. Sensible heat recovery from G Blast Furnace Stoves

Background : A blast furnace consists of the four main areas: (i) blast furnace, (ii) charging equipment, (iii) gas cleaning equipment and (iv) hot blast stoves. The solid ingredients of iron ore, coke and limestone are poured into the top of the furnace and enter the tuyeres region, into which large volumes of high temperature, high pressure blast air are blown. The coke burns in this hot air blast, generating temperatures exceeding 2000 degree C. This resulting gas passes up the furnace through the charge and at such high temperatures, the coke and gas react with the iron oxide in the ore, reducing it to molten iron. The solids in the shaft descend slowly and pass through the furnace in approximately 8 hours. The liquid slag and hot metal are drawn off at the bottom periodically.

Process : A stove alternates between two phases to provide hot air. During the heating cycle, or on-gas phase, blast furnace gas (combustion air) enriched LD or Coke Oven gas is burned and subsequently heats the refractory brick. The changeover to the on-blast phase takes several few minutes as the combustion gases must be purged from the stack. During the on-blast phase, cold air is blown through the hot checker-work in the opposite direction. The hot blast leaving the stove is then fed into the blast furnace. When the hot blast cools sufficiently a switch from on-blast to on-gas is initiated.



Waste Heat Recovery : The prime requirement of waste heat recovery system is that the waste gases must contain sufficient usable heat to pre-heat the combustion air and fuel gas. The thermic fluid (Therm-S 800) is heated in the Heat Exchanger by the stove flue gas at 300 deg C coming from the stove stack. The heated thermic fluid passes through two Heat Exchangers to impart the heat to combustion air and fuel gas. The thermic fluid is thus cooled and the cycle repeats.



While the temperature of exhaust gas has reduced from 300 deg C to 150 deg C this heat recovery system has enabled us to recover the sensible heat of exhaust gas and use it efficiently to pre-heat the fuel gas and combustion air. This has resulted in higher hot blast temperature and reduced Coke rate.

Operational Results

	Before	After
Volume of Fuel Gas required for Stove Heating	90 KNm^3/hr	90 KNm^3/hr
Inlet temperature of BF gas/Air	45 / 35 deg C	45 / 35 deg C
Outlet temperature of BF gas/Air	45 / 35 deg C	140 / 130 deg C
Waste Heat Exchanged	--	6000 MJ/hr
Energy Saving in Coal Equivalent	--	10,800 tons/year
Reduction in greenhouse gas	--	20,000 t-CO_2/year

b. Waste Steam Utilization for boiler deaerator

There are three numbers of deaerator at Boiler House no. 1 which supplies deaerated water to boilers. In this process 7 to 8 tonnes per hour heating steam is required from auxiliary steam system (200psig) reduced to 10 psig in Pressure Reducing Station. In this process there is throttling loss due to reduction of steam pressure from 200 psig to 10psig.

I.D fans of Boilers are driven by electric motor (130 Kw). and also have provision of steam driven turbines during power failure. The consumption of steam of each turbo driven I.D fan is also 7 to 8 tonnes per hour. The turbo ID

exhaust pressure is 10 psig. The turbo driven ID fan is now being run by steam and the exhaust steam of the turbo driven ID fan is utilized as heating steam in deaerators. This has resulted in saving of power (130 Kw) by stopping ID fan electric motor.

Saving :

- Power saving = 130 kWH
- Power saving per annum = 130 x 24 x 365 = 1138800 kWH = 1138.8 MWH
- Cost of each MWH = Rs.2000
- Total saving per year = 1138.8 x 2750
- Net saving per year = Rs. 31.34 Lakhs

c. Optimization of boiler feed pump to reduce auxiliary power consumption

There are four feed pumps for supply of feed water to boilers 1 to 6 at Boiler House No. 1. Under normal condition when five or six boilers are in operation, three of the boiler feed pumps are in running and one is kept in standby. There is also one emergency Turbo driven feed pump, which is used during power failure or any other interruption / stoppage in boiler feed pumps. The drum pressure of all boiler is 225 psig and the feed water header pressure is maintained 420 to 475 psig for adequate supply of water to the boilers. This header pressure is maintained by running the three feed water pumps.

Reduction in feed water header pressure from 420-475 psig to 360-400 psig is adequate to supply the feed water to the boilers. In this way the throttling losses has be reduced and in turn higher feed water flow is being drawn from the boiler feed pumps. The required flow and pressure for the feed water is met by operating only two of the feed water pumps in place of three pumps as was the earlier practice. In this way auxiliary power consumption of the boiler has been reduced by 250 kWH.

Saving on account of stoppage of one electro driven pump is :

- Pump motor rating = 250 Kwh.
- Power saving (annual) = 250x 24x 365 / 1000 =2190 MW hrs.
- Saving in terms of Rupees (@ Rs.2750/- per MW) = 2190 x 2000
  = 60.23 Lakhs per annum.

d. FRP Sheet Lighting of Workshop.

- No. of Locations FRP Sheets used for shed/workshop Illumination = 39
- No. of Corrogated Sheets replaced with FRP Sheets = 25377
- No. of bulbs switched off during day hours = 6205
- Power Saved (Kwh/year) = 5385947
- Saving (Rs. Lakhs) = Rs. 14.81 lakhs per annum.

A brief write-up of the unit..

i. Unit Profile :

Established in 1907 by its Founder J N Tata, Tata Steel is Asia's first and India's largest integrated private sector steel company. Over the years, Tata Steel has emerged as a thriving, nimble, steel enterprise, due to its ability to transform itself rapidly to meet the challenges of a highly competitive global economy and commitment to become a supplier of choice by delighting its customers with services and products. Constant modernisation and introduction of state-of-the-art technology at Tata Steel has enabled it to stay ahead in the industry and successfully meet the expectations of all sections of stakeholders. Tata Steel's four-phase Modernisation Programme in the steel works has enabled it to acquire the most modern steel making facilities in the world. Recently, Tata Steel commissioned its 1.2 million tonne capacity Cold Rolling Mill complex at 'Global Speed and Cost'. Its fifth phase of the Modernisation Programme leveraged the intellectual capabilities of its employees to generate sustainable value for the stakeholders. Tata Steel is taking better Knowledge Management initiatives to shift focus from creating new physical assets to utilising them with ingenuity and a sturdy business sense, the company has been recognised as Asia's Most Admired Knowledge Enterprise at the World Knowledge Forum, Seoul, Korea. Most recently, it has embarked on programme for expansion of its existing steel making capacity by 1million tonne to reach a rated capacity of 5 million tonnes per annum.

Tata Steel's turnover in fiscal 2003-04 was nearly Rs 12070 crores. The company's profit in the same year was Rs 1746 crores, which is its highest ever profit and it produced a record-breaking 4.09 million tonnes of saleable steel. The company has declared a record dividend of 100% for the year 2003-04. The quest for excellence at Tata Steel is not just a process, but a way of life. A determination to move up the value chain in process, products and performance has resulted in Tata Steel being acknowledged for its excellence. It was adjudged the Best-Integrated Steel Plant by the Ministry of Steel for 2000-01 and was conferred the Prime Minister's Trophy, for the third time in row and four times in all. The JRD Quality Value Award and Sustained Excellence Award for the third consecutive year of business excellence; the CII-EXIM Award for corporate excellence; the Corporate Governance Award, instituted by the Union Finance Ministry for excellence in corporate governance, are testimony to the Steel Company's commitment to excel in all activities it undertakes. Tata Steel has been awarded the Export Engineering Promotion Council Award 2000-01 and the Tata Steel Website has been Declared Best for 2002 by International Iron & Steel Institute, Belgium in the "IISI People's Choice Award" category. Till date, eight divisions, including its steel works and its mines and collieries have been ISO-14001 certified for environment management. This certification is a reaffirmation of Tata Steel's belief that better environmental management leads to superior business performance. Tata Steel has been recognised by World Steel Dynamics as a "world class" steel maker. The steel company caters to a wide gamut of customers in India and abroad. They include automobile manufacturers, producers of white goods, construction industry, and consumers of tubes, bearings, agricultural implements, etc. Its well-known branded products are Tata Steelium, Tata Shaktee, Tata Tiscon, Tata Pipes, Tata Bearing and Tata Agrico. The intrinsic strength of the company such as low operating costs, special organisational culture and good profitability has been widely appreciated and this has led to establishing strategic partnership with such international players as Nippon Steel Corporation, Japan; Arcelor, France, POSDATA, South Korea (a subsidiary of POSCO), Ryerson (a JV with Ryerson Tull of USA) and Paul Wurth, Luxemborg.

Tata Steel's continuous success, over a period of more than nine decades, is due to its ability to transform rapidly to meet the challenges of a highly competitive global economy and commitment to become a supplier of choice by delighting its customers with its products and services. It has continuously been on the growth path and is constantly striving to improve the EVA of the company by seizing the opportunities of tomorrow and by exploring newer avenues of operations such as a ferro-chrome and titanium. In ferro-chrome Tata Steel has evaluated its chromite business and explored its future systematically, and is poised to become the only ferrochrome producer in the world to have a multi locale supply base. The selection of Richards Bay, South Africa for the plant with an efficient port structure and minimisation of power and logistic costs and sourcing of high quality chrome from its mines at Sukinda, India are corner stones of this endeavour. And in Titania, Tata Steel signed an agreement with its international consortium partners for setting up its Titania project, in the State of Tamil Nadu for which feasibility studies are underway and prospecting license has been granted by the

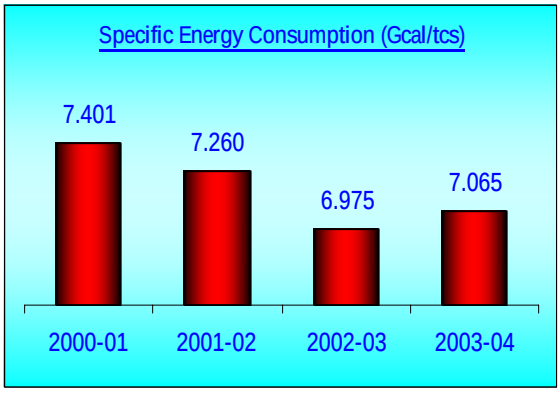
state over an area of 80 square kilometers.

ii. Energy Consumption :

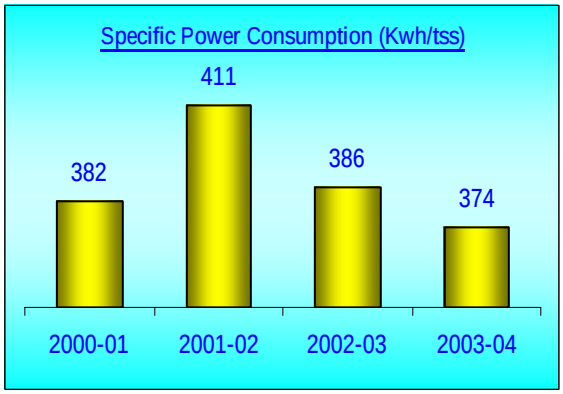
The energy consumption figures for the last three is as shown below :-

Sl.	Particulars	Unit	2001-02	2002-03	2003-04
a.	Light Diesel Oil	Tonne	1747	1948	1192
b.	Coking Coal	Tonne	3330496	3359204	3406592
c.	Coal for injection in Blast furnaces	Tonne	137487	158228	192960
d.	Boiler/Middling Coal	Tonne	845357	801569	716365
e.	Electricity	10^3 KWh	1493297	1522146	1581139
f.	Plant Specific Energy Consumption	Gcal/tcs	7.260	6.975	7.065
g.	Total Manufacturing Cost	Rs. Crores	2778.32	3055.53	3465.23
h.	Total Energy Bill	Rs. Crores	935.38	1037.27	1042.37
i.	Energy as percentage of total cost of production	%	33.67	33.95	30.08

Thermal Energy Consumption



Electrical Energy Consumption



The electricity consumption for 2001-02 is inclusive of CRM (new unit)

iii. Energy Conservation Commitment, Policy & Setup :

Sustainability and environment friendliness is at the core of every business. Tata Steel is fully aware of the fact that the energy supply is mainly supported by fossil fuels, whose reserves are limited and emission of carbon dioxide is caused by energy combustion. Hence it is committed to energy conservation efforts.

With the introduction of the "Energy Conservation Act", Tata Steel has reaffirmed its commitment to rationalization of energy use, matters relating to the recovery and waste utilization. To meet the commitment concrete measures for efficient use of energy, its recovery and waste utilization have been formulated. The company's efforts are focused towards the followings :

a. Benchmarking of the processes & sub-processes, identification of gaps.
b. Online monitoring of energy parameters (100%).
c. State-of-Art instrumentation & Control
d. Process Integration
e. Waste Heat Recovery
f. Enhancing awareness of energy efficiency by publicity & competitions.

The following activities are taken up each year to promote energy conservation & awareness:

a. Annual Quality Improvement Plan (AQUIP) is formulated by all the departments with a focus towards Energy Conservation.
b. The detailed variance of stage wise energy consumption is analyzed on monthly basis & reported the concerned Departmental Chiefs & Heads for necessary action at their end to improve efficiency and reduction in specific energy consumption.
c. A number of Aspire & Self Initiated Projects are taken up in the area of energy conservation all over the plant.
d. Knowledge sharing for efficient use of energy through online Knowledge Management System. Various knowledge communities / sub-communities in the area of electrical energy, thermal energy & its conservation are working within the steel works.
e. Oil conservation week / fortnight is celebrated every year where emphasis laid on conservation of petroleum products.

Note : *The organizational set-up for energy conservation has been documented in 13c of the application.*
The Energy Policy of the organization has been documented in 13e of this application.

iv. Energy Conservation Achievements :

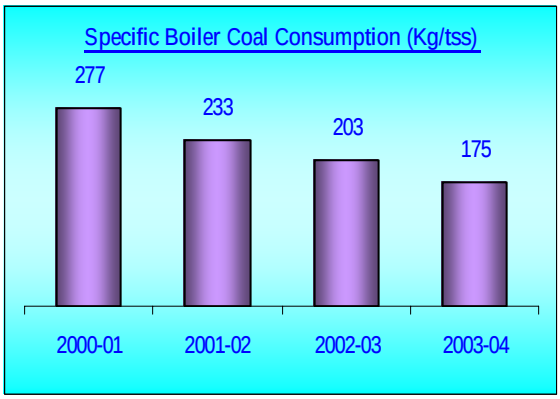
Energy Conservation achieved through introduction of new technologies, optimization of operational practices and process intensification during the five years are :

- Cold Blast Oxygen enrichment at Blast Furnaces.
- Conversion of coal fired boilers for steam & power generation to By-product gas fired boilers.
- Installation of new ammonia incinerator with waste heat recovery system.
- Installation of soft starters in NTM & Stelmore blower at Wire Rod Mill.
- Retrofitting of power saving devices at Oxygen Plant.
- Recovery of flash steam at PH # 4 and its use in deaerators of boilers.
- Recovery of exhaust steam from turbo machines through Thermocompressors.
- Coal Tar and waste lubricant oil injection at Blast Furnaces
- Improvement in vacuum of 20MW & 25MW turbo generator sets at Power House No. 4.
- Sensible heat recovery from "G" Blast Furnace Stove exhaust gases.
- Introduction of online monitoring and process integration for power & steam generation.
- Replacement of direct coupled HT drive by backward curved V/F drive at Power House 4.

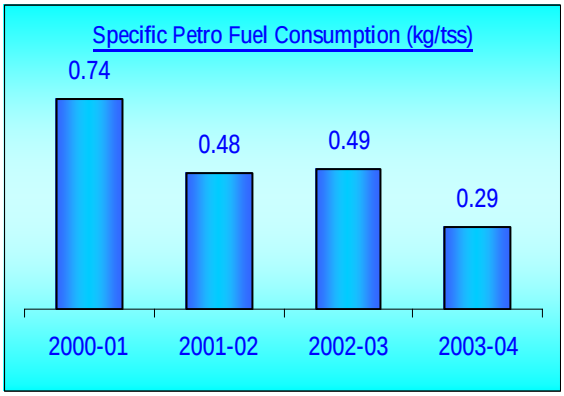
The energy conservation measures during 2003-04 have resulted in achieving

- Record lowest specific petro-fuel consumption of 0.29 kg/tss
- Record lowest specific boiler coal consumption of 175.10 kg/tss.
- Record lowest specific oxygen consumption of 55.98 Nm3/tcs for steel making.
- Record lowest specific steam consumption of 420 kg/thm in Blast Furnace turbo blowers.
- Record lowest process steam loss of 24.41 tph.

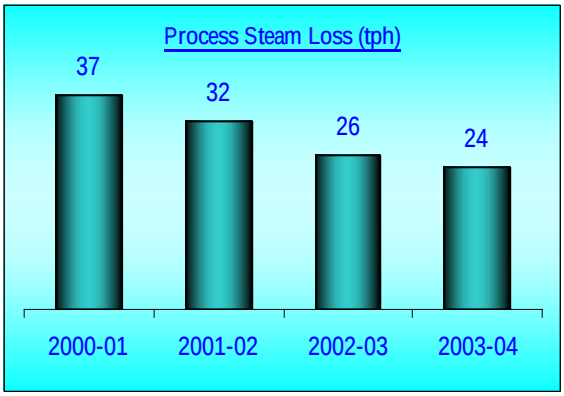
The graphs depicted below shows the achievement made towards energy conservation in the last four years



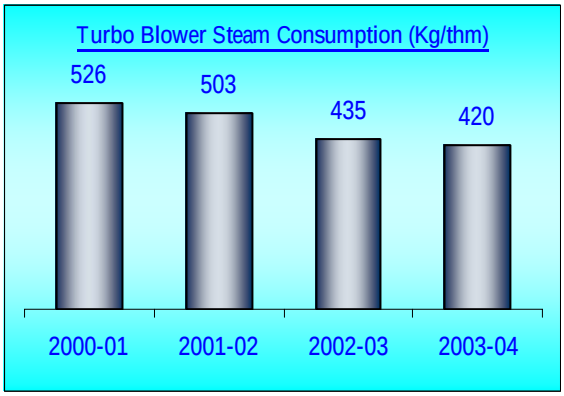
Kg/tss : kilogram per tonne of saleable steel



Kg/tss : kilogram per tonne of saleable steel



tph : tones per hour



Kg/thm : kilogram per tonne of hot metal

v. Energy Conservation Plans & Target

Tata Steel is committed to bring down the plant specific energy consumption to a level of 5.660 from its current level of 7.065 Gcal/tcs. To achieve this Tata Steel has benchmarked its Plant Specific Energy Consumption with IISI Reference Plant.

To lower the plant specific energy consumption, initiatives undertaken under 1 mtpa steel expansion program is aimed at lowering the fuel rate, enhancing waste heat recovery, higher LD gas recovery and 100% utilization of by-product gases increasing efficiency of by-product gas fired boilers. The initiatives planned are :

- Installation of Coke Dry Quenching at Coke Ovens Battery No. 5, 6 & 7.
- Reduce fuel rate of Blast Furnaces (A-F) from 578 kg/thm in FY'03 to 543 kg/thm.
- Reduce fuel rate of G Blast Furnace from 584 kg/thm in FY'03 to 555 kg/thm.
- Reduce specific steam consumption of turbo blowers for Blast Furnaces.
- Reduce specific fuel consumption for ladle & mixer heating at LD # 1 by retiring mixer after Torpedo Ladle introduction
- Reduce specific oxygen consumption from 57.3Nm3/tcs to 55Nm3/tcs at LD Shops.
- Replace flying shear with propane for cutting of billets.

- Improve LD gas recovery to 80Nm3/tcs
- Convert boilers at PH # 3 from coal firing to by-product gas firing.
- Retire boilers 1-6 at Boiler House No.1and convert boiler no. 7 from coal firing to by-product gas firing. Re-locate 2 boilers from Power House No. 3 to Power House No. 5 and convert to by-product gas firing. Install a new boiler with 30MW back pressure turbine at Power House No. 5.
- Rationalize steam lines to reduce condensate and other losses in process steam network.

With the implementation of initiatives planned to be undertaken under 1 mtpa steel expansion program, the plant specific energy consumption will reduce to 6.853 Gcal/tcs.

vi. Environment & Safety

Tata Steel is fully aware of the impact of its activities, product and services on the environment, not only at the local but also at the global scale. Today the world over sustainable development is at the core of business. It is this abiding involvement with the environment which has earned the company recognition for its achievements. The company was adjudged as the top 10 Greenest Companies in India in the survey by TERI & Business Today. Tata Steel has also achieved the distinction of being as ISO 14001 certified company.

New online safety information system has been introduced to identify the hazards and its elimination under "Green Cross Movement" for achieving zero accident.

In continuation of its efforts to make Environmental Management a way of Life at Tata Steel, the following improvements were made during the year 2003-04 :

- Significant reduction in energy consumption had a favorable impact on green house gas emission from steel works. The carbon dioxide emission has reduced from a level of 2.92 t/tcs in 2000-01 to a level 2.58 t/tcs in 2003-04.
- Solid Waste Management over the years has been considered as a business opportunity and all out efforts have been made to increase the re-use of and re-cycle of solid waste to improve business performance as well as the environmental performance of the organization. The Solid Waste Utilization has increased from a level of 70 % in 2000-01 to a level 82 % in 2003-04.
- The discharge of Water Pollutant was reduced from a level of 0.200 kg/tcs in 2000-01 to a level of 0.178 kg/tcs in 2003-04.
- Extensive re-cycling of waste water after treatment has helped in 33% reduction of Specific Water Consumption during the last five years.

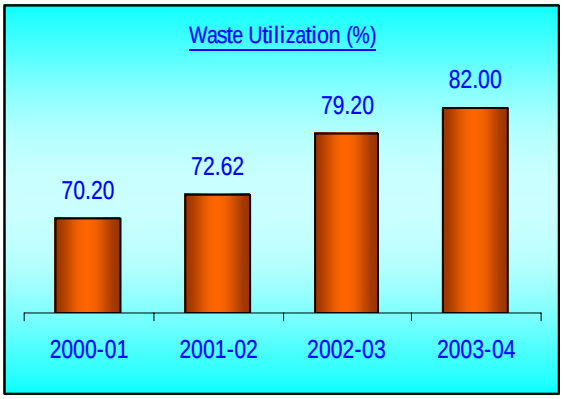
Important Environmental Improvement Projects Implemented

- Use of Ld slag in cement manufacturing (1st time in India).
- Commissioning of ESP for waste gas cleaning at Sinter Plant # 1.
- Commissioning of Stock House & Cast House Fume Extraction system at F Blast Furnace.
- Commissioning of Dust Suppression System for emission control during loading into Demag Car at Blast Furnaces.
- Installation of emission control system for Zero Kiln at Refractories.
- Mechanized road sweeping facility put into service in Steel Works to re-claim uncontrolled spillage during material handling.
- Fume Extraction System installed at Electric Arc Furnace to control fugitive dust generated during furnace operation.
- Dust Extraction system installed at Shot Blasting Machine of Segment Shop.

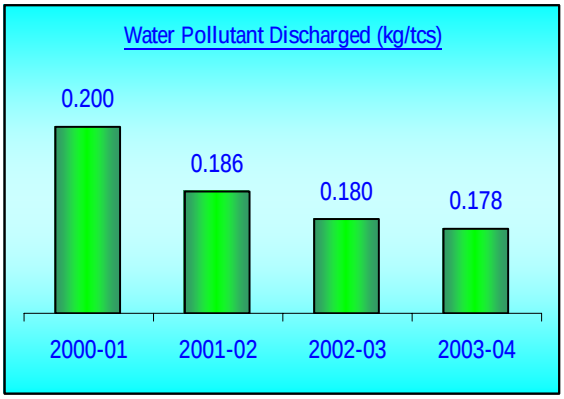
Challenges Ahead

Toward building sustainability through environmental excellence, significant challenges ahead of the companies are as follows

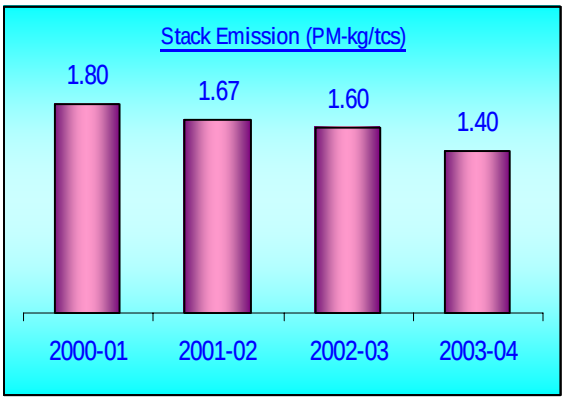
- Meaningful integration of environmental, societal & economic issue to improve & sustain companies overall business performance through a transparent & structured stake holder engagement process.
- Broadening the stake holder base for transparency, credibility & excellence.
- To achieve waste utilization to the level of world benchmark (99% plus) through cleaner processes and technological innovations and make the city of Jamshedpur a zero dumping city.
- To achieve water consumption in the steel works to world benchmark level of 5 m^3/tss.
- To convert the steel works to 100% visible emission free site.
- Effective integration of environmental, occupational health & safety performance of the company under one umbrella.



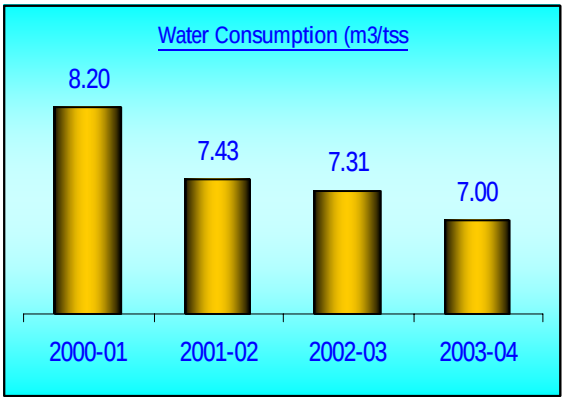
% : percentage



Kg/tcss : kilogram per tonne of crude steel



PH-kg/tcs : particulate matter kilogram per tonne of crude steel



M^3/tss : cubic meters per tonne of saleable steel