ADMINISTRATION MANAGEMENT & DEVELOPMENT OF SAIL-A STUDY

STRATEGIC PLANNING AND MOU IN SAIL: SAIL AN OVERVIEW

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Strategic Planning in SAIL

The Context of Planning

The formal long range planning process, initiated in 1986 in SAIL saw publication of two corporate plan documents – Corporate Plan 2000, and Corporate Plan 2005. Corporate Planning deals with development of comprehensive strategies to – meet future demand of steel, upgrade quality and bring about greater customer satisfaction, and generate required returns for the stakeholders. The corporate plan document is a common reference point on SAIL’s future direction to those within SAIL and to the external agents that SAIL interacts; e.g. the Government, customers, and infrastructure and raw material industries.

Both the earlier corporate plans had a perspective of around 15 years with 5 years milestones, and five yearly reviews. However, the exercise of drafting a new Corporate Plan in the late nineties was not undertaken, as by then it had become apparent that changed business environment necessitated fundamental changes in the Company’s business. The need of the hour hence was a restructuring plan, rather than a traditional long range growth plan.

Path to Turnaround and Transformation

SAIL is one of the leading steel companies in the world and is ranked eleventh largest in terms of crude steel production. Our company’s financials after showing consistent profits from 1984-85 up to 1997-98, have come under strain since 1998-99 on account of a number of reasons. To overcome the adverse situation and attain a position of sustainable profitability, we are in the midst of implementing one of the most comprehensive restructuring programme.

Underlying Reasons for SAIL’s Adverse Business Performance in Recent years:

The Business Environment: After passing through the initial phase of stabilisation following the economic reforms and liberalisation initiated by the government in 1991, the steel industry experienced an average growth of 22% and 14% during 1994-95 and 1995-96 respectively. The year 1996-97, however, witnessed a drastic transformation in the domestic steel scenario. A slowdown in economic activity engulfed almost all the industrial segments, leading to a steep drop in the growth rate of steel consumption – about 4% in 1996-97 and remaining almost flat in 1997-98 and 1998-99. At the same time, the availability of steel in the market grew rapidly with the commissioning of fresh capacities, leading to a declining trend in the price of steel. The problem was further exacerbated by freer imports and declining international prices in wake of South East Asia currency crisis. Though the demand is likely to firm up in coming years, excess capacity is likely to persist in the flats category.

High Financial Charges: Very high financial charges have had a significant impact on SAIL’s profit. The modernisation programmes, at an estimated cost of around Rs. 12,000 crore, were financed primarily through market borrowings due to inadequacy.
of internal resources. With the capitalisation of the facilities under modernisation, there was a steep increase in interest and depreciation charges. The depreciation charges increased from Rs. 585 crore in 1995-96 to Rs. 1104 crore in 1998-99. The interest charges also went up sharply from Rs. 808 crore in 1995-96 to Rs. 2017 crore in 1998-99, partly also on account of increased inventory carrying cost.

**High Cost of Manpower and Social Infrastructure:** During the period 1991-92 to 1998-99 the salary and wage(s) bill of the company increased from Rs. 1203 crore to Rs. 2381 crore. As a proportion of turnover it increased from 13% in fiscal '93 to 16% in 1998-99.

Funding of social infrastructure in the form of schools, hospitals and township, supporting loss-making subsidiaries and a large manpower have resulted in a huge drain on the company's resources.

**Sub-Optimal Benefits From Modernisation Programmes:** The management of our modernisation programmes has affected us at two levels. The overall programme has been costlier due to over-capitalisation and time over-runs. At the same time, stabilisation of the modernised units has lacked the requisite pace, and full economies of cost and quality benefits are yet to be derived.

**Low Net Sales Realisation:** Low net sales realisation during past few years is a result of intensified competition and the general oversupply situation in the market place. However, inconsistent supply and quality of products have also contributed to loss in net sales realisation.

**The Restructuring Plan**

An in-depth analysis indicated that to come out of the adverse situation we need reforms at a very basic level. Hence, the focus of the company for turnaround and transformation will be on the following areas:

I. Restoring the Financial Foundation
II. Restructuring the Organisation
III. Reinforcing Marketing Initiatives
IV. Regaining Cost Leadership
V. Redefining Business Performance

The Government of India in February 2000, approved a financial and business restructuring plan for SAIL. The objective of the restructuring plan is to affect –

a) Financial restructuring to improve the company's financial health, in particular its debt serviceability and bankability of future projects, and

b) Business restructuring to make SAIL a vibrant company which is internationally competitive in its core business of carbon steel, and provides reasonable return to its shareholders.

I. Restoring the Financial Foundation:

Through the financial restructuring, SAIL is targeting a long-term debt to equity ratio of 1:1 through a one-time capital restructuring and recasting of means of finance for current/ future projects.
The financial restructuring was carried out at two levels—

[i] **Restructuring of asset value:** (a) Time over-runs in modernisation projects led to inflated asset values (due to accretion in capitalised interest) without corresponding increase in income generation capability. Therefore, the assets were written down to the extent of interest capitalised. (b) Loans and advances to IISCO through SAIL were also be written off, including interest written off in past in respect of loans to IISCO.

[ii] **Restructuring of capital and liabilities:** The write down of assets were set off by reduction of GoI/SDF debt to the extent of Rs. 5453 crore.

In addition, Government provided guarantee for raising resources for part of the debts whose repayment were falling due, as well as for financing the VRS.

The financial restructuring therefore has had a positive impact on the profitability of the company through reduction in interest and depreciation charges. Apart from the impact on profitability, it has also helped in mitigation of financial risk by reducing the debt-equity ratio and improvement of our debt servicing capability. However, financial restructuring alone would be insufficient for the turnaround of the company.

II. **Restructuring the Organisation:**

SAIL as an organisation largely retained its structure, systems and processes in the pre and post-liberalisation periods. Steel units all over the world, on the other hand have periodically redefined their business. Newer and more efficient units have come up and uneconomic units shut down. The organisation hence has to address the following issues:

- Persistently loss-making units and their potential of turning around
- Non-core assets which can be better managed by the agencies for whom these are core activities
- Promotion policy and incentive systems which align individuals to well defined organisational goals
- Rightsizing of manpower
- Reorganising SAIL from a functional to a business unit structure

**Core Versus Non-Core Business:** In our business portfolio, carbon steel has the prospect of becoming internationally competitive, i.e. SAIL has the potential to become the lowest cost mild steel producer in the world due to inherent advantages in raw material sourcing. DSP and RSP which are making losses today, have the potential to make profits due to the strength of technologies introduced under modernisation. Similar potential however is not available with the special steels business. Hence SAIL will concentrate on its core business of carbon steel and divest units engaged in special steels production viz. ASP, SSP, VISP.

IISCO a subsidiary of SAIL is engaged in mild steel production. However, IISCO requires substantial investments for modernisation which SAIL is unable to provide. In view of this IISCO is planned to be revived through a joint venture route, where the partner will mobilise funds for investment.
Non-Core Assets: With a view to long-term competitive positioning, it is important to identify non-core assets which would operate better as independent companies. Power generation and oxygen production are not our core business activities. Our power and oxygen plants can hence be efficiently managed by companies, which specialise in these businesses. Similarly, we are targeting divestment of the fertiliser plant at RSP which is both a non-performing asset and non-core to SAIL’s business.

Promotion Policy: SAIL is redesigning systems and processes for personnel evaluations, reward and promotions across all levels. As the promotions earlier were by and large delinked from vacancies, it has led to a top-heavy organisation with bulges at certain levels. The policy will now be refined so that the growth of personnel does not dilute the structure. The executive levels below Head of Works will not be more than four to five. Intra- and inter-plant rotation on promotions beyond certain levels and introduction of qualification bars would be the other features of the new promotion policy.

Incentives: Incentives systems will be modified and aligned to financial performance, productivity, quality, cost, and delivery rather than production. For middle and senior management, the incentives will be linked to return on capital employed. The incentive system for sales performance has been changed. In course of time, sales value, inventory management, and contribution will be the guiding factors in deciding incentive.

Rightsizing Manpower: SAIL’s current manpower strength of around 1,35,000 is much higher compared to the international benchmark for integrated steel plants. Benchmarking against comparable iron and steel facilities in the country indicates that it is desirable that SAIL’s manpower strength be brought down to about 1,00,000 in the next five years.

The targeted reduction will take place through natural as well as voluntary separation. While around 7000 employees will superannuate every year over the next four years, manpower in SAIL would still be far in excess of the desired level of 1,00,000 by 2004-05. Hence manpower reduction of around 40,000 has to be achieved through the process of voluntary retirement. During the manpower rationalisation process, SAIL has to reorient its activities to work with a leaner workforce, and work flows will be redesigned to maximise efficiency.

III. Reinforcing Marketing Initiatives:

Reinforcing and strengthening marketing initiatives is necessary for enhancing SAIL’s competitiveness. There is need both for a refocused product-market strategy, as well as improved marketing processes. To begin with, we have to target an optimal product mix, based on attractiveness of different product segments and our own strengths and weaknesses. This would be followed by aligning the marketing, production and capital investment strategies with the optimal product mix.

To meet the challenges of a competitive market we need to have a product-oriented business perspective. This would facilitate product knowledge and segment specialisation of the sales executives. As a first step, CMO has been reorganised along flat and long products lines.
Re-Focused Product Market Strategy: It is estimated that high-end steel consuming segments in the flat products market such as automobile, white goods, and boilers and pressure vessels, are likely to grow about 2% faster than the low- and middle-end segments. However, in volume terms, they constitute only 13% of the market. The low- and middle-end segments would constitute the balance 87% of the market. Consequently, the preferred strategy for SAIL would be to protect its current share in the low- and mid-end segments in flats while selectively moving towards high-end segments. In longs, SAIL will invest to meet quality requirements of customers such as the Railways. There is also a need to increase finishing capacities in future.

Marketing Initiatives: The company initiated some measures to gain additional profits through marketing initiatives in CMO and plants. These initiatives fall into four areas – quality improvement, key account management, sales force effectiveness and marketing channel optimisation.

Quality Improvements: Currently, customers in many segments encounter quality problems with SAIL products. Poor quality in our case has led to large losses, which occur at multiple stages – high arisings in the plant, downgrading at the stockyard, customer rejects, lower price realisation and loss in sales. This situation can be reversed since substantial quality improvements can be achieved through improvements in work practices, technological discipline and optimum utilisation of the new facilities.

Key Account Management: SAIL has also started introduction of a comprehensive ‘Key Account Management’ (KAM) programme for its customers. Currently, only 2% of our customers account for more than 50% of our sales. To protect these large customers from competition, we need to correct anomalies in the existing accounts management process. For example, at present, large customers who buy multiple products from us have to approach separate salespersons. In addition, salespersons spend far too much time with small customers. In some branches, only one or two salespersons handle most of the large accounts yielding up to 80% of sales.

The KAM process is being implemented with involvement of both CMO as well as plant personnel. The team would be responsible for ensuring reliability on quality and delivery of products to the key customers. As a consequence, we should be able to improve our share with them, as well as net sales realisation due to better service.

Sales Force Effectiveness: There is a need for CMO personnel to spend more time on customer contact and less on paperwork. We also need to upgrade critical selling skills of our sales executives, including the acquisition of a thorough knowledge of customers and products. The existing incentive system would be modified to stimulate high performance by basing it ultimately on contribution, NSR and volume. Some of the measures for improving salesforce effectiveness would be:

- Transfer of suitable executives from the plants and CMO headquarters to the branches, and transfer of CMO salespersons to plant and vice-versa.
- Training non-executives to perform low-skill activities such as paperwork and follow-up with plants, and introducing at IT-enabled environment for faster information flow.
• Increasing face-to-face time with customers/prospects.
• Assigning best salespeople to key accounts.
• Training the salesforce to improve communication, negotiation and planning skills.
• Structuring compensation to reward excellent performance based on cash collection, NSR and reduction in marketing cost.

**Marketing Channel Optimisation**: Cost-effective channels are required to be established in distant areas/small towns, as well as to service dispersed demand of small volumes in major consuming centres. With this in mind, SAIL has established a dealer network across the country. Some of the stockyards and branches which have become unviable would also be shut down. Going ahead, we are targeting 10% of sales through the dealers' network.

**IV. Regaining Cost Leadership**: Cost reduction is probably the most obvious driver of improved competitiveness in today's business environment. During the past few years, we have already initiated steps in this area with very good results. However, the thrust in this direction should continue as it will have the highest impact on financial performance in the short and medium term. Moreover, there is a significant opportunity for us to reduce costs and become one of the lowest-cost producers in the world.

Systematic cost savings calls for a rigorous methodology. To impose such a methodology, we have considered four areas of cost reduction:

• Operational costs in the plants
• Purchasing costs
• Working capital (supply chain) costs
• Social infrastructure costs

Together, these represent a large cost reduction potential achievable over the coming years.

**Operating Cost Reduction**: The current cost of production at each of the four ISPs is higher than the benchmarks for plants with similar technology. The main reason for our inflated cost structure is the low performance on key techno-economic parameters such as energy and yield at each stages of production. While techno-economic parameters have improved considerably over the last few years, there is still room for improvement.

Future savings opportunity can be derived from a detailed analysis of each plant's technological capability and performance relative to benchmarks, and should represent parameters or costs that are achievable without significant investments in upgrading or replacing technology.

**Purchase Cost Reduction**: In the past, SAIL has selectively focused on some items for cost reduction. We need to take several steps to ensure purchasing effectiveness and reduce overall costs. An estimated average cost reduction of 5-10% on overall purchase expenses is possible using the purchasing strategies described below.
(1) **Focus on Total Cost of Ownership (TCO)**: The TCO approach looks at the cost of purchased items beyond the procurement price. Ensuring the best procurement price is only the first step in building purchasing effectiveness. The other sources of opportunity lie in reducing internal business costs such as inventory holding cost, transportation costs, and costs of the purchasing administration, which are all incremental to the pure cost of procurement.

(2) **Differentiated Sourcing Strategies**: SAIL plans to move away from its uniform sourcing strategy for all suppliers. As per past practices, our purchasing has been based on a tendering process with a view to maximise the number of suppliers. Instead, we need to follow a differentiated sourcing strategy depending on a segmentation of commodities based on—(a) their strategic importance, and (b) SAIL's bargaining power vis-à-vis suppliers.

As is well known, the interests of various stakeholders in the purchasing process differ. For example, the purchasing group's goal is to get the lowest possible price, while the operations group wants reliability and good quality. Hence, specific commodity teams at the plants have now been formed. These comprise people from different streams such as purchasing, finance, operations and maintenance. The overall role of these commodity teams is to focus on reducing the TCO, provide technical problem-solving capability, and make optimum cost-quality tradeoffs.

(3) **New Procurement Policy and New Purchase Process**: A new purchasing process is being worked out in SAIL, which is being overseen by an Apex Committee of Directors of the Board. It emphasises the thrust on TCO and permits the leveraging of the bargaining power of SAIL to reduce purchasing costs.

**Supply Chain Management**: The supply chain deals with order generation to production and then final delivery to the customer. Improving supply chain management is critical to reducing both working capital and lead times. Systemic changes are required in both marketing and production related processes to minimise inventory levels and also ensure minimum lead-time for delivery to customers. For this the following actions need to be taken:

(1) **Produce only what can be sold**: We must stop the 'production maximisation' philosophy and shift to maximising contribution, taking into consideration costs on account of inventory carrying, obsolescence, etc. Further, whenever inventory builds up, it leads to further discounts, depressing prices artificially.

(2) **Improve both production and marketing related activities**: In the past, we have often faced the problem of receiving fewer orders than anticipated, leading to unwarranted production and inventory pile-up. We have to institutionalise systems to forecast the stockyard demands better based on genuine information (e.g., customer orders) and sophisticated market intelligence.

On the production front, we must decrease the levels of downgrades and diversions. Adhering to well-laid out work practices will have the greatest impact in this area.

(3) **Increase accountability through proper incentive systems**: Accountability would be fixed on concerned marketing and production personnel for managing inventory levels. Failure to sell committed volumes would affect the performance incentives of marketing personnel and unplanned over-production by the plants would
affect their performance incentives. Overall, CMO would be made accountable for inventory levels, particularly at the stockyards, while plant MDs would also be made accountable for inventory levels in the plants.

(4) Reduce stores & spares inventory: SAIL currently has a large stock of non-moving stores & spares inventory. There are various reasons for this—items turning obsolete, purchases lying unclaimed which become unusable over time, ‘non-moving’ inventory of parts not needing replacement for more than three years, maintenance of ‘insurance’ inventory, etc. We should aim to reduce this stores & spares inventory by at least 50%. This will include fixing a maximum ‘insurance’ level, declaring inventory ‘obsolete’ for disposal, and disposal of old stock as scrap.

Social Infrastructure Costs: Our company has been a leading member of the PSU family. In the early years of the working of PSUs, providing employment as well as social benefits to the employees was an important motto. SAIL has fulfilled these responsibilities exceedingly well and is indeed one of the top companies in India in providing social benefits.

The current expenditure on social infrastructure such as township, provision of medical and educational facilities, etc., results in an additional overhead of nearly Rs. 500 per tonne of saleable steel. In today’s fiercely competitive steel industry, it adds a further handicap to our ability to compete against low-cost players. SAIL therefore has to systematically rationalise its expenses on social infrastructure by gradually reducing subsidies without affecting the quality of services/social amenities to the employees. Areas such as manpower reduction in schools, hospitals, contract labour and CISF manning, increase in electricity charges, water charges, house rent, medical charges, education and canteen, have been identified for rationalisation.

V. Redefining Business Performance:

Due to poor financial performance, the credit rating of SAIL has been steadily lowered. The fallout of this is erosion in the capacity of the organisation to borrow from the market. The situation is further compounded due to prevailing negative earnings per share (EPS) of SAIL’s shares, practically shutting out resources through the equity route. Our company’s immediate short term goal hence is to attain ‘self-reliance in cash’ to meet the operating expenses and repayment of loan and interest. For this business performance has to be measured against cash management performance in terms of cash costs and cash turnovers, monitored on a weekly basis.

In view of above, a two-pronged strategy is being put into effect. While the first set of actions would be directed towards revenue maximisation, the second would be towards cost reduction. The proposed actions would provide a viable and profitable future for SAIL. They would also provide us with the levers for attaining cost leadership in the foreseeable future.

Revenue Maximisation: In the medium term, the aim of the CMO will be to sell 2.25 million tonnes of special quality steel, bring down amount against sundry debtors to Rs.1100 crore and the stock-to-sales ration to 30 days. The working capital requirements can be brought down significantly by inventory reduction.

The timely flow of information between the various agencies would be a necessary prerequisite for faster and correct decisions. The use of IT tools to enable this would be given priority both at CMO and plants.
**Improvement in Operating Efficiencies**: The plants have identified cost savings by improving operational efficiencies in areas such as coking coal/other raw material usage, consumption of power and fuel, yield and techno-economic/productivity parameters, stores & spares consumption, expenditure on repair and maintenance, including contract expenditure, optimising purchases, etc.

There are wide variations in the cost of production of various products in the SAIL plants. This needs to be bridged. All plants must migrate to the level at which the best plant of SAIL is operating. Though the reduction in fixed cost in each of the plants should be given thrust in the medium term, the immediate emphasis has to be on reduction of variable cost.

**Conclusion**

With the implementation of Turnaround and Transformation Plan, positive results started coming up. The Company turned around in the 4th quarter of the financial year 2002-2003 and continued its strong performance in the financial year 2003-2004. This has given the Company lot of confidence to start preparing for the Corporate Plan 2012.

**STRUCTURE OF SAIL**

![Structure of SAIL](image)
MOU in SAIL

Introduction

Steel Authority of India Limited (SAIL) signed a Memorandum of Understanding (MOU) with Ministry of Steel (MoS), Government of India (GoI) for the first time in the year 1987-88. Since then, for every year MOU has been signed between SAIL and MoS.

Concept of Memorandum of Understanding (MOU)

The concept of MOU arose from the report of Arjun Sengupta Committee, MOU is described in the report as follows:

Basic of Memorandum of Understanding: “The holding company would specify its plans for investments, production, capacity utilization, dividends, etc. for a 5 year period and enter into Memorandum of Understanding with the Government, after mutual agreement on performance levels. Certain obligations would be cast on the concerned Ministry of Department regarding provision of input and infrastructure, price level etc. The MOU would be reviewed and updated each year. The performance of the holding company will be judged on the basis on MOU, making allowance for failure or otherwise of the Ministry of Department to fulfill its part of the understanding”.

SAIL was among the first Public Sector Undertakings to enter into MOU (first time in 1987-88). This is the sixteenth consecutive year for SAIL to sign MOU with the Ministry of Steel. This continuity is based on the firm foundation of mutual trust and commitment build over the past twelve years through the process of MOU.

Purpose of MOU

The MOU seeks to state the performance expectations and support commitment and support required by SAIL. It also seeks to confer on SAIL sufficient flexibility and freedom of operation, required to achieve not only its performance goals for the year, for which MOU is being signed but also its long-term goals. The MOU also aims to enable SAIL to operate as an efficient public sector commercial enterprise within the board policy objectives set by the Government and the requirements of Parliamentary accountability.

The MOU Document

The MOU document includes statements on the following:

1. Long-term objective of the company (SAIL)
2. Commitment by the company to achieve the objective
3. Commitment by the Ministry (in this case, Ministry of Steel)
4. Principles of Evaluation of the Overall Performance
5. Methodology of Review
**Long Term Objectives of SAIL:**

a) To prosper in business by achieving international competitiveness through satisfaction of customer needs by continual improvements in quality, cost and delivery of products.
b) The production of saleable steel of four integrated steel plants to increase on a pre-determined basis.
c) To improve techno-economic parameters continuously to ensure cost competitiveness of the products.
d) To remain a good corporate citizen and promote environment friendly operations and practices.
e) To ensure high standard of health and safety of its people.

**Commitment by SAIL**

It includes precise statements on what SAIL undertakes to fulfill during the year. Such undertakings (targets for fulfillment) are in the following areas:

- Production of Saleable Steel
- Export
- Stock Reduction
- Techno-economic parameters (such as Specific Energy Consumption, BF Productivity)
- Financial Parameters (such as Sales Turnover, Net Profit, Net Profit to Capital Employed)

The factors mentioned above are termed as static parameters since the results of these parameters can be measured during the year itself.

SAIL commits on certain dynamic parameters also where the results of the efforts being put in the year will be visible in later years. The dynamic parameters are:

- Major project milestones
- Training of employees
- Completion of Research and Development projects.

Other parameters include submission of performance Evaluation Report of the previous year, submission of Draft MOU of the next year and timely signing of the MOU document.

**Commitment by Ministry of Steel (MOS):**

- Ensuring adequate availability of quality and quantity of coking coal, power and railway wagons.
- Assist in removal of infrastructural constraints like ports and rail movements etc.
- Assist in getting Environment clearance from Ministry of Environment and Forest for the projects.
- Assist in fulfillment of the objectives set out in the financial and business restructuring plan.

Production and financial parameters would undergo changes in case indigenous coking coal availability and quality are not as per the requirements.

**Evaluation System**

Every parameter is evaluated on a five-point scale (with a score of 1 at Excellent and 5 as Very Poor Performance). In order to arrive at a composite score (overall efficiency index) the different parameters have been assigned at different weights (ranging from 1%).
The parameters for evaluation, the weight for each parameter, and the criterion values may change every year.

**Review**

The MOU document envisages review of performance at two levels, namely

1. Regular review at Board level at SAIL
2. Quarterly review between SAIL and Ministry of Steel

**Mechanism for Signing MOU**

The following steps are followed for signing MOU:

1. Preparation of draft MOU by SAIL
2. Agreement by the concerned Administrative Ministry (Ministry of Steel)
3. Review by Ad-hoc Task Force set up by GoI
4. Revision by SAIL and MoS
5. Submission to Department of Public Enterprise (DPE)
6. DPE putting up to High Power Committee (HPC) set up by GoI
7. Approval by HPC
8. Signing of MOU by Secretary, MoS and the chairman of SAIL

Also a MOU has been signed between SAIL and the Ministry of Steel on the financial and business restructuring to turnaround SAIL.

**Annual Performance Plan (APP)**

Each unit of SAIL prepares an annual plan for production of goods or services, depending upon the demand forecasts and forecasts on availability of facilities. This then becomes the basis of APP, which is a negotiated agreement between SAIL corporate office and individual units on monthly production targets, quality parameters, techno-economic parameters, financial performance indices, implementation of projects and so on. Such agreements are made by corporate office individually with all SAIL plants.

**The Logic for APP**

APP is a mechanism for translating to the Unit level the commitments made by SAIL to MOS through the MOU. While MOU gives targets for production techno-economic parameters, financial performance, implementation of projects, etc., for plants/units at a macro level, the APP gives details at micro level (Unit level), indicating month-wise, shop-wise and equipment-wise targets. The APP document is directed towards fulfilling the following long term objectives for SAIL:

a) to minimise costs and maximise revenue generation through backward and forward integration and diversification
b) to enter the export market and make a presence through competitive prices and quality
c) to improve customer satisfaction by meeting customer demands within stipulated period and in the required quality and specification
d) to achieve economic viability and financial self sufficiency while keeping production at internationally competitive costs
e) to develop human resources with better manpower utilisation and enhancing...
organisational flexibility to meet environmental and internal changes. The long-term objective of SAIL, both at the Corporate Level and Unit Level, is to achieve high levels of productivity while simultaneously improving the quality of steel produced, financial self-reliance, and customer satisfaction. The spirit of these agreements with Units is one of shared responsibility, where the Units achieve the performance levels specified in the APP so that SAIL fulfills the commitments made to MOS through MOU.

**Parameters in APP**

The APP document of an integrated steel plant includes:

1. Main Products (includes monthly production targets of each major production Unit, such as, Coke Ovens, Sinter Plants, Blast Furnaces, Granulated Slag, Steel melting Shop, each primary & finishing mill, semis for sale and saleable steel)
2. Secondary Products (includes monthly production targets from Foundry Shop, Forge Shop, Structural Shop, Machine Shop, Electrical Repair Shop, and other Shops.)
3. Product Mix (monthly production target for each grade and specification of finished products)
4. Critical Items (monthly production targets for critical items among the products)
5. Techno-economics (monthly targets for indices such as heat consumption per tonne of coal, coke rate, Blast Furnace Productivity, metallic yield at Steel melting Shop, mixer loss, ingot mould and bottom plate consumption and so on)
6. Standard Tested Performance (*monthly targets of tested quality production for different product ranges such as HR coil, HR plate, HR sheet, CR coil, CR sheet, Rails, Sections Pipes, etc.)
7. Equipment Performance (quarterly targets for availability of equipment in major departments such as Sinter Plant, Blast furnaces, Steel melting Shop, and different Mills).
8. Capital Repairs (annual capital repair schedule for key units)
9. Captive Power Generation
10. Commissioning of Projects (AMR schemes costing between Rs. 2 crore to Rs. 20 crore)
11. Approval of Investment Proposals
12. R&D Plan (list of Research and Development projects for each plant)
13. Working Results
14. Capital Expenditure
15. Stores and Spares
16. HRD Performance of Captive Mines (performance targets for mines near Bhilai included in the APP of RMD)
17. Import from Public Utilities
18. Requirement of Coal
19. Inter-Plant Transfer
20. Railway Wagons Requirement

A detailed APP book is prepared covering the above parameters by each plant/unit. Also a one-page APP is prepared for each plant/unit which is signed by the Chairman, SAIL and the Chief Executive of the plant/unit concerned which covers certain Key Performance Parameters which are monitored at Corporate Level. These parameters include –
Commitment by Plant / Unit –

- **Profitability Parameter** – Turnover, Gross Margin, Cost Reduction, Sale of Idle Assets, Consumption of Stores and Spares, Inventory Reduction of semi/finished steel & others
- **Marketing Parameter** – Home Sales, Plant Sales, Export of saleable steel and pig iron
- **Operation Parameter** – Saleable steel production, Value added products produced, Finished products produced
- **Techno-economic Parameter** – Coke rate, Coal to hot metal ratio, metallic consumption in steel melting shops, specific energy consumption, generation of arisings
- **Human Resource Parameter** – manpower reduction
- **Special Relevant Parameters** – critical projects, development of new products etc.

Commitment by Corporate Office –

- Cash Allocation
- Raw material requirement

**Review of APP**

The fulfillment of APP by each Unit is reviewed at two levels, namely –

- at the Unit level, in monthly review meetings by the Chief Executive with the department heads
- at the corporate level, in the meetings of Chief Executives with Chairman, SAIL.

As mentioned earlier, MOU is also reviewed at two levels, namely –

- regular review at Board level at SAIL
- quarterly joint review by SAIL and MOS

**Benefits**

MOU and APP have been beneficial to SAIL since the formulation of these concepts. This is well supported by the improved performance of the Company in the last 5 years. Other gains have been:

1. Improved trust between SAIL and MOS
2. Flexibility in operations
3. Clear cut goals for achievement, both at SAIL level and Unit level
4. Creating a sense of direction at the shop-floor level
5. Methodology for comparison between units of SAIL
6. Competition between units to do better, and
7. Increased motivation among employees

**Conclusion**

MOU and APP are based upon the principle of autonomy vis-à-vis accountability. When a PSE performs better than before, it is in a better position to influence the Government and obtain more autonomy for its operations. This is a healthy process for the growth and development of any PSE. Today, MOU and APP are integral parts of the management process at SAIL. The advantages have been felt by SAIL as a collective and SAIL is committed to the MOU targets. Individual Units develop their APP, which in the form of a booklet is treated as the ‘holy book’ of the unit. Sufficient challenge is built in the targets of APP, and these challenges charge the employees with a determination to achieve. SAIL will soon reach the top bracket of efficient steel producers in the world. MOU and APP are the stepping stones.
Total Quality Process in SAIL

Introduction
From time immemorial man has always been in search of excellence. This applies to life, personal and spiritual, Total Quality concept has also evolved from the deeper understanding of integrated evolution of human personality, be it from the view of philosophy of human existence or the management of business enterprise.

Different aspects of Quality
ISO 9000:2000 defines quality as the “degree to which a set of inherent characteristics (of a product or service) fulfills needs or expectations that are stated, generally implied or obligatory”. Quality is not a concept that can be defined by just one characteristic. The different aspects of quality are usability, safety, availability, reliability, maintainability and economics. Keeping in view the different aspects of quality, it can be defined in terms of -

- fitness for use
- value for money
- customer satisfaction
- conformance to requirements
- delivery of defect free products at competitive price to customers in time
- doing the right things right, first time everytime.

Quality as a concept can be approached both from a customers perspective and an internal processes perspective. From a customers perspective quality is defined in terms of the satisfaction that he gets from the products and services provided to him. From the internal organizational perspective, the focus is on the processes through which these needs are met. The internal focus is on doing everything “right” the first time every time. Thus quality addresses issues of both effectiveness and efficiency.

Total Quality Management
ISO 9000:2000 defines quality management as “coordinated activities to direct and control an organization with regard to quality”. Total Quality Management is a philosophy of management that believes in managing all aspects of quality in a holistic manner, involving everyone in the organization. The philosophy of TQM can be summarised in the eight quality management principles that form the basis of the ISO 9001: 2000 Quality Management System (QMS)

1. **Customer focus**: Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.

2. **Leadership**: Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization’s objectives.
3. **Involvement of people**: People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

4. **Process approach**: A desired result is achieved more efficiently when activities and related resources are managed as a process.

5. **System approach to management**: Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.

6. **Continual improvement**: Continual improvement of the organization's overall performance should be a permanent objective of the organization.

7. **Factual approach to decision making**: Effective decisions are based on the analysis of data and information.

8. **Mutually beneficial supplier relationships**: An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.

Taking a holistic approach to quality management leads to varied advantages like:

- Improved rate of resource utilisation, less wastage, low scrap generation, less rework
- Customer satisfaction and trust
- Growth in business - sales & profit
- Improved company image reputation and goodwill
- Improvement in yields and productivity
- Cost reduction
- Improved morale, satisfaction of work-life, greater pride in organisation and work
- Consistency of performance and improved certainty of operations
- No abuse of equipment
- Cross functional interaction

Total Quality Management aims at the prevention of defects and starts at the beginning of the process rather than detection of defects at the end of the product line. Relying on the cost of non-conformance Total Quality involves every body at all levels and at all stages of the process.

For quality improvement everybody is responsible -

<table>
<thead>
<tr>
<th>Transmit needs to suppliers</th>
<th>Plan process to meet customers’ needs</th>
<th>Know who are customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide feedback to suppliers</td>
<td>Control process to meet customer needs</td>
<td>Understand need of customers</td>
</tr>
<tr>
<td>Obtain feedback from suppliers</td>
<td>Improve process based on customers feedback</td>
<td>Avoid creating problems for customers</td>
</tr>
</tbody>
</table>
Managing for Quality

<table>
<thead>
<tr>
<th>Quality Planning</th>
<th>Quality Control</th>
<th>Quality Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Determine who are customers</td>
<td>• Evaluate actual product performance</td>
<td>• Establish the infrastructure</td>
</tr>
<tr>
<td>• Determine the needs of the customers</td>
<td>• Compare actual performance to product goals</td>
<td>• Identify the improvement projects</td>
</tr>
<tr>
<td>• Develop product features which respond to customers' needs</td>
<td>• Act on the different</td>
<td>• Establish project teams</td>
</tr>
<tr>
<td>• Develop processes able to produce the product features</td>
<td></td>
<td>• Providing the teams with resources, training and motivation to -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Diagnose the causes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Stimulate remedies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Establish controls to hold the gains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transfer the plants to the operating forces</td>
</tr>
</tbody>
</table>

Tools and Techniques for Quality Management

A number of tools and techniques can be collectively used in organizations to manage different aspects of quality at various levels for understanding customers' needs and measurement, control and continual improvement of quality. Some of the tools are:

Kano Analysis

A product development tool used for analysing quality requirements not as a continuum from good to bad, but differentiating between three types of quality requirements

a. Basic quality - which is a must, and whose absence causes dissatisfaction
b. Performance quality - features where more is better, e.g. mileage in an automobile
c. Delight quality - not anticipated by the customer, but valuable to him

Quality Function Deployment (QFD)

QFD is a tool for incorporating the voice of the customer into the design of the product in a systematic process using different matrices to capture the inter-relations between the different customer requirements, technical requirements and competitor offers. The basic building block for QFD is called the house of quality, where the tradeoffs between different design requirements and impact on customer requirements are analysed to provide a feasible product that provides value for cost. The house of quality provides a comprehensive matrix where the "Voice of Customer" (VOC) in terms of "what" they want as expressed in customer's own language are taken into consideration as one aspect. The "Voice of the Engineers or Designers" indicating "how" those needs can be met is taken as another dimension. The "hows" are an interpretations of "whats" in terms of technical specifications or design requirements in terms of potential choices for product features.
The PDCA cycle (PLAN – DO – CHECK – ACT)

The use of process approach to identify opportunities for improvements on a continuous basis by treating the organizational systems as a collection of inter-related processes. Also known as Demings Cycle.

Statistical Quality Control (SQC)

Use of its focus on measurement of processes and defects and the use of statistical tools to draw inferences about the variances observed developed as a science by with its focus on measurement of samples from key points in processes and control charts ensure that processes stay in control by providing feedback on variances within processes.

Kaizen

Kaizen is a culture of sustained continuous improvement focusing on eliminating waste in all systems and processes of an organization. The kaizen strategy begins and ends with people.

Poka-yoke

A poka-yoke device is any mechanism that either prevents a mistake from being made or makes the mistake obvious at a glance. The ability to find mistakes at a glance is essential because, the causes of defects lie in worker errors, and defects are the results of neglecting those errors. It follows that mistakes will not turn into defects if worker errors are discovered and eliminated beforehand.

Six Sigma

Six Sigma means that there are 3.4 defects per million events. The main goal is continuous improvement. Six Sigma is carried out as projects. Most common type is the DMAIC method (Define, Measure, Analyze, Improve, Control). First, the project and the process to be improved are defined after which the performance of the process is measured. The data is then analyzed and bottle-necks and problems identified. After analysis, improvement program is defined and defects removed. This development program is controlled by a management group. After DMAIC circle it is time to define a new project.

Total productive maintenance (TPM)

The systematic execution of maintenance by all employees through small group activities. The dual goals of TPM are zero breakdowns and zero defects. TPM is often defined as productive maintenance involving total participation - a kind of marriage between PM and TQM. TPM aims to establish good maintenance practice through the pursuit of “the five goals of TPM”:

1. Improve equipment effectiveness: examine the effectiveness of facilities by identifying and examining all losses which occur - downtime losses, speed losses and defect losses.

2. Achieve autonomous maintenance: allow the people who operate equipment to take responsibility for, at least some, of the maintenance tasks.

3. Plan maintenance: have a systematic approach to all maintenance activities.
Train all staff in relevant maintenance skills: the defined responsibilities of operating and maintenance staff require that each has all the necessary skills to carry out these roles. TPM places a heavy emphasis on appropriate and continuous training.

Achieve early equipment management: the aim is to move towards zero maintenance through "maintenance prevention" (MP).

Cost of quality

Cost of quality measurement is a quantitative method that uses a methodology of tracking the direct & indirect impact on profits because jobs were not being done right first time. A comprehensive measure of COQ is "costs incurred to help employees do the job right every time & the cost of determining if the output is acceptable, plus any cost incurred by the company & the customer because the output did not meet specification and / or customer expectations."

The Elements of COQ are:

Prevention Costs are all costs for preventing errors or helping to jobs right first time. e.g. Quality, job related training, vendor surveys, preventive action to stop recurrence of problem, develop quality control system, implementing process improvement, process capability studies, design reviews prior to pilot run, failure analysis.

Appraisal costs are for evaluating the output & measuring the conformance to specifications.

Internal Failure Costs are costs incurred by the company due to errors detected within the company or before reaching the customer.

External Failure Costs are costs incurred by the company due to errors detected after reaching the customer, because the appraisal system did not detect the fault within company.

As an organization pays more attention to preventing errors the costs incurred due to errors reduce significantly, thereby reducing the total cost of quality. The management philosophy underlying this framework is to continuously track and reduce the cost of quality as an integrated part of the work process.

Difficulties in implementing Total Quality Management

Implementation of TQM in organizations involves crossing many hurdles that are faced at places where the culture of quality has not been sufficiently strengthened. Some of the difficulties one might face are:

- Lack of commitment and personal involvement by management. A belief that lip service to quality is sufficient.
- A misconception that TQM implementation is the responsibility of quality & process control department. Quality Control seen as a necessary evil, which has to be tolerated.
- Lack of expert assistance leading to improper implementation of certain techniques of TQP such as Quality Circles.
• A myth that TQP already exists in many of the work areas whereas in reality we do not apply to all areas of the plant.

**Guidelines for Introducing Change**

• Study the existing cultural pattern  
• Identify those aspects which need change  
• Secure active participation of others involved - including customer participation as well as his active assistance  
• Start on a small scale and use results to broaden application  
• Make Quality Improvements project by project and in no other way  
• Make use of available tools  
• Make studies with application of simple rather than sophisticated tools of SQC  
• Provide sufficient time for mental change to take place  
• Training and self development programmes should be carried out as planned and project for quality break through  
• Avoid surprises  
• Built Quality into the products during design & manufacturing

**The Universal Sequence for Break Through**

• Project identification for improvement using the Pareto principle  
• Organisation to guide the projects  
• Organisation for diagnosis for analysis of projects/ causes  
• Diagnosis to find the causes: break through in knowledge  
• Break through in cultural resistance to change  
• Break through in results - remedial actions on the findings to prove that remedies are effective under operation conditions  
• Control at the new level of gains

**Quality management in SAIL**

Underlying the quality policy and objectives is a set of Seven Guiding Principles which define Quality in SAIL's context. These principles may be adopted as the Basic Quality Philosophy of the Company.

• Quality means clearly identifying customer needs - both internal and external and meeting these requirements without error, First time, Every time.  
• Quality is comprehensive and applies to all business activities.  
• Quality is achieved only by the commitment of every individual in the company. Appropriate skills and attitudes are essential elements of this commitment.  
• Quality is built into the process; it comes through prevention rather than inspection.
Quality is measurable by the cost of non-conformance to requirements.

A spirit of partnership with suppliers and other business associates is an integral part of the Quality Improvement Process.

Quality Improvement is a continuous process.

SAIL has taken a systems approach to Quality Management, with involvement of people at multiple levels. All major units of SAIL have a QMS conforming to the ISO 9001:2000 standard. To ensure compliance of systems and coordinate activities related to Quality, there are various mechanism in SAIL. Some of the systems and structures are:

A Quality Group in the Corporate Office of SAIL coordinates the quality initiatives of various plants. It also organizes inter-plant audits for compliance to systems, where qualified auditors from one unit go to audit the systems of another unit. It also organizes training for the lead auditors from all units, so that SAIL has a large pool of qualified auditors. This pool is also the resource for enhancing the awareness about quality in the organization.

Departments for TQM, Statistical Quality Control and Operations Research at the Unit who act as resources for quality control and improvement initiatives and provide training and consultancy to the managers in various departments.

Apex level quality councils at each unit lead by the CEO who regularly review the quality related issues. All the senior level managers are present in the meetings, which are held regularly.

Quality Policy and quality objectives. Each unit that is certified to ISO 9001:2000 has a quality policy and quantified quality objectives that guide the quality initiatives of the unit. These objectives are derived from the organizational objectives within the guiding framework of the quality policy. The achievement of these objectives is backed through various systems and procedures like a quality manual, documented procedures, work instructions, standard operating and maintenance practices. Compliance of the quality system is monitored through three levels of audits

- **Internal audits** coordinated within the plant/unit by the Management representative who is a senior level officer
- **Inter-plant audit**- coordinated by the corporate quality group in consultation with the plant.
- **External audit** carried out by the certifying agencies, who provide independent verification of the compliance to quality system.

Quality Improvement Teams (QIT) consisting of key persons within a department have been set up to implement the Quality projects within their department. The number of members forming the QIT varies depending on the size of the department/shop. Each quality project necessarily has at least one QIT. The improvement teams implement the projects with the involvement of all involved in the ongoing process of implementing Quality. These are the real driving force behind the quality initiatives in SAIL.
Role of Front Line Executives in TQM

To implement TQP, a total transformation is necessary. During this transformation one encounters the following questions -

- How do I change?
- How does my organisation implement & “Live” these concepts?
- How do I help my organisation change?
- How do I lead this organisation?

Front line executives are the interface between the workers and the management and all the management initiatives are executed at their level. It becomes their responsibility to involve, inspire and guide the workers for quality improvement initiatives on the shopfloor. They do so by becoming leaders of quality improvement teams, developing the competence of the workers in quality management and help them in the analysis of data related to quality management.

In SAIL, acquiring ISO 9001:2000 certification for all Plants and Units is a major step in the direction of creating international credibility and boosting our exports. These are some of the examples of plants/units having obtained ISO 9001 certification as tabulated below:

<table>
<thead>
<tr>
<th>Plant/Units</th>
<th>Standard</th>
<th>Certification body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhilai (Whole plant except SPI &amp; SP II)</td>
<td>ISO 9001:2000</td>
<td>LRQA, UK</td>
</tr>
<tr>
<td>SMS I, HSM, CRM, Silicon Steel Mill, BF</td>
<td>ISO 9002</td>
<td>RWTUV, Germany</td>
</tr>
<tr>
<td>Bokaro - CRM Complex, HRCF, SMS-I&amp;II, CCS, Slabbing Mill, HSM</td>
<td>ISO 9002 &amp; 9001:2000</td>
<td>RWTUV, Germany</td>
</tr>
<tr>
<td>C.E.T. Ranchi</td>
<td>ISO 9001</td>
<td>LRQA, UK</td>
</tr>
<tr>
<td>M.T.I. Ranchi</td>
<td>ISO 9001</td>
<td>RWTUV, Germany</td>
</tr>
<tr>
<td>ASP, Durgapur</td>
<td>ISO 9002</td>
<td>RWTUV, Germany</td>
</tr>
<tr>
<td>DSP, Durgapur All Production Units</td>
<td>ISO 9001:2000</td>
<td>RWTUV, Germany</td>
</tr>
<tr>
<td>SSP, Salem</td>
<td>ISO 9002</td>
<td>RWTUV, Germany</td>
</tr>
</tbody>
</table>
SAIL an Overview

Formation of Hindustan Steel Limited

When the Government of India decided to enter into the field of Iron & Steel production, it broadly envisaged not to run the firm as a departmental undertaking. Although initially steel project administration was directly under a Ministry of the Central Government, Hindustan Steel was formed as a Limited Company, with President of India owning the shares on behalf of the people of India. Thus Hindustan Steel Limited was set up on January 19, 1954.

Growth of Hindustan Steel (1959-1973)

To start with, Hindustan Steel was designed to manage with only one plant, that was coming up at Rourkela. For Bhilai & Durgapur plants, the preliminary work was done by officials in Iron & Steel Ministry. From April 1957, the supervision and control of the Bhilai & Durgapur Plants were also transferred to Hindustan Steel. The registered office was originally in New Delhi, moved to Calcutta in July 1956 and ultimately shifted to Ranchi in December 1959. Initially Bokaro Project was also under HSL.

A new steel company Bokaro Steel Limited was incorporated in January 1964 to construct and operate the steel plant at Bokaro. The 1 MT phase of Bhilai & Rourkela Steel Plants were completed by end of December 1961. The 1 MT phase of Durgapur was completed in January 1962 after commissioning of wheel and axle plant. As a result, the crude steel production of HSL went up from 158 thousand tonnes (in 1959-60) to 1.6 MT (in 1961-62). 2.5 MT phase of Bhilai was completed on 2nd September, 1967 after commissioning of Wire Rod Mill. The last unit of 1.8 MT phase of Rourkela was Tandem Mill commissioned on 17th February, 1968 and 1.6 MT phase of Durgapur was completed on 6th August 1969 after commissioning of furnace in SMS. Thus, with the completion of 2.5 MT stage in Bhilai, 1.8 MT in Rourkela and 1.6 MT phase of Durgapur, the total Crude Steel output from HSL was raised to 3.7 MT in 1968-69 and 4 MT in 1972-73.

Steel Authority of India Limited

I. Formation:

The Committee of Public Undertaking of the Fifth Lok Sabha was the first Parliamentary Committee to undertake a significant review of the question of setting up a Holding Company for steel. It was first considered in the Department of Steel in 1971 with the following two objectives:

- Rapid growth of the industrial sector, of the economy, of the state as a leading agent of the growth process; and
• Ability of the Government to divert investment into areas which are strategic from the point of view of future development.

In this context, it was recognized that the Public Sector had to be made more efficient in order that it might be able to contribute far more than it had to the common pool of investible surplus in the economy.

Further, such a holding company could perform a number of other important functions like coordination and control of constituent units, planning long term programmes, introduction of necessary technological changes, setting up of an R & D organisation and training of managerial personnel for the Public Sector as a whole.

Based on the above considerations, the proposal to set up a holding company for Steel and associated input industries was approved by the Government in January 1972. Accordingly, the formation of Steel Authority of India Limited was approved by the Government in December, 1972. The company was incorporated on January 24, 1973 with an authorised capital of Rs.2,000 crores. In 1978 SAIL was restructured as an operating company.

II. Present Status

Steel Authority of India Limited (SAIL) through its five integrated steel plants at Bhilai, Bokaro, Burnpur, Durgapur and Rourkela accounts for major steel production capacity of India.

Two special steel plants at Durgapur and Salem produce a wide range of special alloy steels and stainless steel.

VISP, Bhadravati is an integrated complex with an installed capacity of 0.18 MT, produces alloy & special steels.

MEL, Chandrapur is one of the largest producer of bulk Ferro Alloys in the country.

Today, SAIL is one of the largest corporate entities. Its innate strength lies in its technologists and professionals and a trained manpower of around 1.4 Lakh including subsidiaries. It has a sales turnover of over Rs. 31,800 crores during 2004-05.

Plants & Units

Bhilai Steel Plant (BSP)

An agreement was signed in New Delhi on February 2, 1955 between the Government of India and Soviet Union to set up an integrated steel plant at Bhilai with a capacity of 1 MT of ingot steel. The plant began its operation on January 31, 1959 when Coke Battery No. 1 was commissioned. Production of Pig Iron at Bhilai began on February 4, 1959 when Blast Furnace No. 1 was commissioned.

Situated in Chhattisgarh, this was one of the three 1 MT capacity crude steel plants set up in the Public Sector in the late fifties. Subsequently it was expanded to 2.5 MT ingot capacity, and currently expanded to 4.0 MT. With this, the Saleable Steel Capacity increased from 1,965 MT (2.5 MT stage) to 3,153 MT (4.0 MT stage).

The plant was the first in India to produce wide (3600 mm) heavy plates. A major exporter of steel products, Bhilai specialises in shaped products, such as heavy rails,
Designed by Tsaroproimexport of the erstwhile Soviet Union in the early '70s and supplied in 1977-78, BSP's Plate Mill was commissioned in 1983 as part of the plant's 4 mt expansion project. As one of the largest single units in the domestic steel industry, the Plate Mill represented a new contribution to India's capabilities in heavy fabrication and machine building at the time of its installation. It was envisaged to roll plates of killed grades of carbon steels and low alloy steels for shipbuilding, bridges, construction, boiler manufacturer, machine building, steel structures, etc. In the DPR prepared for BSP at the 4 mt stage, the capacity of the mill was worked out as 950,000 tonnes/year of finished HR plates in 5,600 HR hours.

Situated in Orissa, it was the first integrated steel plant in India to produce only flat products and the first in Asia to introduce basic oxygen furnace (BOF) process at a time when this process was yet to receive recognition from the established
heavy structurals, merchant products and wire rods. Almost all units in this integrated steel plant are armed with ISO : 9001-9002 certification. Plate Mill and Dalli Mechanised Mine of Bhilai Steel Plant has received the ISO : 14000 Certification for its Environment Management System.

<table>
<thead>
<tr>
<th>Product Mix</th>
<th>Capacity (Tonnes / Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semis</td>
<td>553,000</td>
</tr>
<tr>
<td>Rails</td>
<td>500,000</td>
</tr>
<tr>
<td>Heavy structurals</td>
<td>250,000</td>
</tr>
<tr>
<td>Merchant products</td>
<td>500,000</td>
</tr>
<tr>
<td>Wire rods</td>
<td>400,000</td>
</tr>
<tr>
<td>Plates</td>
<td>950,000</td>
</tr>
<tr>
<td><strong>Total saleable steel</strong></td>
<td><strong>3,153,000</strong></td>
</tr>
</tbody>
</table>

**Rourkela Steel Plant (RSP)**

RSP was the first of the three steel plants taken up in the Public Sector. On December 31, 1953, an agreement was made between the Government of India and a Consortium consisting of Thyssen & Demag, Aktiengesellschaft, Duisburg to set up a steel plant of initial capacity of 0.5 MT subsequently a supplementary agreement was signed in July 1955 to set up a 1 MT plant. The Coke Oven Battery No.1 was commissioned on 3rd December, 1958 and the first of the three Blast Furnaces was commissioned on 3rd February, 1959.

A major producer of diversified range of sophisticated steel products, RSP is an integral part of the Steel Authority of India Limited (SAIL) and is among India’s few Plants producing 100% of the steel through the globally profoused Continuous Casting route since 1998.

RSP is the only Plant having Pipe Plants. The Plant has recently undergone modernization / upgradation in two phase involving around Rs.500 crores. The modernization process of RSP started in 1988. The Phase-I of modernization completed in 1994 and Phase-II modernization completed in 1997-98.

After modernization, the capacity got augmented to 2 MTs of hot metal and 1.9 MTs of crude steel. Modernized units include; Ore bedding and Blending Plant, Sintering Plant-II, Steel Melthing Shop-II, Tonnage Oxygen Plant-II etc.

The details of which have been given later. RSP is geared up producing defence and space quality plates through a Special Plate Plant.

Situated in Orissa, it was the first integrated steel plant in India designed to produce only flat products and the first in Asia to introduce basic oxygen furnace (BOF) process at a time when this process was yet to receive recognition from the established
steel producers at home and abroad. The plant produces a wide range of flat steel products like plates, hot and cold rolled coils and sheets, galvanized sheets, electrical steel sheets, electrolytic tin-plates and large diameter electric resistance welded (ERW) and spiral welded (SW) pipes. The plant was expanded in the late sixties (1965-68) from 1.0 MT to 1.8 MT per annum ingot steel capacity. Continuous technological innovation has led to greater diversification in this plant's product range. The new units for producing cold rolled non-grain oriented (CRNO) sheets, cold rolled grain oriented (CRGO) sheets has been commissioned to meet the market needs.

In Blast Furnace, Steel Melting Shop-I & II, Continuous Casting Shop-I, Oxygen Plants – I & II, Hot Strip Mill, ERW & SW Pipe Plants, Galvanising Lines and Silicon Steel Mill, Calcining Plant – II, Plate Mill, Repair Shop (Mech), Fabrication & Structural Shop, Mechanical Shop, Repair Shop (Electrical), Air-Conditioning, Roll Shop, Loco Repair Shop, Field Machinery (Maint), Sintering Plant – II are accredited with ISO 9001 Certification. The Silicon Steel Mill, Sintering Plant II and Environment Engineering Department have been accredited with ISO 1400 Certification for its Environment Management System.

<table>
<thead>
<tr>
<th>Product-mix</th>
<th>Capacity (Tonnes / Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Mill Plates</td>
<td>325,000</td>
</tr>
<tr>
<td>HR Plates</td>
<td>130,000</td>
</tr>
<tr>
<td>HR Coils</td>
<td>746,000</td>
</tr>
<tr>
<td>ERW Pipes</td>
<td>45,000</td>
</tr>
<tr>
<td>SW Pipes</td>
<td>55,000</td>
</tr>
<tr>
<td>CR Sheets &amp; Coils</td>
<td>220,000</td>
</tr>
<tr>
<td>Galvanized Sheets (GP &amp; GC)</td>
<td>180,000</td>
</tr>
<tr>
<td>Electrolytic Tin Plates</td>
<td>60,000</td>
</tr>
<tr>
<td>Silicon Steel Sheets (CRNO)</td>
<td>75,000</td>
</tr>
<tr>
<td>Special Steel Plates</td>
<td>3,000</td>
</tr>
<tr>
<td>Total saleable steel</td>
<td>1,839,000</td>
</tr>
</tbody>
</table>

**Durgapur Steel Plant (DSP)**

Set up with an initial annual capacity of 1 million tonnes of ingot steel, DSP was later expanded to 1.6 million tonnes and further expanded to 1.876 MT. Among the various products rolled out are medium structural steel products, skelp and continuously cast billets. A new product-extra high strength thermo mechanically treated (TMT) bar has been successfully developed and marketed. Besides these, it is a major producer of railway products like forged wheels and axles, sleepers and fish plates.
With the completion of the massive modernisation programme, DSP is in possession of state-of-the-art technology for quality steel making. Stabilisation of the modernised units has brought about improved productivity, substantial improvement in energy consumption and better quality products. DSP's Coke Oven, Blast Furnace, Sinter Plant, RMIP, Steel Making Complex, Merchant Mill and Wheel & Axle Plant are covered by the ISO-9001:2000 quality assurance certification.

<table>
<thead>
<tr>
<th>Product-mix</th>
<th>Capacity (Tonnes / Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merchant products</td>
<td>325,000</td>
</tr>
<tr>
<td>Structurals</td>
<td>180,000</td>
</tr>
<tr>
<td>Skelp</td>
<td>220,000</td>
</tr>
<tr>
<td>Wheels and Axles</td>
<td>30,000</td>
</tr>
<tr>
<td>Semis</td>
<td>1000,000</td>
</tr>
<tr>
<td><strong>Total saleable steel</strong></td>
<td><strong>1,755,000</strong></td>
</tr>
</tbody>
</table>

**Bokaro Steel Plant (BSL)**

Bokaro Steel Plant 'brings out before one's eyes the vision of a massive giant in the making'. As the fourth steel plant in the Public Sector, conceived in 1959, it actually started taking shape in 1965 with the signing of an agreement with the Government of USSR on 25th January 1965. Envisaging a capacity of 1.7 MT in 1st stage and 4.0 MT in 2nd stage, its construction started on 6th April, 1968.

Bokaro Steel Plant was originally incorporated as a Limited Company on 29th January 1964. After the formation of SAIL in 1973, it became a wholly owned subsidiary of SAIL and on 1st May 1978 it was eventually merged with SAIL in terms of Public Sector Iron & Steel Companies (restructuring) and Miscellaneous Provisions Act 1978.

The plant was conceived as the country's first 'Swadeshi' steel plant, to be built with maximum indigenisation going into the equipments, materials and know-how. Thus, this project has been a radical shift from the earlier dependence on foreign sources of know-how and consultancy, design and equipment, engineering, supervision and erection to almost a full measure of self-reliance and confidence.

Bokaro Steels first phase of 1.7 MT commenced on 2nd October, 1972 with the commissioning of 1st blast furnace and completed on 26th February 1978 with the commissioning of 3rd Blast Furnace.

After modernisation, BSL's Liquid Steel output is rated at 4.5 MT and Saleable Steel Production capacity is 3.78 MT per annum.

Bokaro is geared to provide a sure and strong raw material base for a host of modern engineering industries like motor vehicles, pipes and tubes, cold rolling units, barrel
and drum making and lately, LPG cylinders. Galvanized plain and corrugated sheets are finding use in industrial and domestic applications. The black plates (being imported earlier) are helping in conserving scarce foreign exchange. The industries which are served by Bokaro are not only essential for economic development but also for raising the standard of living of the people in the country.

The plant has taken up modernisation with a view to introducing Continuous Casting facilities and updating the Hot Strip Mill, a major step towards providing the state-of-the-art technology for producing Quality Steel at International Standards. A range of special steel products like SAIL, COR, SAIL PROP, SAIL MEDS, SAIL RIM, API Grade Steel, HRVO, WICR, DMR 249 'A' Grade Steel, E460 / E500/ E550, etc. have been introduced after modernisation in the Plant.

<table>
<thead>
<tr>
<th>Product-mix</th>
<th>Capacity (Tonnes / Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR Coils, HR Plates and HR Sheets</td>
<td>2,120,000</td>
</tr>
<tr>
<td>CR Coils and Sheets</td>
<td>1,390,000</td>
</tr>
<tr>
<td>GP / GC Sheets</td>
<td>170,000</td>
</tr>
<tr>
<td>Tin Mill Black Plates</td>
<td>100,000</td>
</tr>
<tr>
<td>Total saleable steel</td>
<td>3,780,000</td>
</tr>
</tbody>
</table>

Alloy Steels Plant (ASP)

The pioneer in the production of alloy and special steels, Alloy Steels Plant (ASP), Durgapur was commissioned with an initial capacity of 1,00,000 tonnes of ingot steel and 60,000 tonnes of saleable steel. Through two phases of expansion and modernisation, the capacity has been revised to 2,46 lakh tonnes of liquid steel and 1.78 lakh tonnes of saleable steel from SMS-1.

Recipient of ISO:9002 certification for the entire plant, ASP is equipped with state-of-the-art technology for producing world class quality alloy and special steels. The plant has one slab-cum-twin bloom continuous casting machine, the only one of its kind in India. It is specially designed for casting special steels like Austenitic and Ferritic stainless steel and a variety of non-stainless steels including bullet proof steel. ASP has the capacity to produce Slabs, Blooms, Bars, Plates and Forged items of over 400 grades in a wide range of sizes.

It also produces value added items like CRM rolls, concast rollers, crane wheels, springs, hammers, grate bars, hot saw blade, shear blade, bright bar, stainless steel liner plate, etc. ASP is also supplying import substitution item components to many customers through established conversion agents.
Salem Steel Plant (SSP)

Salem Steel Plant (SSP), is a premier producer of international quality stainless steel in India. Commissioned in 1981, the Plant has a capacity to roll 1,86,000 tonnes of hot rolled carbon and stainless steel flat products and 70,000 tonnes of cold rolled stainless steel sheets and coils per annum. The Plant has gone beyond its designed capacity and successfully cold rolled value-added 0.13 mm thick stainless steel. SSP can also supply hot rolled carbon steel in thicknesses of 1.5, 1.4 and 1.25 mm. Its products have become a household name ‘Salem Stainless’ in the domestic market and are widely exported, besides meeting the requirements of 100 percent export oriented units and free-trade zones in India. In hot rolled special grade carbon steels, SSP has been recognized as a well-known manufacturer of boiler quality steel. The Plant is also supplying LPG grade IS 6240 steel in sheet form. The entire Plant is certified for the ISO:9001 Quality Assurance and the ISO:14001 Environmental Management Systems.

Blanking Line, the first of its kind in India, was established in 1993 with an annual capacity to produce 3000 tonnes of ferritic grade coin blanks or 3600 tonnes of utility blanks. Coinage of Rs. 1.50 paise and 25 paise denominations are minted from the blanks supplied by SSP to Government Mint in Noida, Mumbai, Kolkata and Hyderabad.

SSP has revolutionized application of stainless steel in India both in conventional and unconventional areas. High-tech industries like atomic power stations prefer ‘Salem Stainless’. It is also chosen in industrial sectors like dairy and food processing, chemical and fertilizer, heavy engineering, railways, automobile, bulk solid handling, power etc. The building and architecture segment, which is growing at a rapid pace sees ‘Salem Stainless’ as the most dependable companion.

SSP undertakes turnkey projects like fabrication and supply of stainless steel tubes, pipes for sugar and chemical industry and for water pipelines. Under conversion scheme, value-added products like kitchen & tableware and doorframes are manufactured and supplied in bulk to corporates. SSP has also developed new applications of its products viz. LPG tanks for automobiles, stainless steel ceiling fans, exhaust fans, corrugated sheets, water tanks, etc.

In architecture, building and construction, the prestigious structures where ‘Salem Stainless’ was chosen include the Parliament House Library Complex, New Delhi, the world’s tallest Petronas Twin-Towers, Malaysia and the retractable roofing at Melbourne Tennis Stadium, Australia. The coaches of the high-speed Jan Shatabdi Express trains are furnished with modular railmarts and subpantries made entirely of Salem Stainless. Korean blue resin coated corrugated curved roofing of the Koparkhairance Railway Station in Navi Mumbai is a trend setter for railways in India.

Visvesvaraya Iron & Steel Plant (VISPA)

Visvesvaraya Iron & Steel Plant (VISPA) is a pioneer in production of high quality alloy and special steels and pig iron. Steel is produced through BF-BOF-LRF-VD route. The facilities include vacuum degassing, vacuum oxygen-decarburisation, ladle
refining furnaces, continuous casting machine, 1600 tonnes-hydraulic-high-speed forging press, a fully automatic horizontal long forging machine with numerical control system for a semi-automatic and automatic mode of operation. VISP has an installed capacity of 77,000 tonnes of alloy and special steels and 205,000 tonnes of hot metal.

VISP has received the ISO:9002 certificate for steel production through rolled and forged routes and pig iron production.

The Indian Iron & Steel Co. Ltd, Burnpur (IISCO)

The India Iron & Steel Company Limited (IISCO), one of the nation's premier suppliers of basic iron and steel items and one of the oldest integrated steel plants, started production of iron as far back as 1875 in its Kulti unit, IISCO's Burnpur Steel Plant initially set up in 1918, began producing steel in 1939. In the late 50's it expanded further to become a million tonnes steel plant.

IISCO is a multi-product, multi-unit organisation. It has got an integrated steel plant at Burnpur, Captive collieries at Chasnalla, Jitpur and Ramnagore and Iron Ore mines at Gua, Chiria and Manoharpur.

IISCO produces a wide range of products, starting from coke; pig iron to finished steel products, mainly heavy, medium and light structurals, light and heavy rails, plain rounds, TMT rebar, Tor Steel, Sleeper bar and various special sections like Z-bars, Z-pilings, MS Arch and 8"x6" joists at its integrated steel plant at Burnpur. It is worth mentioning that IISCO is the pioneer in producing Z-section centre sills are Z-type sheet piling sections used in the fabrication of wagons and barrages as well as in integration, hydro-electric and other projects. Its Merchant & Rod Mill is equipped with ISO:9002 certification. It has started production of TMT Rebars (Product range – 16mm to 32mm) since May, 2001. Presently IISCO has a capacity to produce 0.4 million tonnes of ingots annually.

<table>
<thead>
<tr>
<th>Product-mix</th>
<th>Capacity (Tonnes / Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structurals and rails</td>
<td>1,60,000</td>
</tr>
<tr>
<td>Bars and Rods</td>
<td>1,12,000</td>
</tr>
<tr>
<td>Special Section</td>
<td>11,000</td>
</tr>
<tr>
<td>Semis for sale</td>
<td>14,000</td>
</tr>
<tr>
<td>Saleable Steel</td>
<td>2,97,000</td>
</tr>
<tr>
<td>Conversion</td>
<td>54,000</td>
</tr>
<tr>
<td>Total Saleable Steel</td>
<td>3,51,000</td>
</tr>
<tr>
<td>Pig Iron</td>
<td>3,32,000</td>
</tr>
</tbody>
</table>
2.3.9 Maharashtra Elektrosmelt Limited (MEL)

Maharashtra Elektrosmelt Limited (MEL), besides being the largest producer of manganese based ferro-alloys in the country with a capacity to produce 100,000 tonnes of ferro-alloys, has emerged as a leader and trend-setter in technology development. A fast changeover from High Carbon Ferro Manganese to Silicon Manganese and vice-versa in the submerged Arc Furnaces, production of Medium Carbon and Low Carbon Ferro Manganese through Electric Arch Furnaces, Sintering of manganese one fines through Conventional and High Pressure Sintering Process, Generation of 4.2 MW electric power by gainfully utilising ferro-alloys furnace gases and production of building bricks from ferro-alloy slags are some of MEL's major technological achievements. It's ferro-alloys route has received ISO:9002 certification.

2.3.10 Raw Materials Division (RMD)

SAIL has the second largest mining outfit in the country after Coal India Ltd. Spread over the mineral rich states of Jharkhand, Orissa and Chhatisgarh, the mines of SAIL started their operations as captive sources of raw materials of its integrated steel plants. By virtue of their locations and also having developed under the different steel plants for more than 2 to 4 decades, they present a picture of fascinating diversity, not only in the nature of their reserves/deposits but in their legacies as well, with each one of them being remarkably distinct from the other.

In 1989 SAIL launched Raw Materials Division (RMD) as a separate unit and by June 1990 had brought all its mines that were captive to its steel plants in the eastern sector – RSP, DSP, BSL and IISCO (a subsidiary) – under its umbrella. The mines attached to Bhilai Steel Plant continued to work separately and were kept out of the RMD ambit.

The avowed purpose for formation of RMD was to rationalise supply of raw materials to different SAIL steel plants in the eastern sector and to achieve systematic reduction in purchase of iron ore, in particular, from external sources with a view to ensure uninterrupted availability of raw materials, economically and of consistent quality. Unified control, incremental improvement through networking and integrated efforts and synergetic sourcing of raw materials, were the main driving forces behind the wisdom of the architects to conceive RMD in order to achieve self sufficiency in iron ore to underscore SAIL's operational and competitive strategies before the dawn of liberalisation in the steel industry.

Presently, RMD, with its headquarters at Kolkata, has 5 iron ore mines at Meghahatuburu, Kiriburu, Bolani, Barsua and Kalta and 4 limestone/dolomite quarries at Kuteshwar, Purnapani, Bhawanathpur and Tulsidamar. The management of 2 iron ore mines (Gua and Manoharpur) and 3 collieries (Chasnalla, Jitpur, and Ramnagar) have been handed back to IISCO in April 1999 for revival of the subsidiary as a separate package. RMD has 3 Customer Services Offices (CSO) at Rourkela, Durgapur and Bokaro for liaison and coordination with its customers – the steel plants, and 2 Liaison Offices (LO) at Delhi and Bhubaneswar for liaison with various Central and State Government as well as different statutory agencies.
Central Coal Supply Organisation (CCSO)

Situated at Dhanbad in Jharkhand, the Central Coal Supply Organisation (CCSO) of the Operations Directorate, SAIL is entrusted with the crucial task of arranging around 14,000 tonnes each of indigenous coking coal and power grade coal daily for steel plants.

Central Marketing Organisation (CMO)

Central Marketing Organisation (CMO), one of the largest marketing network in the country, markets mild steel products from the four integrated steel plants of SAIL. The CMO headquarters is at Kolkata and the Commercial Directorate is located at New Delhi. A nation-wide network of regional offices, sales offices and several strategically placed warehouses is further supplemented by consignment agents and authorized dealers to meet the demands of the smallest customers in the remotest corners of the country.

CMO maintains its aggressive marketing efforts in order to retain market leadership by meeting customer requirements and evolving strategies to increase sales. In order to strengthen the marketing approach and initiate product and segment specialization, CMO has been reorganized on the basis of long and flat products. Likewise, Key Account Management process (KAM) has been implemented in CMO to provide better service, quality and tailor made products to Key Customers through a single window. This is being followed up by the Customers Satisfaction Index (CSI) to increase responsiveness to customer needs.

Yet another significant development has been the re-orientation of the sales branches and warehouses. This will enable the marketing team to concentrate on building customer relationship to provide them better service, along with the best quality. Dealer development, especially in rural areas, is being aggressively pursued by CMO to reach out to the farthest corners of the country. This wide network of authorized dealers also helps meet customers’ demand for steel in small quantities.

International Trade Division (ITD) of CMO manages exports of mild steel products and maintains close liaison with buyers abroad. ITD has been successful in making SAIL steel, a familiar name, across the continents. SAIL’s reputation as a producer of quality steel products has been established in as many as 70 countries around the globe. Notable among them are Japan, Egypt, UK, Italy, Russia, Sri Lanka, Bangladesh, Taiwan, Myanmar and Nepal. Transport & Shipping Division (T&S) of CMO performs the important functions of ensuring proper dispatch of export material and timely imports of raw materials to keep the SAIL plants going.

SAIL Consultancy Division (SAILCON)

SAIL, during its existence of over four decades, has acquired a high level of expertise and vast experience in building, operating and maintaining a chain of integrated and mini steel plants and associated facilities encompassing diverse technologies, equipment and product-mix. The knowledge thus gained led to formation of a consultancy and services marketing division – SAIL. Consultancy Division
(SAILCON), based in New Delhi, to provide a wide range of services to the iron & steel and other industries in India and abroad.

SAILCON is a single window, for clients spread over the world, providing design, engineering, technical, management and training consultancy and services available from different SAIL plants and units. It is an ISO:9001:2000 certified organisation equipped to render quality services from concept to commissioning.

In addition to successful completion of a number of assignments in India, SAILCON has satisfied clients in Egypt, Saudi Arabia, Iran, Qatar, Bangladesh, Oman, Philippines, Nepal, Taiwan and Thailand.

Research & Development Centre for Iron & Steel (RDCIS)

The Research & Development Centre for Iron & Steel (RDCIS) at Ranchi is the corporate R&D unit of SAIL. Set up in 1972, the Centre has ISO:9001 certification to its credit. It undertakes R&D projects in diverse realms of Iron & Steel Technology under the categories of Basic Scientific Research, Plant Performance Improvement, Investigation & Consultancy Assignments, Equipment & Instrument Design and Major Technology Development.

RDCIS has more than 300 dedicated and competent scientists and engineers and its laboratory is equipped with around 300 sophisticated diagnostic research equipment and 5 pilot plant facilities.

RDCIS provides customers with prompt, innovative and cost-effective R&D solutions; develop and commercialize improved processes and products; continually enhance the capability of its human resources to emerge as a centre of excellence. The major efforts are directed towards cost reduction, quality improvement and value-addition to products of SAIL plants and providing application engineering support to SAIL's products at customers' end. RDCIS along with steel plants, has recently taken initiatives to develop special steel products utilizing the modernized production facilities at steel plants.

RDCIS also offers technological services to various organisations in the form of: Know – how transfer of technologies developed by RDCIS; Consultancy services; Specialised testing services; Contract research and technology awareness programmes.

SAIL Safety Organisation (SSO)

SAIL Safety Organisation (SSO), a Corporate Unit set up in 1988 at Ranchi, monitors and guides the Safety Promotional, Fire and Occupational Health Services activities undertaken at different Steel Plants/ Units/ Mines/ Stockyards. To accomplish the above mentioned functions, SSO formulates and prepares appropriate safety policies, procedures, systems, action plans, guidelines etc. and follows up for their implementation and thereby helps in providing accident free work environment. Consistent efforts are also being made by SSO for competence building in the area of safety management through HRD interventions covering heads of shops, line
managers, safety personnel & trade union leaders.

A multi-disciplinary Safety Engineering Department exists in each of the steel plants and mines to look after their safety needs. The emphasis is now on Systematic Approach to Safety Management. SSO is managing the Secretariat of the Joint Committee of Safety, Health & Environment in the Steel Industry (JCSSI), a bipartite forum which addresses steel plant's safety, health & environment issues with active involvement of management and central & plant level trade unions and provides guidelines to the member organisations like SAIL, TISCO, RINL, HSCL, Dastur Co., etc. on promoting safety, occupational health and pollution control measures.

Centre for Engineering & Technology (CET)

Centre for Engineering & Technology (CET), an ISO:9001 certified organisation, is the design, engineering & consultancy unit of SAIL. It has its Head Office at Ranchi, Sub Centres at Bhilai, Durgapur, Rourkela, Bokaro and an IPSS Secretariat at New Delhi for formulation of Interplant Standards for Steel Industry. As a ‘solution provider for all project needs’, CET has been rendering complete range of services not only to the steel plants under SAIL but also to various clients other than SAIL – both within and outside the country. Some of the important clients other than SAIL include EGITALEC (Egypt), Ashok Steel (Nepal), Chittagong Steel Mills (Bangladesh), Birla Copper, Mukand Ltd., Jindal Vijaynagar Steels Ltd., National Iron & Steel Co., Hindustan Zinc Ltd., National Mineral Development Corporation and Romelt – SAIL (India) Ltd. CET is also the nodal agency for acquisition and lateral transfer of technologies within SAIL plants.

The range of services includes conceptualization, project evaluation & appraisal, project consultancy, design & engineering and project management in the areas of iron and steel making. Apart from this, CET has been providing its services in the related areas like mine planning and development, infrastructural development, industrial piping, industrial warehousing, material handling system, industrial pollution control and environment management systems, water supply and sanitation, town planning, power projects, etc. CET represents a reservoir of technical & managerial expertise inherited over four decades of Indian Steel Industry. It has kept pace with changing times and made continuous efforts for updating skills of engineers through planned HRD programmes, collaborative arrangements with academia and other professional organisations of repute and acquiring up-to-date hardwares & softwares for engineering work. All of these are blended with a concern for clients’ profitability to ensure that the clients get the most cost effective solution, tailor-made for their requirement.

Management Training Institute (MTI)

This apex training institute for management training in SAIL was set up in 1962 in Ranchi to fulfil the managerial development needs of senior executives of the company and thereby act as a catalyst for achieving organizational goals. It is one of the first management training centres to be set up in the corporate sector in India.
The Management Training Institute (MTI) assesses the training needs of senior executives, designs and executes need-based training programmes and disseminates modern management thinking through its publications. It is involved in preparing trainer manuals, case studies, exercises and business games. It also undertakes management research for diagnosing organizational issues. MTI designs company-wide HRD interventions, organizes senior level management workshops and conducts problem solving workshops for middle level executives. It also undertakes consultancy services in the area of management, organisation development and HRD within India and abroad. MTI also offers some selected programmes to executives of other organisations. In recent past it has conducted programmes for MMTC, NALCO & TISCO.

MTI, as a corporate institute, monitors the overall progress of training activities in SAIL. It organizes regular training audits using documented training standards. It conducts network meetings for selected and important programmes. These steps are taken to ensure quality in training activities and continuous improvement.

Central Power Training Institute (CPTI)
SAIL, has established its own Central Power Training Institute (CPTI) at Rourkela, which functions under the Rourkela Steel Plant. The Institute has a full scope replica simulator for 60 MW coal fire unit and an Area Operator Training Simulator (AOTS). This is the first indigenous simulator and the only one in non-utility sector. The institute has a 80 seat capacity auditorium, lecture halls, a well-stocked library, a model room and a large foyer. Latest audio-visual and reprographic aids have also been provided.

The Institute conducts training largely for operation and maintenance personnel of SAIL captive power plants and Power Distribution Network departments. Of late, CPTI is also imparting training to participants from other organisations like M/s NTPC, ICCL, INDAL, TISCO, IB Thermal etc. CPTI is well-equipped to design tailor-made programmes as per the requirement of the customer organisations in the area of power. CPTI of SAIL has been recognized as Category-I Institute by Central Electricity Authority, Ministry of Power, Government of India for conducting training in power area in accordance with Indian Electricity Rules. It also received at the first instance the coveted Golden Peacock National Quality Award 1997 as winner in Service Organisation – Small Enterprises Category.

Environment Management Division (EMD)
The Environment Management Division (EMD) is a corporate unit monitoring and facilitating the environment management and pollution control activities in the SAIL plants and units. This division, set up in 1988, has its headquarters in Kolkata. This unit is certified with QMS-ISO 9001-2000. Some of the EMD’s main activities are –

- Updating the corporate environmental philosophy and implementing company’s Environmental Policy adopted in June 1996.
Identifying areas of environmental concern in the plants and units, developing implementation strategy for mitigating measures and monitoring the execution of the projects.

Conducting the performance of the pollution control devices installed in the SAIL Plants and evaluation of the emission/discharge data.

Monitoring air, water and noise qualities of RMD group of mines as per the State Pollution Control Board’s stipulations.

Conducting Environmental Awareness Training programmes for plant & mines personnel at MTI and CPTI.

Internal evaluation of SAIL plants’ project proposals from environmental angle and according environmental concurrence.

Coordinating with the Central and State Pollution Control authorities/Ministries.

**Growth Division (GD)**

Growth Division (GD) functions as a nodal agency for manufacture and supply of various spare parts and equipment to the SAIL Plants by utilizing available in-house facilities and vendor base. GD functions focus on effective utilization of the engineering shops in the steel plants. Main objectives of GD are:

- Effective utilization of captive engineering facilities of each steel plant.
- Providing technical help to manufacture specialised equipment to cater to present requirement as well as long-term expansion and modernisation.
- Undertake projects within SAIL plants or outside.

**Corporate Office (CO)**

The main function of the Corporate Office is to integrate the functioning of Plants / Units to improve synergy of the total operations of SAIL. This is achieved through various Directorates of the Corporate Office as under:

1) Operations Directorate
2) Project Directorate
3) Finance Directorate
4) Personnel Directorate
5) Commercial Directorate

The Corporate Office is an overall policy-making body responsible for providing all the necessary help and support to the units for implementing the policies of the company by coordinating with the various organisations and Government departments.
Human Resource

Proud of its dedicated 1.30 lakh people (excluding subsidiaries), SAIL is one of the largest talent banks in the country. Spotting and nurturing young talent, SAIL strives to give them the best possible working and living environment. Modern townships and community facilities, schooling, medical and development of the area peripheral to the steel plants are continuing commitments of SAIL.

Organisation

The SAIL Board constitutes of Functional Directors and Managing Directors and is headed by Chairman, SAIL. It has been designed to enable SAIL to perform the following general functions at the Corporate level -

- Long term strategic planning for the Company
- Policy formulation in consultation with plant personnel. Getting agreed action plans for implementation of the policies and ensuring their fulfillment. Achieving clarity and organisational commitment on objectives, goals and plans of action.
- Developing norms of performance in every functional area and ensuring commitment of progressively improved norms.
- Ensuring smooth and efficient operations and achievement of optimal performance of existing resources. Ensuring fulfillment of targets and orderly growth of the Company. Organisational development to maximise efficiency of the company.
- Reviewing performance of each unit with respect to target and suggesting corrective action where necessary.
- Achievement of well coordinated functioning of different plants: improving inter-plant interactions, dissemination of knowledge and achieving synergy in Company’s operations.
- Centralised control of Finance, Sales, Purchases / imports of inputs.
- Capital investment decisions beyond power delegated to plant MDs.
- Coordination with all external agencies, Central and State Governments Ministries, Railways, suppliers etc. in order to improve overall company operations.
- Development of an efficient and well designed data bank and MIS at all levels within the organisation to assist in problem identification and resolution.
- Projection of corporate image of the Company through media to the public in general.

An organisation structure cannot remain static. It has to change with the changing perceptions of the organization’s role and the new thrusts sought to be given for its development. Similarly at the plants also, the organization structure has been changing.

SAIL had till recently 10 hierarchical levels of officers from Jr. Manager (E1 grade) upto Executive Director (E-9 grade). It was increasingly felt that such a larger number of hierarchical levels was counter-productive as they diluted the authority of each level and led to excessively long chains of command and communication channels,
the number of levels was sought to be reduced to not more than five below the GM level. The model adopted was to have the following hierarchical levels -

a) Zonal Heads in the rank of GM or DGM who would be Incharge of a complete Zone i.e., Iron Zone / Steel Zone etc.

b) Departmental head in the rank of DGM or AGM to be Incharge of single department within the Zone.

c) Shift / Section Incharges at the level of Sr. Manager / Manager / Dy. Manager would be Incharge of shifts and also in general shifts to look after coordination, technology and planning.

d) The front-line supervisors at the level of Asstt. Manager / Junior Manager would be Incharge of a group of workmen or a specified job.

With the reduction in the number of levels the number of executives required for direct line functions would reduce and thus make available personnel to look after the special functions of planning, coordination and ensuring technical discipline.
## MAJOR PRODUCTION FACILITIES IN SAIL

<table>
<thead>
<tr>
<th>Facilities / Products</th>
<th>BSP</th>
<th>SAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig Iron for Sale</td>
<td>630</td>
<td>1740</td>
</tr>
<tr>
<td>Solid Steel</td>
<td>3925</td>
<td>11987</td>
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<tr>
<td>Saleable Steel</td>
<td>553</td>
<td>1414</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Semis for Sale</td>
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<tr>
<td>B. Finished Steel</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Flat Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Wide &amp; Heavy Plates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- HR Sheets / Strips, Coils / Narrow Plates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Skelp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- CR Sheets / Strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Electrolytic Tin Plates</td>
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<td></td>
</tr>
<tr>
<td>- Galvanised Sheets</td>
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<td></td>
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<tr>
<td>- HR Elec Steel Sheet</td>
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<tr>
<td>- Silicon Steel</td>
<td></td>
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<tr>
<td>- ERW Pipes</td>
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</tr>
<tr>
<td>- Spiral Welded Pipes</td>
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<tr>
<td>Sub Total (i)</td>
<td>950</td>
<td>1249</td>
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<tr>
<td></td>
<td>6581</td>
<td></td>
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<tr>
<td>(ii) Non-flat Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Medium Structural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Heavy Structural</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>- Merchant Products / Bars &amp; Rounds</td>
<td></td>
<td>780</td>
</tr>
<tr>
<td>- Wire Rods</td>
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<tr>
<td>- Heavy Rails</td>
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<td>- Wheels &amp; Axles</td>
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<td>- Sleepers</td>
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<tr>
<td>- Fish Plates</td>
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<tr>
<td>Sub Total (ii)</td>
<td>1650</td>
<td>2195</td>
</tr>
<tr>
<td></td>
<td>2195</td>
<td></td>
</tr>
<tr>
<td>Total Saleable Steel (A+B)</td>
<td>3153</td>
<td>10190</td>
</tr>
</tbody>
</table>
ADMINISTRATION MANAGEMENT & DEVELOPMENT OF SAIL-A STUDY

RESEARCH & DEVELOPMENT - MODERNISATION & AUTOMATION:

Research & Development Prospect in Sail.
Modernisation & Automation Process in Sail.
Service Condition, Code of Conduct & Plant Service.
Research & Development in SAIL

Introduction

The Research & Development Centre for Iron & Steel (RDCIS), Ranchi, the ‘brains trust’ of Steel Authority of India Limited (SAIL) was established way back in 1972 by the then Hindustan Steel Limited. Over the last 28 years this unit, known as RDCIS today, has grown and established itself as a Centre of Excellence for research & development in the field of iron & steel. It is the corporate R&D unit of SAIL. It is India’s premier research organisation in the field of ferrous metallurgy and has been contributing valuable technical inputs to the steel plants for improving productivity, reducing cost, enhancing product quality, and for developing new products. RDCIS is now an internationally recognised institution in the area of steel technology.

As a corporate unit of SAIL, RDCIS formulates and implements various R&D programmes in all the steel plants and units of SAIL. RDCIS strives to achieve continuous improvement in performance indices of the plants in order to improve the productivity and lower cost of production, improve quality of products and develop new grades of steel to cater to the market requirements.

In the fast changing business scenario, RDCIS is required to play increasingly vital role in the efforts of SAIL towards achieving technological excellence. The speed with which RDCIS can respond to the current as well as future needs of the steel plants critically depends on the availability of the state-of-art research facilities and their utilisation. All equipment and diagnostic tools available in different laboratories are maintained under planned preventive maintenance programme and are regularly checked/calibrated in accordance with the requirements of ISO 9001 Quality Assurance System.

Capabilities

Equipped with more than 350 advanced diagnostic equipment and 5 pilot facilities under 15 major laboratories, RDCIS undertakes research projects encompassing the entire spectrum of iron and steel.

The Centre is engaged in providing R&D inputs to the plants & units of SAIL for:

- Improving the process parameters
- Development of value added products
- Energy conservation
- Improvement in quality
- Upgradation of existing technologies and
- Introduction of new technologies

RDCIS has developed and introduced several innovative systems and procedures, which have enabled quantification of inputs, outputs and measurement of the performance. The centre delivers technological services to the complete satisfaction of the customers with a motto that “A Customer is the partner in Our Innovation.”
ISO 9001 & Beyond

RDCIS is an ISO 9001 accredited organisation since 1994. This has enabled the Centre to continuously improve upon the Quality Assurance System towards accomplishment of international standards. RDCIS stands for total quality and contributes extensively towards improving the quality of SAIL products.

Areas of Expertise

RDCIS has continuously enhanced its capabilities over the years. It has developed wide spectrum of expertise, which can readily be utilised for solving complex problems in numerous technological disciplines.

Major areas of expertise include –

- Coal, Coke & Chemicals
- Raw Materials & Agglomeration
- Iron Making
- Energy
- Steel Making & Secondary Refining
- Continuous Casting
- Refractories
- Development of Steel products
- Rolling Technology
- Metallurgical Services
  - Metallurgical Investigations
  - Chemical Analysis
  - Corrosion
  - Tribology
- Instrumentation & Automation
- Computer Application and Software Development
- Design & Engineering
- Pollution Control and Waste Management

RDCIS is equipped with modern laboratory facilities in the above areas and carries out complex metallurgical and scientific investigations to provide solutions to operational as well as quality problems faced by various manufacturing organisations. Some of the important facilities at RDCIS are Pilot Coke Oven, Pot Sintering Unit, Cold Model for BF Charging System, Thin Slab Caster, Experimental Rolling Mill, Scanning Electron Microscope etc. Over the years, RDCIS has developed expertise in almost all the areas of iron and steel technology through the pursuit of carefully balanced approach towards basic and applied research.

Projects

While identifying R&D projects for different plants and units, the goals of the company and specific needs of individual plant or unit are taken into account.

RDCIS pursues 5 different categories of R&D projects:

- Plant Performance Improvement (PPI)
- Investigation & Consultancy Assignments (ICA)
- Basic & Scientific Research (BSR)
- Equipment & Instrument Development (EID)
- Major Technology Development (MTD)

Of these, PPI and ICA projects carried out in the plants account for more than 70% of RDCIS efforts. The remaining 3 project categories are pursued at the Centre's Laboratory Complex and followed up in the plants, wherever needed.

The objectives of these R&D projects are depicted in the diagram below.

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**Project Selection & Evaluation**

Over the years, the Centre has evolved an unique systems for selection, microplanning, execution, monitoring and review of R&D projects jointly with plants/units. The progress of the projects are regularly reviewed by Head of Works at Plants and at RDCIS every Quarter, apart from different stages of internal reviews.

An innovative system has been developed at RDCIS to evaluate the outputs in monetary terms as well as Customer Satisfaction Index (CSI). The monetary benefit accrued by utilisation of project outputs for 12 calendar months are certified by Head of Works as Certified Annual Benefit (CAB). The Customer Satisfaction Index (CSI) is assessed by the Shop-in-charge on few parameters on 4-point scale. The other outputs of R&D projects are patents, copyrights, publications, awards and honours.
Plant Centres

RDCIS Plant Centres are located at all the steel plants of SAIL. Experts from major technological disciplines man these Plant Centres. The role of each centre is to work as an interface between the plant and the main centre at Ranchi. They facilitate identification and formulation of R&D projects, participate in the execution of the projects, provide technical services to plants, monitor and review the progress of projects and facilitate utilisation and evaluation of the R&D innovations.

Achievements:

a) Specific areas in which R&D activities were carried out by the Company
   - Quality Improvement
   - Yield/ Productivity Improvement
   - Energy Conservation
   - New Technology/ Product Development

b) Benefits derived as a result of R&D efforts

Quality Improvement

- Introduction of superior quality magnesia board in tundish, alumina graphite SEN and use of start-up powder improved slab yield at Bhilai Steel Plant (BSP). Better dimensional control of rolled plates was ensured by introducing proper edging passes and roll pass schedule thereby reducing losses due to excessive trimming of plates. These measures resulted in about 10% increase in the yield of the finished plates.

Further, a combined effect of technological measures like restricting super heat of 35 °C (max.), use of smaller diameter rolls in secondary cooling zone and multiple point bending of slab during casting, control of Mn (1.5% max.) and elimination of slab thickness laying passes in the plate mill resulted in decrease in Non-distinctive Testing failure of plates from 10% to 4%.

Design modification in A & B strands of Wire Rod Mill at BSP have been made for acceleration cooling of wire rods. This has enabled cooling of wire rods at water pressure of 8-10 Kg/cm² resulting in average cooling temperature of 770-830 °C as compared to earlier level of 880-920 °C. This has resulted in reduction in secondary scale formation to 8.84 – 1.24% from a level of 2.0 – 2.5%. The system is in regular use.

- Increased incidence of rolled-in-scale on the surface of HR coils was tackled effectively through reduction of entry bar temperature after R5 of Hot Strip Mill of Bokaro Steel Plant (BSL) by bringing down furnace drop out temperature in the range of 1050-1060 °C from earlier value of 1100 °C. Finishing entry temperature of 930-950 °C was maintained. Inter-stand cooling between F6-F7 and F70F8 was introduced to prevent further rise in skin temperature. Thus, formation of hard haematite could be restricted to around 5.5 – 7.5%. The marked decrease in haematite content had a profound influence in reducing the diversions.

- A new system has been designed and commissioned for making provision for applying pressure for 0 to 100 bar for precise shape control in TCM-1 at BSL. A similar system has been designed for SPM-1. Strip crown after TCM-1 has been reduced from 0.010-0.20 mm to 0.005-0.01 mm. Strip flatness improved by 25% and customer complaint on account of bad shape reduced considerably.
Cost Reduction

- A screen type charging system was developed and installed in machine no. 8 of Sinter Plant – II at BSP replacing conventional chute system to improve vertical segregation of carbon and size in sinter mix. Mean size of sinter mix on the pallet varied from 2.49 to 7.6 mm from top to bottom of the bed. Specific productivity and strength of sinter improved by 3% and 7% respectively.

- Heat holding time (above 1100 °C) of top layer (80 mm above surface) of SP-III at BSP has been prolonged from 60 to 90 seconds by reducing velocity of air sucked through sinter bed from 0.3 – 0.4 to 0.25 – 0.32 m/sec by manipulating damper opening of initial and final wind boxes. The productivity increased from 1.12 to 1.23 t/m²/hr.

- In order to bring down the consumption of costly deoxidisers viz., Aluminium and CaFe/café in SMS-II at BSL, a process has been designed and implemented. It comprises reduced use of Al at tap, partial replacement of Al by sacrificial deoxidiser, on-line argon purging during tapping, improved LF slag regime; and ladle to tundish shrouding by ceramic and gas. This has resulted in reduction in specific Al consumption from 2.67 Kg/tcs to 2.1 Kg/tcs.

- RDcis provided a number of technological inputs in SP-II at Rourkela Steel Plant during April 1999 to March 2003 such as improvement in suction; optimisation of ignition regime; installation of permeability bar; optimisation of charging, etc. During the period, the productivity of SP-II improved from 1.16 to 1.26 t/m²/hr.

- Improved operating practice, regular slag splashing, hot maintenance, patching and gunning also contributed to increase in lining life. Increased lining life of approximately 1100 heats has been achieved during current year as compared to 995 heats during 2001-2002.

- To enhance life of steel ladle at RSP, a zonal lining design comprising of different qualities of MgO-C bricks has been developed and two sets of linings procured and tried. The important issues considered during lining design were: restriction of heat loss by using Insulation, carbon pickup in steel, matching repair schedule of slag zone, seating and well blocks. The ladle lining lasted 100 heats as compared to 45 heats obtained earlier with only one repair of slag zone.

- With an aim to increase specific productivity, a number of measures have been incorporated for raw material preparation and sintering process. In Sinter Plant- II at Durgapur Steel Plant in RMHP, Coke Crushing Index has been improved to 70-75% as against earlier value of 60-65%. In Sinter Plant, installation of two rows of permeability bars, IR moisture meter, increase in bed height by 75mm, modification of the raw mix profile in sinter mix hopper resulted in improving productivity from 1.15 t/m³/h to 1.3 1.3/m³/h. Simultaneously, further efforts are directed towards: installation of additional facilities such as: in-situ roll turning in coke crushing circuit, 3 piece sector gate distribution system for controlling sintering speed across the width of pallet, horizontal heat pattern control and compaction rollers for compacting top layers of sinter mix.

Energy Conservation

- Wire Rod Mill furnace lining thickness at Bhilai Steel Plant has been reduced by 65 mm replacing the 115 mm thick insulation brick in each wall with ceramic fibre board and one layer of asbestos board. Specific energy consumption
decreased from 485.5 to 262.5 Mcal/ton and productivity increased by 4% due to faster pick-up temperature after shutdown.

- Application software has been developed in-house and applied in Coke Oven Battery #3 at BSP for coking process control. Based upon raw coke oven gas temperature and coke temperature at the quenching tower, optimum heat demand calculation is being worked out and heating of ovens is controlled through coking control model. This has resulted in reduction in specific heat consumption by 5% in the coke oven battery. This technology also facilitates on-line preparation of oven scheduling and data logging for operator guidance.

- Average dropout temperature was reduced at BSL from 1250 – 1280°C to 1180-1210°C and average specific heat consumption has been brought down to 463 from 485 Mcal/t due to higher rolling rate attained through the use of heat shield between R4 and R5.

- A number of process optimisation measures such as burden distribution optimisation based on the cold model findings with MIA charging system, control of KE and RAFT at optimum level, increased number of castings to 8-9 casts/day along with other process control measures, were undertaken at Rourkela Steel Plant to improve the blast furnace performance. Successful implementation of these measures resulted in 12% increase in hot metal production and 5.8% decrease in coke rate.

**New Technology/ Product Development**

- A modified superior chemistry was designed for TMT wire rod with low carbon (0.10% max.), low Mn (0.50% max) and slightly higher P (0.08-0.10%). Two heats were made at Bhilai Steel Plant with this chemistry and processed to SWR-14 grade and TMT 415 grade wire rod simultaneously conforming to IS 1786 specification. In the performance trial at the customer’s works, newly developed SWR-14 grade steel has performed well in batch drawing and continuous drawing process in which 8mm dia wire rod was drawn to 2mm dia wire, besides improved atmospheric corrosion resistance properties of the drawn wire.

- Experimental corrosion resistant rails with controlled alloying addition of Cu and Cu-Mo were made at Bhilai Steel Plant in separate campaigns for Indian Railways. Mechanical properties and corrosion resistance of these experimental rail steels were found to be superior to the conventional IRS T-12/96 Gr. 880 plain C-Mn rail. These grades of steel are to be used in coastal railway line where the environment is corrosive and harsh.

- To increase the market share of EDD steel (HR/CR), particularly in the automobile and cold reducer segments, improvement in quality of conventional EDD steel (C≤0.06%) through lowering of carbon (≤0.04%) was attained at Bokaro Steel Plant through Combined Blowing Technology in BOF by optimising the steel making parameters. This resulted in reducing carbon level in the range of 0.025-0.04% and nitrogen level between 35 to 40 ppm. Cleanliness level of steel also improved (inclusion vol. 0.12% max.).

- As an import substitution measure, trial manufacturing of the plates used for proof of ammunition for strategic applications was carried out at Rourkela Steel Plant. The steel chemistry and process details were designed and one heat of 50t was made at ASP and the ingots were rolled at BSL. The slabs were converted into 150mm thick plates conforming to the required properties.
Ballistic tests were conducted at Chandipur and the results were comparable to imported plates. The material flow during bullet penetration was more uniform in trial plate.

- Process technology has been developed for production of EDD steel with superior formability properties through CC route with close control of chemistry and hot rolling parameters, maximisation of cold reduction and improved annealing cycle.
- Process chart for API X-65/X-70 grade plates at BSP has been redesigned with respect to draft, speed and thermal regime in roughing and finishing stands to avoid overloading; line pipe steel plate upto 25mm thickness was successfully rolled conforming to specification.
- Technology of slag splashing in BOF of SMS-II at BSL has been introduced. SOP has been formulated for coating of different zones of the lining. Addition of dolo-chips, during blowing has also been introduced. This technology has increased the average lining life of BOF to 697 heats from earlier level of 557 heats.
- For market promotion of special steel product at BSL, special steel grades with high contribution and good marketing potential were identified. Process chart was developed and 20,000t of steel despatched to customers.

c) Future plan of action

R&D programmes identified for the next five years are as follows:

**Technology Areas**

**Coal, Coke & Chemicals**
- Improvement in coal carbonisation practices and coke quality; Introduction of process automation for improvement in coke quality and yield of by-products; Improvement in service life of coke oven battery; Improvement in coal charge preparation for optimisation of cost of coal blends.

**Iron & Sinter**
- Maximising of BF productivity with Indian Iron ore through in-furnace investigations (Under SDF aided Project); Reduction in coke rate; Assimilation of new iron making technologies; Improvement in process parameter for increasing productivity and reducing cost of BF hot metal; Development of appropriate beneficiation and agglomeration schemes through lab/pilot studies; Technological upgradation of beneficiation plants, Improvement in sintering technology to achieve performance of sinter plant to international level; Optimisation of sintering process parameters to improve sinter quality/yield; Introduction of innovative agglomeration technologies and their horizontal transfer.

**Steel Making & Casting**
- Reduction in cost of liquid steel through improved productivity and reduced level of inputs in BOF and secondary refining units, enhancement of caster productivity including improved sequence length and tundish life and reduction in level of non-metallic residuals for production of high value products.
<table>
<thead>
<tr>
<th>Domain</th>
<th>Improvements / Developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractories</td>
<td>Improvement in life of ladles for handling hot metal and steel by using better refractory lining; Introduction of low/ultra low cement castables in SAIL plants; Laboratory development of refractory cement from dolomite; Development and application of models for state-of-art customised lining design and life prediction aimed at reduction of specific refractory consumption; Introduction of self flow castable in SAIL plants.</td>
</tr>
<tr>
<td>Rolling Technology</td>
<td>Improvement in the operational efficiency of Rolling Mills; Elimination of surface defects; Improvement in the productivity and surface quality of cold rolled products; Control of process parameters for improving the quality of rails and yield improvement of primary mills.</td>
</tr>
<tr>
<td>Product Development</td>
<td>Development of process for advanced hot dip coated products using hot dip process (SDF aided project). Production of low aluminium wheel and optimization of heat treatment practice; Improvement in yield and quality of special quality plates; Development of special steel grades for automobile, agriculture and oil segments, corrosion resistant rail steel, auto body quality sheets &amp; coils; Improvement in the performance of lubrication systems to enhance life of critical equipment; Promoting the application of new SAIL products in different sectors like- agriculture, automobile and construction.</td>
</tr>
<tr>
<td>Energy Conservation</td>
<td>Development and introduction of fuel efficient burners; Optimisation of heating and rolling regime for reduction in energy consumption; Modifications of combustion system in heating/ heat treatment furnaces; Improvement in utilization of BF gas; Energy conservation using computerised process and combustion control systems, Implementation of multi-slit burners at Sinter Plants for improved fuel efficiency.</td>
</tr>
<tr>
<td>Automation &amp; Computerisation</td>
<td>Introduction of automation and control systems for productivity, yield and quality improvement in steel plant units like – reheating furnaces, heat treatment furnaces, finishing lines and rolling mills; Development of integrated communication and instrumentation system; Development and application of softwares for various applications.</td>
</tr>
<tr>
<td>Environment &amp; Pollution Control</td>
<td>Assessment of PAH, NO, and improving effluent treatment in coke oven area of different steel plants; Evaluation of impact of hazardous wastes and studies on their reuse/ safe disposal.</td>
</tr>
</tbody>
</table>

**Collaborations & Interactions**

RDCIS collaborates with the leading academic and research institutions as well as industrial organisations in India and abroad for the purpose of enriching the level of expertise, exposure to newer technologies and for undertaking joint research projects.
to transfer know-how. These collaborations and interactions have been very fruitful in widening the horizons of knowledge of the RDCIS personnel. Some of the collaborations from abroad in the recent past were Tsnichermet, Russia; National Science Foundation and Naval Research Laboratory, USA; International Flame Research Foundation, Holland; MEFOS, Sweden; NKK, Japan; Voest Alpine, Austria, and NPL, England. In India, the collaborative work has been undertaken with the Indian Institutes of Technology, Indian Institute of Science, Banaras Hindu University, MECON, CSIR Laboratories, IOC, BE College, Welding Research Institute, BHEL.

Technology Dissemination

Proper appreciation of technology is the key factor for its effective implementation and utilisation. Through systematic dissemination Technology Information with current developments & trends augments the appreciation of technology. RDCIS is actively engaged in meeting this challenge by:

- Organising Technology Awareness Programmes for SAIL executives on specific issues both at Ranchi and at plant sites.

Technology Marketing

RDCIS offers technological services to various organisations in the form of

- Know-how transfer of technologies developed by RDCIS
- Consultancy services
- Specialised testing services
- Contract research

The Centre has acquired several patents and copyrights over the years.

Apart from the projectised R&D inputs to SAIL plants, RDCIS also carries out various assignments at the corporate level. RDCIS also works hand-in-hand with the plants for adaptation and stabilisation of new technologies in addition to carrying out troubleshooting assignments, diagnostic and failure analysis, specialised metallurgical testing.

Technology Marketing Group of RDCIS interacts with the customers outside SAIL and facilitates the marketing of technological services in India and foreign countries both.

Human Resources

RDCIS is a people oriented organisation. Its human resource base is its pride and promise. About 350 scientists and engineers many of them are post graduates and doctorates contribute for the success of RDCIS. The unique blend of academic brilliance and operational experience has empowered RDCIS to pursue multi-disciplinary R&D Projects. There is emphasis on continual development of intellectual capital through R&D in SAIL.
Modernisation & Automation

Introduction
The Steel Plants of SAIL were set up in the late fifties and early sixties. Expansion schemes were brought in the sixties in DSP and RSP. A number of new developments have taken place in the last three decades in the iron and steel technology resulting in higher productivity levels, improvement in technological parameters, improvement in quality of products and lower cost of production. Apart from some balancing facilities subsequent to expansion, no comprehensive efforts have been made in RSP and DSP to remove the obsolescence through technological up-gradation of the plants. This has resulted in unsatisfactory capacity utilization particularly in the areas of iron and steel making. Therefore there is an urgent need to modernize the plant operations to improve production, productivity and profitability.

Objectives of Modernisation
Decision was taken to update the technology and modernize the Plants with a view to establish all the Plants on a strong foundation. The objectives of the modernisation were:

• Improvement in health of plant and equipment through replacement of aged equipment and machinery.
• To utilise the available capacity potential fully.
• Improvement in the quality of raw material inputs.
• Technological upgradation of plant through introduction of new technologies.
• Improvement in quality of products with a view to come to international standard.
• Improvement in productivity of machine, material and labour.
• Reduction in energy consumption
• Reduction in cost of production
• Better environmental pollution control
• Improve instrumentation and automation.

New Technologies Incorporated under Modernization

• Base blending facilities for preparation of sinter mix for new sinter plant.
• Installation of “Partial briquetted coal charging” facilities for coke ovens.
• Mini pelletising facilities for use of plant wastes for sinter mix.
• Installation of cast house slag granulation facilities.
• Inert gas purging facilities for LD converter.
• Suppressed combustion facilities for recovery of converter gas.
• Facilities for continuous casting of liquid steel into slabs.
• Magnesia enrichment, pitch bonding & tempering facilities for converter bricks.
• Installation of coil box facilities in HSM.
**Major Schemes for Environmental Control under Modernisation**

- Raw material bedding plant to be provided with elaborate dedusting facilities based on bag filter.
- Dedusting facilities to be provided in the new coal crushing facilities in Coke Ovens.
- New sinter plant to be provided with ESP’s for space dedusting and waste gas dedusting.
- Blast furnace stack house to be provided with dedusting facilities.
- New converters to be provided with suppressed combustion and gas cleaning facilities.
- New lime kilns to be provided with elaborate dust separation and disposal facilities.

**RSP Modernisation Details** – The modernisation and Technological upgradation of RSP was completed in two phases. Full utilisation of modernised units are being done. The facilities provided are as follows:

**Phase - I**

- Centralised raw material handling system.
- Modification of coal handling facilities in Coke Ovens.
- Blast furnace stack house conveyorisation and sinter screening facilities.
- Cast house slag granulation plant for BF No.4.
- Modification of dolomite Brick Plant.
- Ix180 TPD air separation unit in the new Tonnage Oxygen Plant (TOP-II).
- Augmentation of power distribution facilities.

**Phase - II**

- Augmentation of raw material handling facilities.
- Installation of partial briquetted coal charge facilities for Coke Ovens.
- Installation of new 1x192m² Sinter Plant.
- System of conveyors to and from new Sintering Plant.
- 2x150T capacity new converter shop for steel making.
- Continuous casting facilities for new steel melting shop.
- Continuous casting facilities for existing steel melting shop.
- Flux calcination facilities for supply of flux to new SMS.
- Installation of new reheating furnaces for Plate Mill and HSM.
- Modification in the hot strip mill (Roughing Stand RO/VO).
- Renovation and relocation of dividing line in HSM.
- Installation of 1x60 TPH capacity medium pressure boiler.
- New ladle repair shop for B. Fce. ladles.
- Mobile storage yard equipment for RMHS Phase-II (Ore Bedding and Blending Plant).
- Augmentation of power distribution facilities.

**DSP Modernisation Details**

*Bolani Iron Ore Mines*

- Augmentation of Mining and haulage equipments and replacements of primary
& secondary crushing facilities to increase the mine capacity to about 3.44 MT ROM/Yr.

Coal Washery
- Modernisation and augmentation of existing coal washery with 1.2 MT PA capacity.

Raw Materials Storage and Handling Plant
- One additional rotary Wagon Tippler with electric pusher car provided.
- Rail/Road off loading bunker facilities.
- Additional stacker-cum-reclaimers for handling ores & fluxes.
- Lump ore screening facilities for fluxes.
- Sinter mix blending yard facilities with stacker and reclaimer.
- Sampling and weighing facilities on conveyor routes.

Coke Ovens & By-Product Plant
- Addition of 1 Battery of 87 ovens 4.45 M High (6A & 6B)
- Addition of one by-product recovery stream of 20,000 NM³/Hr capacity consisting of Gas condensation plant, PHOSAM plant for recovery of Ammonia and Benzol recovery plant.

Sinter Plant
- Addition of one new sinter Machine (198 M³ screening area)
- Process control computer system and pollution control facilities.

Blast Furnace
- Cast House slag granulation for B F No.4
- Recommendation of B F 2 & 4 to improve BF productivities from 0.58 T/M³/D to 1.04 T/M³/D.
- Hot Blast Temp. from 700°C to 1000°C.
- Sinter screening.
- Conveyorisation of stock house.
- Cast house slag granulation for No.4 BF
- Automatic process control.
- High top pressure.
- Movable throat armour (MTA)
- Neutron moisture system for controlling coke charge

Steel Melting Shop
- 3x110M³ basic Oxygen furnaces (LD convertors) with associated facilities (capacity 110 tonnes & Tap to Tap time 57 min.)
- Vacuum arc degassing (VAD) unit for secondary refining of steel.
- 2x1300T Mixer plant.
- 3x300T per day New Lime calcining plant.

Continuous Casting Plant
- 2x6 strand concast unit for casting liquid steel into 100mm square billets

Merchant Mill
- Slit rolling process with crop & cobble shearing arrangement.
• Thermax cooling facilities.
• Automatic bundling and binding facilities

**Wheel & Axle Plant**
• Band saw for cutting fluted ingots - 6 Nos (Ingot/Hr./Machine)
• Block Reheating furnace - 1 No. (32 Block/Hr.)
• Oil hydraulic combination press (63MN/ 12MN) for pressing & punching of wheels. - 1 No. (25 Wheels/Hr.)
• Holding furnace 1 No. - Wheel Mill - 1 No. (25 wheels/Hr.)
• 20 MN Disling press. - 1 No., - Marking Press - 1 No.
• Heat Treatment furnace - 4 Nos.
• CNC Machines for machining of wheels. - 15 Nos.
• Ultrasonic Testing, Inspection & Assembly

**Oxygen Plant**
• 2x300 T/Day Oxygen plant with Argon separation facilities.

**Computer Facilities**
• Production, Planning & Control computer.
• Software facilities for main frame computer.
• Process control computers for raw materials storage and handling plant, Sinter plant, Blast furnace, BOF shop and Concast plant.

Apart from the increase in the total capacity, the modernisation has improved various techno-economic parameters - operation costs, energy consumption, raw material usage, labour & equipment productivity.

**BSL Modernisation Details**

**Steel Melting Shop - Additional Equipment**
• Stand for 300T Ladles two numbers
• Steel Ladle Drier one number
• Self Propelled Steel Ladle Transfer Car From SMS To CCD, 2 Nos.
• 30T Capacity EOT Magnet Crane with repair hoist in scrap yard one number
• Containers for Argon Rinsing Lance one set
• Lance Drying Oven one number
• 300T Steel Teeming Ladle With Slide Gate five numbers
• Slag pot with Std two numbers.
• Tilt type slag pot car with slag pot eighty numbers
• Pneumatic slag arrester system two numbers.
• 300T hot metal ladle one number
• Extension of scrap yard by 48m

**Continuous Casting**
Installation of 2 double strand slab continuous casting machines comprising -
• Steel refining unit two numbers.
• Continuous casting machines two numbers.
• Handling and finishing line
• Tundish preparation facilities
• Section for preparation and storage of replaceable equipment for CCM
• Slab storage and conditioning facilities.
• Installation of new re-heating furnace
• Reconstruction of two out of three existing re-heating furnaces No. 2 & 3 to walking beam type
• Introduction of hydraulic arc in last four finishing stands.
• Modification of entry and exit guides of the finishing stands.
• Interstand cooling and roll coolant headers in finishing stands
• Reconstruction of run-out table
• Installation of water wall type strip cooling system
• Modification of coiler Nos 1, 2 & 3.
• Installation of coiler No

Related Services
• Ventilation station
• Replaceable equipment repair shop
• Oxygen compressor shop
• Chilled water plant
• Storage facilities for casting powder
• Power supply facilities
• Water supply for soft and industrial water and sewerage facilities
• DM water plant
• Compressor station
• Pneumatic sample despatch system
Service Conditions
(Policy & Rules, Conduct & Discipline)

Executive Performance Appraisal System

SAIL Executive Performance Appraisal System aims at development of its human resources and advancement in career based on performance and results achieved. The objectives of the policy are:

- To integrate growth opportunities of the executives with fulfillment of company objectives.
- To man executive posts in the company with competent personnel having growth potential, and to utilize their capabilities in the working environment to the maximum through opportunities available for advancement.
- To provide for a system which is conducive to equity, fairness & objectivity in matters concerning promotions of executives.
- To ensure uniformity and consistency, to the extent possible, in promotions of executive of different units of the Company.
- To motivate executives of the organisation for better performance, by rewarding their contribution to the growth of the organisation, in deciding promotion on the basis of overall merit.
- To ensure continuity of the management and systematic succession planning for senior / key posts in the executive cadre.
- To provide input for the development of executive linked to their levels of performance and their specified strengths and requirements.

Salient features of the promotion policy are as follows:

a) It introduces the concept of clusters for the purpose of promotion and career planning. Under this concept a group of scales of pay are clubbed into a cluster and promotions within a cluster are made on acquiring the required credit points in the appraisals and completing the minimum prescribed period of service in the present scale.

b) It is performance based and an executive is required to put in sustained good results, as reflected in his appraisal reports, for earning a promotion. Thus for the purpose of promotion from one cluster to another cluster average credit point (ACP) is the main basis for determining eligibility for promotion. The ACP” is calculated from the appraisal scores for past years in the prescribed manner. Other factors, which reckon for the purpose of promotion from one cluster to another cluster, are scores for qualification and length of service in the grade.

c) Promotions within a cluster are based on accumulation of required credit points whereas promotions from one cluster to another are linked with vacancy. However in both in situations merit is the paramount consideration and in exceptional cases lack of vacancy is no bar for promotion.
d) Promotion Policy and Rules provide for identifying executives with high and low potential and arrange for their job rotation and development.

e) Promotions are decided by a higher level Departmental Promotion Committee.

This policy has been introduced in the company from 15th June '86 and last revised in 1991-92. We have also evolved a uniform promotion policy for the non-executives based on the cluster concept.

Appraisal System for Executives

SAIL has introduced a new appraisal system for the executives. This system has been evolved after evaluating the need for change from the earlier system, discussions with the Chief Executives of SAIL units, Heads of Personnel and Officers of the Company. Salient features of the new system are given below:

• The system envisages pre-set targets/tasks to make the assessment more objective and to give the appraisee an indication in the beginning of the year of the critical performance areas.

• The self-appraisal has been made more structured to give the appraisee an opportunity to present facts/data, which he considers relevant for his appraisal.

• There is provision for a performance review & planning (PRP) discussion to be held twice in a year to enable continuous review of performance and make exchange of feedback possible.

• Enforcement of normal distribution to ensure proper identification of executives on the basis of their performance.

• Assessment against key criteria where the weightages differ for junior and senior levels.

• The system is quantitative.

• In the executive appraisal system performance is assessed with reference to:

  a) Job performance factors (which are quantity of output, quality of output, cost/time control, job knowledge and skill, team spirit & lateral coordination, discipline, development & quality of assessment of subordinates and any other relevant factor).

  b) Potential factors (these are Planning and organizing, initiatives, commitment and sense of responsibility, communication, problem analysis and decision making, management of human resources).

These factors are weighted differently for different groups of officers. An appraisee gets a minimum of 20 credit points and a maximum of 100 credit points on these factors. The credit points are given by the Reporting Officer, the Reviewing Officer and, where applicable, by the Reporting Officer (8). Credit points given by them are also weighted. These credit points enable the Performance Review Committee to decide the grading of an officer, the four grades being O, A, B & C. The following range of scores may be used as a guide for the indicative grades of the reporting officer.

  84 and above – O, 68 to 83 – A, 52 to 67 – B, 20 to 51 – C,

The reporting officer will differentiate between performance levels of appraisees under him and to the extent possible follow distribution patter as indicated below in order of merit) – ‘O’ - 10%, ‘A’ - 20% - 45%, ‘C’ - 25%

An important output of the appraisal reports is an indication of the development
needs of the executives. These are used by the Training Department to plan necessary training and development programmes for executives.
The appraisal report is also used for deciding job rotation and appropriate placement for the executives.
Management trainees ranking distribution is done in the following manner – 25% 'O', 50% 'A' & 25% 'B' of those who have passed at first attempt. In case the training is extended for any reason, the trainee gets C.

Pay and Fringe Benefits
The wage and fringe benefits in steel industry are settled in ‘Key Bargain’ negotiations between the employers and the Unions. The outcome of this bargain decides the wages and fringe benefits of entire industry. Traditionally, we have been the forerunners in wage agreements and all other public sector industries base their ‘bargain’ on the steel wage agreement. Also being the largest public sector enterprise and represented by leaders of national repute in the trade unions, it becomes necessary to be trendsetters in ‘wage bargains’.

A Management Trainee will be undergoing a comprehensive training for a period of one year, during which his basic pay will be as per the prevailing pay scale. He will receive a pay voucher indicating the various components of the gross emolument like basic, dearness allowance, conveyance allowance, incentive bonus etc. as well as the deductions like PF, E.P.F etc. A brief outline of the various components of pay and other benefits are presented below.

Basic Pay
Basic pay is a stage in a time scale of pay, which is normally related to the length of service in the pay scale. The basic pay of an employee increases every year on account of annual increment. Normally, annual increment is granted on the 1st of January or on the 1st of July depending on the date of promotion/appointment. An employee appointed or promoted between 1st January to the 30th June of a year draws his annual increment from 1st January of every year and the employees promoted/appointed between 1st July and 31st December draw their annual increment on the 1st July of every year. In IISCO there is only one annual increment date for executives i.e. 1st of April every year. An executive is put on probation, for one year on appointment and for six months on promotion. The confirmation in a grade depends on the performance during probationary period. An executive on promotion draws his/her annual increment on the due date, without reference to probation period in the higher scale.

In so far as Management Trainees are concerned, their pay remains the same during the one-year training period. On satisfactory completion of the training they are appointed as Junior managers and are put on probation for 6 months. They are confirmed in the services of the Company on satisfactory completion of probation after which they are entitled to draw annual increment as explained above.

Dearness Allowance
Dearness allowance is paid towards neutralization of the hike in cost of living. DA is linked to the All India Consumer Price Index (AICPI) w.e.f. 1.1.1997 over AICPI 1.1.99.
The current rate of DA for the quarter July 2005 to September 2005 is @ 52.1% of basic pay.

**Incentive / Reward Bonus Schemes**

Production Bonus/Reward Schemes have been formulated in all Steel Plants to motivate the employees for increased production and productivity.

The cut-off point and quantum of money linkage with preceding and succeeding departments and differential between production, maintenance and service departments, vary from plant to plant. This has become necessary as different plants are operating at different levels. MTs will be eligible for incentive/bonus on appointment as Junior Manager. The potential of incentive earning for E-1 level executive on an average comes in the range of Rs.2,700/- per month in certain departments of Steel Plants. Employees working in night shift are entitled to an allowance of Rs. 45/- per night.

**Reimbursement of Local Travelling Expenses (LTE), Transport Subsidy, Magazine & Entertainment Expenses**

Some of the steel plants maintain a fleet of buses to bring the employees to the Works. However, in view of the large work force, it has not been possible to provide Company’s transport for all employees. Hence those executive employees who use their own motor vehicle for official work are reimbursed a certain amount as indicated below:

<table>
<thead>
<tr>
<th></th>
<th>Scooter/Motor Cycle (including 100 cc bikes)</th>
<th>Rs.625/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Car – E0-E2</td>
<td></td>
<td>Rs. 1950/-</td>
</tr>
<tr>
<td>(b) Car – E3-E5</td>
<td></td>
<td>Rs. 2450/-</td>
</tr>
<tr>
<td>Car – E6 &amp; above</td>
<td></td>
<td>Rs. 2700/-</td>
</tr>
</tbody>
</table>

The rates of LTE for non-executive employees are for Scooter/Motor Cycle Rs. 350/-. Those executives and non-executives who neither claim LTE nor use company’s transport are entitled to transport subsidy of Rs. 6/- per day on actual attendance subjected to a minimum of Rs. 90/- per month. Subscription on magazine and entertainment expenses are also allowed as per rules.

**Township**

Every steel plant has a well-developed township, with residential, medical, education, recreational, sports and cultural facilities, which are continuously improved to meet the growing needs of the company employees. Management Trainees are provided with semi-furnished bachelor’s accommodation initially. A nominal charge is levied for providing accommodation. The housing satisfaction level, in different plants is given below:
<table>
<thead>
<tr>
<th>Unit</th>
<th>Satisfaction Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhilai Steel Plant</td>
<td>68%</td>
</tr>
<tr>
<td>Bokaro Steel Plant</td>
<td>70%</td>
</tr>
<tr>
<td>Rourkela Steel Plant</td>
<td>100%</td>
</tr>
<tr>
<td>Indian Iron &amp; Steel Co Ltd.</td>
<td>65%</td>
</tr>
<tr>
<td>Durgapur Steel Plant</td>
<td>65%</td>
</tr>
</tbody>
</table>

Those who are not provided with company accommodation are paid house rent allowance, which is 10% of basic pay in the steel plant location.

Medical Facilities

All steel plants have hospitals with modern amenities and are well equipped for various kinds of specialized treatment. All employees and their dependents are entitled to free medical treatment in company’s hospitals. There are provisions for reimbursement of medical expenses incurred for those posted in places like Delhi, Bombay, Calcutta etc. where company’s hospitals do not exist.

Sometimes patients are referred for specialized medical treatment to such institutions of repute as Jaslok Hospital, Bombay, Apollo Hospital, Madras, CMC, Vellore, AIIMS, Delhi etc. and the cost of medical treatment is borne by the company.

Education

There are company run schools in all steel townships and employees’ children get free education upto matriculation (not applicable at some of the Plants). Where employees’ children study in other schools, fees to the extent of government rates are reimbursed where company run schools is not available.

Leave Travel Concession (LTC/LLTC)

The Company pays for self and family the concession for travelling to one’s hometown and any other place in India once each, in a block of 4 years. For the purpose of LTC family includes spouse, parents residing with the employees and legitimate children and step children residing with the employees and wholly dependent on him/her. An employee is required to proceed on 6 days leave (CL, EL or HPL) to avail LTC.

The block of 4 years for LTC starts from the year in which one completes one-year service in the Company. MTs joining SAIL in 2003, block year for LTC will be 2004-2005, in four year block 2004-2007 and so on. He can avail of LTC on completion of one-year service in the Company.
Leave

Executives are entitled to following kinds of leave:

i) **Earned Leave (EL)**
   
   Earned leave is calculated at the rate of 1 day for every 10 days of service subject to a maximum of 2.5 days per month. EL can be accumulated up to 240 days.

ii) **Half Pay Leave (HPL)**
   
   HPL is calculated at the rate of 20 days per completed year of service and can be accumulated without limit. HPL can be commuted on medical grounds or for approved course of study, to full pay leave.

iii) **Special Disability Leave** is granted to an employee who is temporarily disabled on account of personal injury caused by accident arising out of and in the course of employment. Other kinds of regular leave include Maternity Leave, Quarantine Leave & Special Casual Leave.

iv) **Casual Leave** is limited to 15 days in a calendar year and cannot be accumulated.

Welfare

i. An incentive of Rs. 2000/- is granted to employees for undergoing sterilization operation (either by the employees or spouse) to promote small family norms.

ii. Scholarships are awarded to employee's children to motivate them for better academic performance. There is both Merit as well as Merit cum Means scholarships.

iii. **Incentive for Higher Educational qualifications for specified courses** is provided.

iv. An employee is eligible to become a member of the Provident Fund Scheme of the Company from the date of joining.

v. Withdrawals from the Provident Fund are permitted in certain circumstances as prescribed in CPF Rules. These, among others, include withdrawal for meeting the cost of higher education of dependent child, expenses in connection with the marriage, building a house etc. Withdrawals are subject to certain conditions too. Amount withdrawn is payable in suitable installments. Full withdrawal (together with Company's contribution) of the Provident Fund is permissible on retirement or resignation.

vi. As for gratuity, for CPF also an employee should make nomination at the time of joining.

Retirement Benefits

On retirement an employee of the company is entitled to receive Gratuity and Provident Fund.

a) Gratuity is calculated at the rate of half month's wages (i.e. Basic+DA) last drawn by the employee for every completed year of service and one month's wage for service rendered beyond 30 years. Training period is also considered for the purpose of computation of gratuity.
b) In the case of executives, the amount of gratuity is subject to a maximum limit to Rs. 3.5 lakhs.

c) An employee should make nomination conferring one or more persons of his/her family the right to receive the gratuity in the event of his/her death, indicating the shares payable to each member. In case of an employee having no family, the nomination may be made in favour of a person or persons or body of persons, corporate or incorporate.

d) Transfer benefits – on retirement of an employee the company bears the expenses of settling at a place in India. These include, fare for family, transportation of car and personal effects.

e) Employees Pension Scheme has been introduced. Terms and conditions of the scheme have also been worked out.

Encashment of unavailed earned leave and half pay leave is permissible upto a limit of 240 days each at the time of retirement/resignation.

Conduct and Discipline

The company has codified its conduct and discipline rules. The first, important provision is that:

a) Every employee of the Company shall at all times:
   i. maintain absolute integrity
   ii. maintain devotion to duty; and
   iii. conduct himself at all times in a manner which will enhance the reputation of the company.

(b) Every employee of the company holding a Supervisory Post shall take all possible steps to ensure the integrity and devotion to duty of all employees for the time being under his control and authority.

c) Other provisions related to Misconduct, Employment of near relative, Taking part in Politics and Elections, Taking part in demonstrations, Connection with press and radio, Criticism of Government and the company, Gifts, Giving and taking dowry, Insolvency and habitual indebtedness, Transaction of movable and immovable and valuable property, Disciplinary action are explained in the appropriate rule books applicable.

Safety

The company pays considerable attention to the safety of employees. Each plant has a Safety engineering Department. Central Safety Organisation at Ranchi monitors the Safety aspects of SAIL as a whole.
Plant Services

Production Planning & Control

PPC - or Production Planning & Control as it is called, is the department that basically evolves the Production Plan for the year and the months in consultation with the different shops. If it is the monthly plan, the Executive Director (Works) approves it and the different shops are informed about the shop's plan/targets. If it is yearly plan, then the same is discussed with Finance, budget prepared and further discussed with Operation Directorate of Corporate Office for final approval by the Board.

Since 1987-88, however, a new system has been evolved. SAIL enters into an agreement with the Ministry of Steel through a Memorandum laying down the production plan that SAIL has to fulfill and the assistance that the Government has to render to SAIL to fulfill the Plan for the year. Once the monthly plan as agreed upon by all the shops and approved by the Management, the shops set out to fulfill the same. Here again PPC has a very vital role to play. Evidently, different shops in the whole plant have to work harmoniously and in unison. Then only can the whole plant fulfill its target. This needs meticulous monitoring by a central agency, which is called the plant control.

Each Shop has a despatch control which is connected by direct telephones with each of its sections and the shift incharges can feed information to the Despatcher of the Shop regarding production, delays and constraints, if any, in time and also ask for help if need be. Each of the despatcher control and other important areas of the Plant are connected by direct telephones to the Central Plant Control. Thus the production activities are monitored continuously and arrangements made by the Plant Control for necessary help asked for by the production units. The plant control despatcher unit has also direct telephone connections with all heads of department (HoDs) and Executive Director (Works) and senior executives. This facilitates ED (Works) to have a daily despatcher conference with HoDs for review of past 24 hrs performance as well as in giving guidelines for the next 24 hours. The Plant Control Incharge is given special assignments by ED (Works) for monitoring the actions, overcome constraints occurring from time to time.

In addition, PPC has a Statistical Section which compiles all the relevant data for the management information system for the shift, the day, the week and finally the year. Production statistics are published in the form of a hand-book and distributed to all agencies in SAIL to serve as ready reference book. PPC is the authorised reporting agency for all technical data pertaining to the Steel Plant. All official figures are issued by PPC. PPC coordinates with the Marketing Department and CMO for procuring orders and plans despatch to ensure timely delivery.

Traffic Department

Traffic volume and complexity of traffic of an integrated steel plant is almost like that of a Railway Division and at times more complex considering the production process which would take no delay whatsoever.
In the plants designed during the fifties - Bhilai, Durgapur and Rourkela, rail traffic is around 80%, conveyorisation about 15% and the balance 5% by road; while in the Plants of the sixties/ seventies like Bokaro, the more economical model of material handling viz. Conveyorisation takes the lion’s share of around 50%, rail transport 40% and the balance 10% by road. In the more recent designs like at Vizag, rail traffic is about 30%, conveyorisation 60% and road transport 10%. The latest trend, in 7th Blast Furnace at Bhilai, there is no rail traffic at all - it has gone track-less except for the transportation of Hot Metal. All the input and rest of the outputs are by either conveyors or road transport.

We have the inevitable external traffic - bringing in raw materials and taking out finished products. At the one million-tone level, a Steel Plant has to handle around 10 trains outgoing per day.

While handling the Railway wagons inside the Steel Plant, they undergo some detention. In order that such detention is kept within reasonable limits Railways have prescribed a certain “free time” for each type of wagons, operation wise. When the detention is beyond the Free-Time allowed, the Plant has to pay to the Railways “demurrage”. This is a wasters expenditure and has to be controlled. To calculate demurrage, obtain Railway Receipts for despatches and handle such matters, there is a Commercial Section of Railways in Traffic Department.

Loco & Wagon Shops and Permanent Way Section are the basic infrastructure of Traffic Department. Each Steel Plant has its own network of railway tracks, locomotive and different types of wagons to meet the diverse requirements of various production shops.

Some of the busy yards of the railways system inside the Plant have been equipped with Centralised Track Circuiting or Centralised Traffic Control system so as to ensure speedy and safe rail movement. In this system the route is set by point motors operated by remote control switches in a central building which has an illuminated yard layout replica on a board. There is a fool-proof inter-locking system such that no conflicting movements can take place, thus safety of movements, is ensured.

Research & Control Laboratory

If SAIL is to stay in business, we can’t dispense with quality. And to ensure quality in all our products, Research & Control Laboratory (RCL) plays a vital role as the watch-dog of quality, every minute, at Production Shops of the Steel Plant.

RCL has four wings namely, Metallurgical, Chemical, Inspection & Research & Development

Metallurgical Wing helps the Process in the different production Shops, Coke Ovens, Blast Furnace, Steel Melting Shop, Rolling Mills, Foundry etc, to maintain the speed of production as well as quality of the products. Process Control exercises control on quality of the inputs and production parameters such as yield, off grade production, working practices, heat - regimes, temperature control, mechanical properties, chemical compositions, requisite micro structures, etc. Some of the sophisticated equipment/instruments used for these controls are; Thermo-vision Camera, Digital Pyrometer, Ultrasonic Flaw Detectors, Quanta-vac Slag Analysers etc. Nucleonic
Gauge Variation Detector and Adjuster to control gauge variation of hot rolled coils is installed in the mills.

Sample pieces from each production unit are taken to the Laboratory for testing and ensuring that the products conform to the standards of different specifications before despatch to the valued customers. The laboratory also investigates failed spare parts to determine causes of failure, so that the shops are properly guided to procure spares of desired quality.

The chemical wing collects samples from incoming raw materials as well as from intermediate products for analysis of chemical composition and size fractions. There are Express Laboratories attached to different production units for quick sampling analysis and control. They help in controlling quality of inputs from one stage to another in the long process of conversion of raw materials to finished steel products.

It is finally the Inspection wing which sorts out the good from the bad: Tested quality, off-grade, commercial grades, defectives, rejects etc. are carefully classified with an eye on the cost of different categories - so that the customer gets what he wants and the Company is not put to loss. Off-grade and diversions are minimised by proper fitment into grades to earn more.

Finally, packaging of the Products is equally important so that product reaches its destination in a sound condition. This is also inspected before despatch. Inspection Group also observes satisfying operation of different intermediate products like slabs, blooms etc. to avoid defects in the final products.

Research & Development Wing

There cannot be progress without Research. The main Research & Development work is being done at the RDCIS, Ranchi, and for application of some of the findings or new technologies, certain small scale trials are conducted in the Steel Plants actually on the job to assess the benefits and constraints, if any. The basic objective of this wing is to investigate into different production parameters for reviewing them periodically for overall improvement of plant productivity and product quality.

All these wings of RCL work in conjunction with themselves as well as with production units as a team to ensure technological discipline and excellence of quality.
Role of Frontline Executives

The success of any organization depends largely on its frontline executives. They play a very important role especially in the manufacturing industry. They are closest to the production zone. They play a vital role both in plants and other support service Units.

The Company’s Vision and Core Values should be properly understood by all employees as they are the guiding principles for all planning and actions. All goals and objectives should be aligned to the Vision. A frontline executive is the person who has to take care of the execution of jobs and take corrective measures to minimize deviation. A front line executive plays a dual role i.e. he should identify himself with the management’s actions and initiatives and at the same time, he should work as a leader of the team. He should reach out to the people and motivate them to achieve organisational goals and targets.

In general the personality and behaviour of the frontline executives should be as follows:

- He should be perceived as a role model by the employees.
- He must demonstrate officer-like qualities such as discipline, honesty and punctuality at work.
- He should not leave the work spot without permission and should avoid gossips, rumour-mongering etc. and endeavour to maintain the dignity and decorum of the workplace.
- He should follow company rules, regulations and decisions of the management.
- He must be conversant with safety rules and regulations.
- Respect for seniors should be shown including following of their instructions and advice.

The A To Z for Frontline Executives

Some specific points are mentioned to highlight the important aspects at work to understand the role of frontline executives.

a) Positive Mental Attitude: A frontline executive should exhibit positive mental attitude which itself is a great source of motivation to the subordinates working with him. This is a powerful way of motivating and developing the subordinates.

b) Planning and Job Allocation: He must be good in planning and must think ahead – what are the activities to be performed and what resources are needed, who will be performing which tasks and the envisaged time required for executing the jobs. Once the plans are made, the frontline executives have to take actions for getting desired results. He has to allocate the jobs to people with requisite skills and arrange means and resources required for the job.

c) Discipline in the Shopfloor: The frontline executives should ensure proper technological as well as behavioural discipline. The technological discipline is ensured through adherence to Standard Operating Procedures/ Standard
Maintenance Procedures (SOPs/SMPs). He should control absenteeism in the shop floor, ensure availability of employees and their effective utilisation. Proper record keeping/ documentation of all activities is necessary. Logbooks and necessary checklists should be filled-up in a very precise manner. Temporary absence should be discouraged and should not be allowed as far as possible. Office Management skills should be learned by those who have to work in non-works area. Due care should be taken while interacting with external persons, agencies and organisations. Advice of seniors should be asked for in case of any ambiguity. A good image of the organisation is to be projected at work and outside.

d) Safety: Safety and systematic housekeeping are very important activities on the shopfloor. Safety consciousness should be there in the working environment. The frontline executives must be conversant with all safety rules, safety procedures and the guidelines for injury cases like injury on work, injury while coming/ returning from duty. The injured person should be given immediate medical attention and records should be prepared and maintained. He should come properly dressed to the site.

e) Shop floor Communication: Shop floor communication is very important, as all the workers will look towards the frontline executives for information and direction. He must be honest and trustworthy. He has to present the shopfloor facts to the Management in an objective manner without any bias or distortion. Verbal and body language should be good. Communication skills may be sharpened, if required.

f) Attendance, Leave and Out Pass System: Each Plant has Time Keeping System. It may be token system through Time Office, signing the attendance register, punching the attendance card etc. A frontline executive should get conversant with the prevalent Time Keeping System in the Plant/Unit. A frontline executive should be familiar with various types of leaves like Casual Leave (CL), Half Pay Leave (HPL), Earned Leave (EL), Commuted Leave, Extra Ordinary Leave (EOL), Quarantine leave and Restricted Holidays (RH). He must always plan his leave and of his subordinates so that the workflow doesn’t hamper. He must follow the principles of ‘No work – No pay’ and take actions to minimize the shift-change delays. Each Plant has got a different system of issuance of ‘Out-Pass and short leave pass’ and frontline executives must be conversant with the system.

g) Lateral Coordination: The frontline executives should constantly interact with his counter-parts in charge of different functional areas like Operations, Maintenance, Materials Procurement, Technical Services and Management Services etc., so that the tasks are performed in unison without any conflict.

h) Reward System: Each Plant has got a ‘Reward System’ for rewarding and recognizing good workers. The Quality Circles, Shop Improvement Groups are the various means to improve the performance in the shop. Even a pat on the back of the workers after successfully completing the job is highly motivating. They should always praise good work and congratulate the team for accomplishing the task.

i) Issue of Materials and Spares: As a frontline executive, it is his responsibility to optimally use the resources and he maintains good record of the issue/receipt of
materials and spares as per the Plant procedures. Misuse or wastage of materials should be prevented.

j) Grievance Management: The frontline executive has to play an important role in Management of Grievance of the subordinate employees. Many grievances are only perceived grievances and if the frontline executives patiently listen to the people, most of the grievances will be redressed. For genuine grievances, he can guide the employees to the agency concerned and for any clarification; he can also seek the same from different agencies on behalf of the employees.

k) Team Building: The Shift In-charge is the leader of the team. He has to lead the team from the front. He must lead by example of personal discipline, commitment, motivation and encourage the team to achieve greater heights. He should keep a watch on group behaviour of the employees and take steps to improve inter-personal relationship.

l) Non-Executive Promotion Policy: The frontline executives should be clear about the Non-Executive Promotion Policy in vogue in the respective Plant/Unit. He must make objective assessment of the performance of the subordinates while writing annual confidence character role (CCR). He must know the weightage given to different factors like attendance, devotion to duty, initiatives, job competence, capacity for given responsibilities, team spirit, cost and quality consciousness etc.

m) Energy & Health: The frontline executives should maintain good health, as a weak man can’t perform his duties properly or lead the people effectively. He must be the source of energy for the people working with him.

n) Empathy: This is a very important ability to get along with other people. He must remember the cardinal principle “Treat others as you would like others to treat you”. He should inculcate a sense of cooperation among employees and fellow workers.

o) Competence on the Job: The frontline executives should develop the competency on job by absorbing necessary knowledge, skills and a positive attitude towards the job. He must be competent so that he is able to coach his subordinates to do better in their jobs. Mistakes should not be repeated. PC skills and PC based Packages like MS Access, AutoCad, MS Projects and other functional/specialised programmes are to be learned by executives who are to use these softwares.

p) Self Control under Pressure: The frontline executives should develop ability to work under pressure. If people panic, then wrong decisions may be taken which can cause huge loss.

q) Dedication & Dependability: By his qualities and actions he must demonstrate his sincerity, dedication and devotion to duty.

r) Focus on Right Issues: The frontline executives should be able to prioritize and focus on important jobs, which will give maximum results to the organisation. He must have single-minded concentration on execution of the job, “Right First Time” attitude is important because it is the most cost effective way of doing the job.

s) Ability to Train Others: The frontline executives should have the ability to train others by demonstrating the right practices. Once he is perceived as a good coach, his respectability will grow multifold.
Problem Solving: The frontline executives should develop problem solving and diagnostic skills. He must be able to distinguish between symptoms and causes and he must always try to remove the root causes of the problem so that the problem doesn't occur again. Problems are to be solved in the best and most economical manner.

Role in Improving Quality: The frontline executives should have the ability to always do a quality job. He must practice Deming's Cycle of 'Plan-Do-Check-Act' (PDCA) to ensure continual improvement. Customer satisfaction should be the key principle. Appropriate ISO 9000 and ISO 14000 procedures are to be adhered to and followed.

Productivity: The frontline executives must be constantly on the look out on maintaining the equipment, making optimal use of material and enhancing productivity and also find out ways to minimize waste and enhance yield. Any non-value adding activity should be identified in consultation with the workers and managers and must be eliminated. A flair for creativity and innovation is also required to improve efficiency and make the work interesting.

Cost Reduction: If the frontline executives follow the Quality and Productivity route, it will be the best way to reduce cost and increase productivity.

Health of the Equipment: Front level executives are the custodians of the technological assets of the Company. He should not abuse the equipment and take care of the equipment by proper use and maintenance. He should remember RAM (Reliability, Availability and Maintainability) of the equipment always. Proper use, upkeep and maintenance of computer and peripherals are important.

Learning Attitude: The frontline executive should develop a learning attitude and learn from his experience and he can note down the important points in his diary, which will be source of reference in future.

Statutory Provisions and Standing Orders: The frontline executives must be familiar with Statutory Provisions of different Labour Laws like Factories Act 1948, Industrial Disputes Act, Workmen Compensation Act, Payment of Wages Act, Indian Mines Act, Contract Labour (R&A] Act 1970, Indian Electricity Act 1910, Environmental Protection Act, Indian Boilers Act 1923 etc. depending upon the area of working. The details will be understood while on the job. Standing Orders are the rules of an establishment with statutory force concerning the basic terms and conditions of employment of workmen. This Act applies to all industrial establishments employing 100 or more workmen. The frontline executives should be familiar with the Standing orders, which will help in smooth working in the shop floor.

Conclusion
These are not exhaustive but some of the guidelines which the frontline executives should make the best use to consolidate their knowledge and apply them to improve their effectiveness in the organisation. Continuous learning should be followed for self-development and organisation's growth.

Note: 'He' has been used in the write-up as the gender of frontline executives only for convenience but it applies to both Male and Female Frontline Executives.