

Energy Conservation Efforts at the Tata Iron and Steel Company

Energy cost accounts for about 30 per cent of the total production cost of steel in the Tata Iron & Steel Company (TISCO). As an integrated steel plant, the company consumes fuels such as metallurgical coal for manufacturing blast furnace grade coke, middlings for steam and power generation. In addition to captive power generation, the steel works imports electricity from DVC and the Jojobera Power Plant of Tata Electric Company. Highlights of energy consumed during 1999 – 2000 are given in Table 1, while the trends of key indicators of energy conservation are given in Figures 1 – 4.

A number of efforts contributed in lowering the annual energy bill for 1999 – 2000 to Rs 763 crore (Rs 798 crore), which is 29.98 per cent of total cost of production.

In-plant power generation is around 120-40 MW and power supply from grid is about 140 MW. Captive power is used mainly for in-house critical loads and for maintaining emergency supply to the township. The base load of the plant has been identified for selected loads for steel production, power plant auxiliary, selected utility and non-rolling loads on finishing mills.

Table 1: Energy Consumption in TISCO (1999 – 200)

Coal (Metallurgical and middlings)	10 ⁶ tonne	4.5
Petro-fuel (LDO & FO)	10 ³ KI	5.82
Purchased Electricity	10 ⁶ kWh	442.63
Self-generated Electricity	10 ⁶ kWh	1131.22

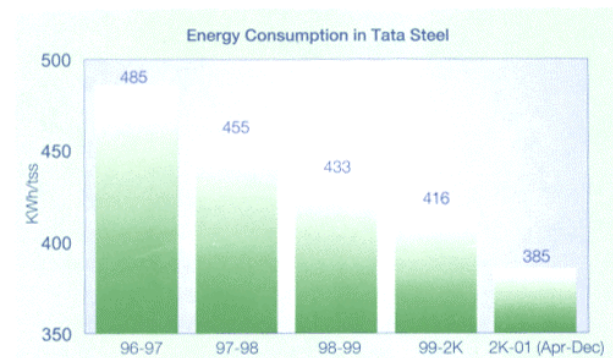


Fig 1

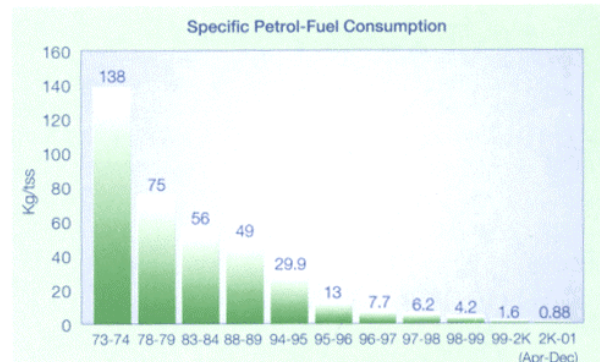
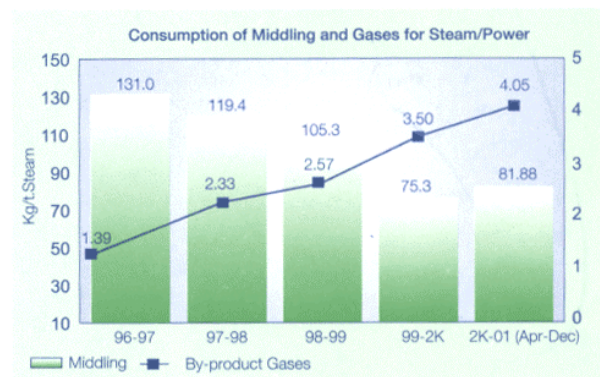
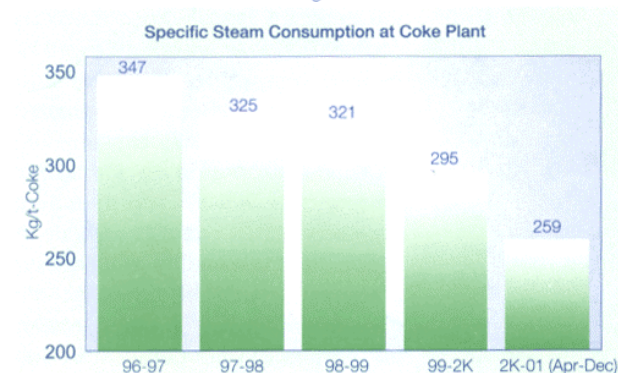


Fig 2



Energy Conservation Management at Tata Steel

Efforts towards energy conservation in Tata Steel has been greatly intensified during the last three decades with clear objectives and goals to improve energy efficiency and reduce energy cost in the different sectors of production. A systematic approach was adopted to identify all potential areas for

energy saving and these were categorized as short-and long-term action plans based on the ROI, efficient utilization of resources and overall plant energy balance.

Tata Steel has the unique distinction of establishing the first independent unit called Energy and Economy Department (E &E) exclusively for energy conservation and management way back in 1982. The division consists of experts in the field of energy conservation and process control instrumentation systems.

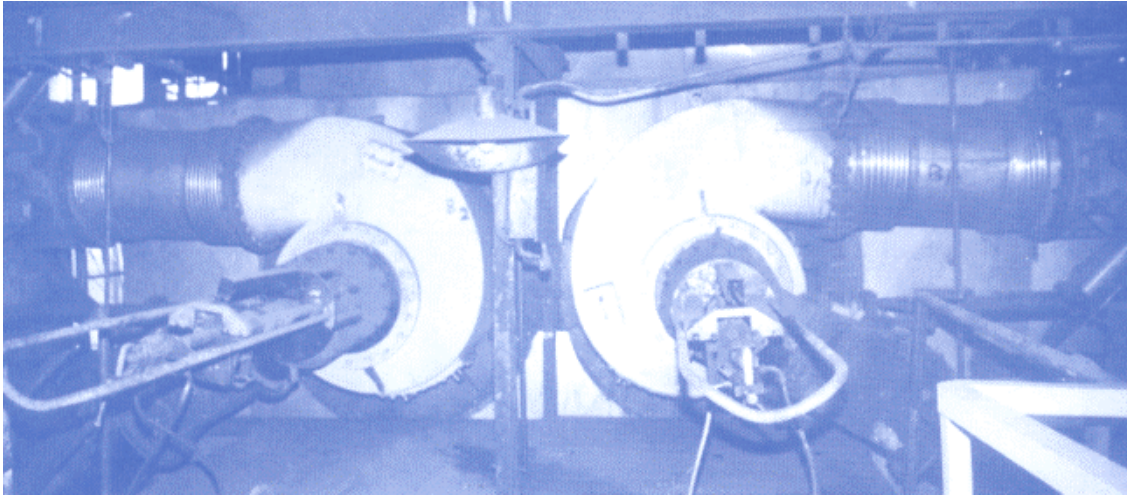


Table 2: The Energy Plan

Period	Energy Saving Measures and Technologies Implemented
1971–1981	<ul style="list-style-type: none"> ▪ Intensive energy saving campaign ▪ 100% flush charge – SMS#3 – Bessemer Converter Retired ▪ Formulation of the 10 –year energy conservation
1981-1991	Commissioning of <ul style="list-style-type: none"> ▪ BOF steel making through LD vessels ▪ Continuous caster for billet making replacing the primary rolling mills ▪ LD Gas recovery and usage ▪ Energy efficient lime shaft kiln (Maerz Kilns) replacing rotary kiln ▪ Energy efficient Sinter Plant #2 ▪ Stamp charge coke oven battery replacing top charge battery # 6 ▪ Walking hearth reheat furnace at Wire and Rod Mill Retirement of open hearth furnaces at SMS # 1
1991-1994	Commissioning of <ul style="list-style-type: none"> ▪ Energy efficient ‘G’ Blast Furnace ▪ 2nd BOF steel making shop (LD # 2) ▪ Continuous caster for slab ▪ Energy efficient walking beam furnace with state-of-the-art instrumentation at Hot Strip Mill Replacement of top charge batteries # 5 & 7 with stamp charge batteries Retirement of energy intensive processes such as Open Hearth Furnaces
1994-2000	<ul style="list-style-type: none"> ▪ Plan for higher usage by product gases in boilers to replace coal and oil. ▪ Coal air injection in three best furnaces ▪ Efficiency improvement in the existing units. ▪ Commissioning of the Energy Management Centre with state-of-the art technology for online monitoring of energy parameters for effective control ▪ Installation of thermocompressors for waste steam recovery at coke plant. ▪ Conservation of tar dolo kiln from LDO to coal tar firing.

The new recruits at entry level undergo a 9 month training programme on energy conservation tailor-made for steel plants. Refresher courses are also conducted to keep the workforce abreast with the latest developments.

E & E has sub-sections responsible for maintaining supply, distribution and efficient use of energy among the different users in the plant. It gives regular feedback on energy efficiency, fuel rates, specific fuel consumption and energy cost to all operating departments and to the higher management to achieve desired control. On matters of energy such as purchase/procurement of new technology/equipments, E & E advises both the project and operating departments.

A state-of-the-art Load Dispatch Centre (LDC) was established in 1992 for online monitoring of the electrical system network for efficient and safe distribution of electrical energy in the plant. A state-of-the-art fully computerised Energy Management Centre was conceived in 1997 for online monitoring of close to 1,000 parameters for safe management of energy networks and efficient distribution of various forms of energy. Horizontal interactions between the Energy Group and that of the operating departments take place round the clock.

Formulation of the Energy Plan

The first phase comprised building awareness, targeting and monitoring energy consumption levels of various units followed by housekeeping measures for saving energy across the plant. The process included activities such as intensive training, workshops and seminars in the area of energy conservation.

The second phase, that began in 1980-81, consisted an on-site energy audit and formulation of a structured 10 year Energy Plan as a corporate approach to energy conservation. The plan in Fig 1, (page 15) was broad-based and incorporated multifaceted strategies identified through benchmarking to enhance energy conservation.

The corporate environmental policy subsequently formulated also integrated the need for energy and resource conservation as an essential element for sustainable growth.

Technological upgradation and process improvements implemented under the expansion-modernisation programmes led to quantum improvements in energy efficiency. A special Task Force-Total Operational Performance (TOP)- addressed the gaps identified in various energy performance parameters through benchmarking and value engineering..

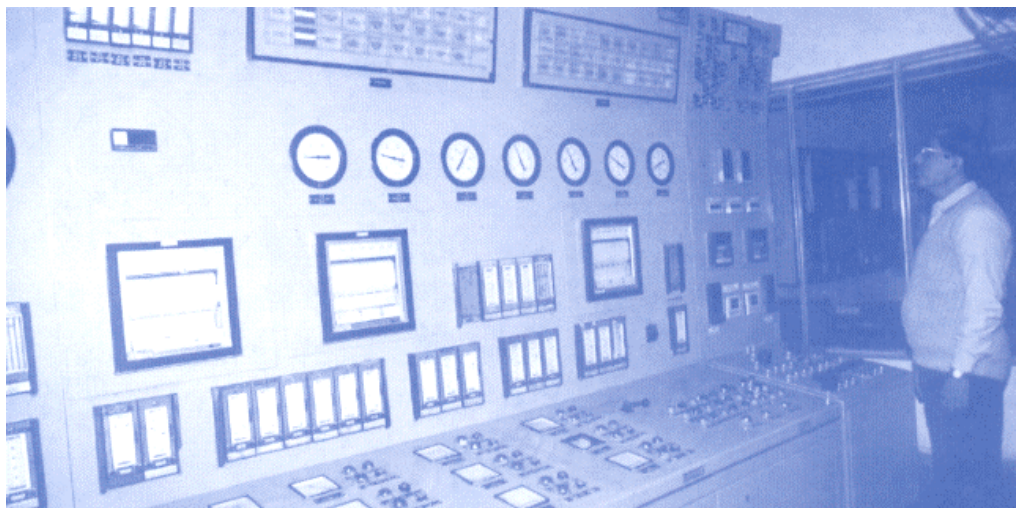
The exercise provided adequate information, which helped to quantify the energy used in a facility/process system to focus attention on continual improvement in energy efficiency through prevention of losses, process optimization and automation.

The Principal Objectives and Targets of Energy Plan 1980-91

- Identifying energy saving opportunities
- Training and involvement of entire workforce
- Phasing out old and inefficient processes and plants such as the Open Hearth practice of steel making
- Introduction of energy-efficient technologies during the phased modernisation programmes, such as Continuous Casting, Stamp Charge Coke Making, etc.
- Search for proven energy-saving technologies for introduction in various process stages such as gas firing in boilers, use of auxiliary fuels (coal and coal-tar) in blast furnaces
- Reduction/elimination of petrofuel consumption
- Overall reduction in specific energy consumption by more than 1 per cent annually through coke economy in the blast furnaces, operation efficiency at various process steps including waste heat recovery, fuel substitution and process integration

Implementation of Energy Saving Measures and Technologies

The initial audits in 1980-81 showed that the major energy consuming units in Tata Steel were old machineries with or without inbuilt energy saving devices. Non-availability of matching technology within and outside India hampered implementation of energy conservation schemes for long-term objectives. A modernisation programme was therefore undertaken in phases to replace the older units and outdated technology with newer units with inbuilt energy saving systems.



Based on the Energy Plan, energy saving measures and technologies implemented progressively at Tata Steel are summarised in the box.

Tata Steel shares its experience with sister concerns such as Tata Refractories Ltd, Tata Yodogawa, Tinsplate, Telco, Tata Metalliks, Tata Sponge, and others in the area of energy conservation. It also helps in conducting energy audits to formulate and implement the energy conservation plans in their respective areas.

In addition, Tata Steel is a regular participant at various workshops organised by CII and PCRA where experiences on energy conservation are exchanged for the benefit of the other companies.

Results and Conclusion

Sustained energy conservation efforts yielded good results. Consumption of plant specific energy was reduced @ 1.5 per cent a year as shown in Fig 5. Since reduction in specific energy consumption is a high impact factor on cost, efforts are focused in this area. Future plans include new gas-fired boilers with cogeneration of power, rationalisation of the steam distribution network, and other such measures. The possibilities of installing waste heat recovery systems through NEDO aided by the Government of Japan is also being explored. The energy conservation journey at Tata Steel is never ending.

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Reference book:
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