INDUSTRY AND COMPANY AWARENESS

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STEEL AUTHORITY OF INDIA LIMITED

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Chapter -1
Global Steel Scenario & Indian Steel Industry

1.1 Introduction

Though Iron and steel have been used by men for almost 6000 years, yet the modern form of iron and steel industry came into being only during the 19th century. The growth and development of iron and steel industry in the world until the Second World War was comparatively slower. But the industry has grown very rapidly after the Second World War. World production of steel, which was only 28.3 million tonnes (MT) in 1900, rose to 695 MT by 1992. The oil crisis of the seventies affected the entire economy of the world including the steel industry. The position started improving after 1983 and peaked at 780 MT in 1989. World Steel production gained momentum due to rise in production and demand in Asia particularly in China and crossed the 1.5 Billion Ton mark in the year 2011. The rate of growth of steel production has come down significantly after 2011 and in the year 2016 the global crude steel production was 1628 MT with a marginal increase of 0.8% over that of 2015.

As per WSA report, Governments participating in the OECD Steel Committee consider excess capacity as being one of the main challenges facing the global steel sector today. (The Organisation for Economic Co-operation and Development is an intergovernmental economic organisation with 38 member countries). The latest available data suggest that global steelmaking capacity (in nominal crude terms) increased to 2.362.5 million metric tonnes in 2019 and by 1.5% from the levels of 2018. Global crude steelmaking capacity increased by 37.6 million metric tonnes (mmt), or 1.6%, in 2020 despite extremely weak market conditions. Over the past two years, global capacity has increased by a total of 73.7 mmt.

A key market development in 2020 was the increase in global steelmaking capacity, while production and demand for steel declined. Indeed, global steelmaking capacity rose to 2 452.7 mmt in 2020, while crude steel production declined to 1 829.1 mmt, with the gap between the two increasing to 624.9 mmt from 568.7 mmt in 2019 (Figure 3.A). Global steel production as a share of capacity declined from 76.5% in 2019 to 74.5% in 2020

Historical Background

There are evidences that man knew the use of iron since the ancient civilization of Babylon, Mexico, Egypt, China, India, Greece and Rome. Archeological findings in Mesopotamia and Egypt have proved that iron or steel has been in the service of mankind for nearly 6000 years. The origin of the methods used by early man for extracting iron from its ores is unknown.

In early days the product probably was so relatively soft and unpredictable, that bronze continued to be preferred for many tools and weapons. Eventually iron replaced the non-ferrous metal for these purposes when man learned how to master the difficult arts of smelting, forging, hardening and tempering iron.

Iron, in the beginning was smelted by charcoal made from wood. Later coal was discovered as a great source of heat. Subsequently, it was converted into coke, which was found to be ideal for smelting of iron. Iron kept its dominant place for 200 or more years after the Saugas works that was the first successful Iron Works in America founded in 1646. With the advance of Industrial Revolution, iron formed the rails for the newly invented railroad trains. It was also used to armour the sides of the fighting ships. About the mid-19th century the new age of steel began with the invention of Bessemer process (1856) making steel available in large quantities at reasonable cost.

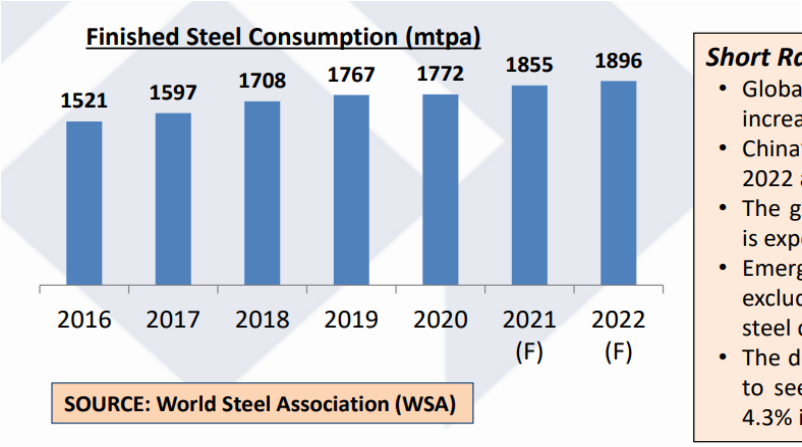
Indian History

Indian history is also replete with references to the usage of iron and steel. Some of the ancient monuments like the famous iron pillar near New Delhi or the massive beams used in the Sun Temple at Konark bear ample testimony to the technological excellence of the Indian metallurgists.

The history of iron in India goes back to the ancient era. Our ancient literary sources like Rig Veda, the Atharva Veda, the Puranas and other Epics are full of references to iron and to its uses in peace and war. According to one of the studies, iron has been produced in India for over 3000 years, in primitive, small scale facilities.

1.2 Global Scenario

According to the World Steel Association (worldsteel)'s Short Range Outlook released in June 2020, global steel consumption picked up by 3.4% in 2019. The largest increases were recorded in Viet Nam (9.0%), China (8.5%) and Russia (5.0%). The largest decreases were observed in Turkey (-15.4%) and Germany (-12.0%). Steel consumption growth turned negative in the first three months of 2020 due to the initial impact of COVID-19 on the global economy. Total steel consumption decreased by 2.4% in this period compared to the same period one year earlier, with the largest drop year-over-year being in March 2020 (-7.7%). Assessments of the impacts of COVID-19 on steel consumption suggest that the steel market could face a prolonged period of weak demand.



Short Range Outlook, October'21:

- Global steel demand is expected to increase by 2.2% in 2022.
- China's is set to see constant demand in 2022 as previous year.
- The global growth rate excluding China is expected to be 4.7% in 2022.
- Emerging and Developing Economies excluding China, are expected to see steel demand grow by 5% in 2022.
- The developed economies are expected to see growth in steel consumption at 4.3% in 2022.

In FY22 (till January), the production of crude steel and finished steel stood a 98.39 MT and 92.82 MT, respectively. According to CARE Ratings, crude steel production is expected to reach 112-114 MT (million tonnes), an increase of 8-9% YoY in FY22. The consumption of finished steel stood at 86.3 MT in FY22 (till January). Between April 2021-January 2022, the consumption of finished steel stood at 86.3 MT.The Government's National Steel Policy 2017 aims to increase the per capita steel consumption to 160 kgs by 2030-31.

Crude steel production 2021 (WSA)

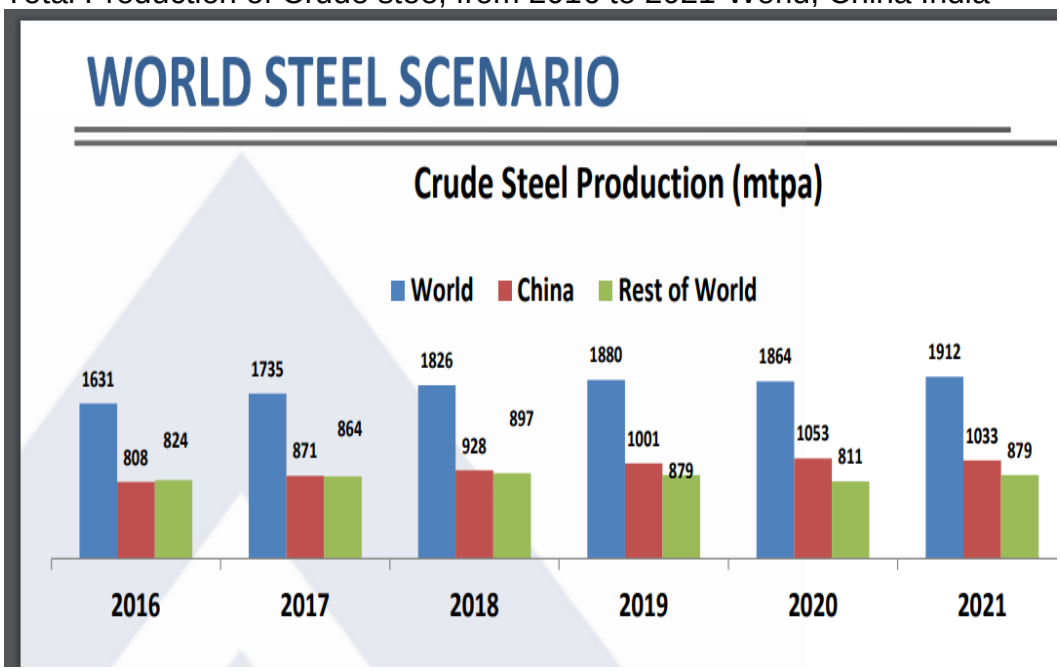
Total world crude steel production was 1,950.5 Mt in 2021, a 3.7% increase compared to 2020. India is the second largest producer of steel in the world. List of top ten producers of steel in the year 2021 is given below:

Table 2. Top 10 steel-producing countries

https://worldsteel.org/media-centre/press-releases/2022/december-2021-crude-steel-production-and-2021-global-totals/

Rank		2021	2020	%2021/2020
1	China	1 032.8	1 064.7	-3
2	India	118.1	100.3	17.8
3	Japan	96.3	83.2	15.8
4	United States	86	72.7	18.3
5	Russia (e)	76	71.6	6.1
6	South Korea	70.6	67.1	5.2
7	Turkey	40.4	35.8	12.7
8	Germany	40.1	35.7	12.3
9	Brazil	36	31.4	14.7
10	Iran (e)	28.5	29	-1.8

Total Production of Crude stee; from 2016 to 2021-World, China India



As the trend in the world is towards producing low cost steel by using more environmental friendly means, steel producers worldwide are adopting new technologies like Corex, EAF, Compact Strip Casting etc.

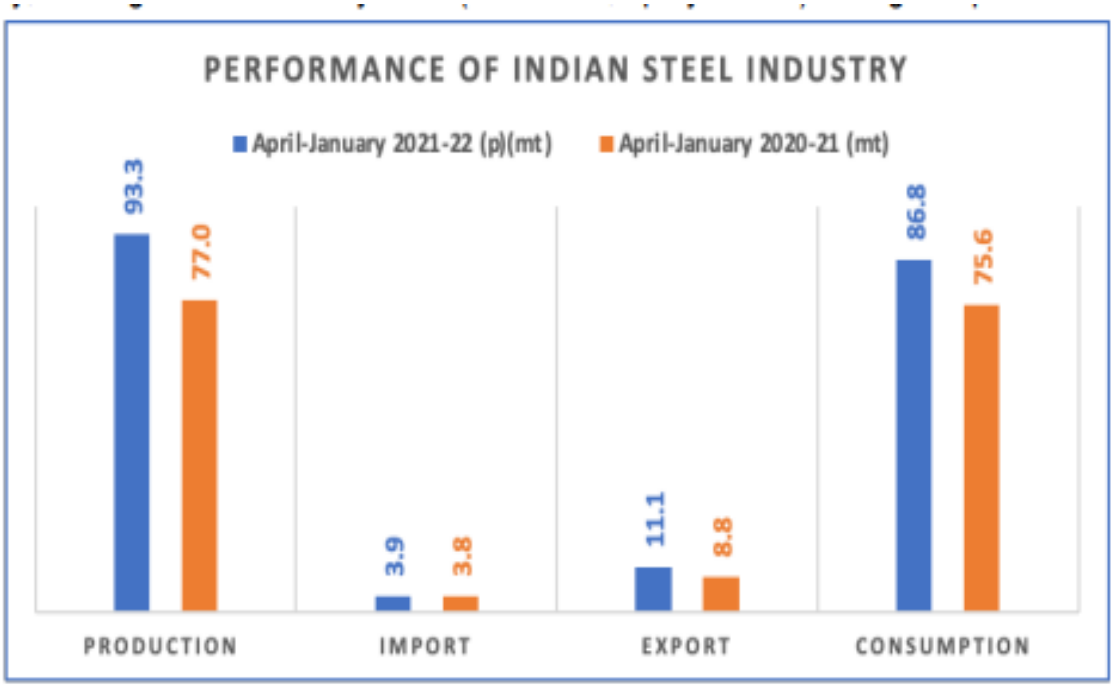
1.3 Growth of Indian Steel Sector

Steelmaking capacity in India has been expanding rapidly in recent years, and the country is now ranked second after China in terms of the size of its crude steelmaking capacity. Further growth is expected in the medium to long term.
India was the world's third-largest steel producer in 2016. The growth in the Indian steel sector has been driven by rising domestic demand for steel, low per capita steel consumption, domestic availability of raw materials such as iron ore and cost-effective labour. Consequently, the steel sector has been a major contributor to India's manufacturing output.

Market Size

As per the Trend Report February 2022 of JPC, At 93.271 mt, production of total finished steel was up by 21.1% in April-January 2021-22. At 86.829 mt, consumption of total finished steel was up by 14.9% in April-January 2021- 22.
Finished Steel Export trends:
Overall exports of total finished steel at 11.142 mt, up by 26.1%. • Volume wise, Non-alloy HR Coil/Strip (4.952 mt, down by 12.8%) was the item most exported (49% share in total non-alloy). • Vietnam (1.394 mt) was the largest export market for India.

Finished Steel Import trends:
Overall imports of total finished steel at 3.907 mt, up by 3.0%. • India was a net exporter of total finished steel in April-January 2021-22. • Volume wise, Non-alloy HR Coil/ Strip (0.682 mt, up by 6.4%) was the item most imported (28% share in total non-alloy). • Korea (1.676 mt) was the largest import market for India (43% share in total).



http://jpcindiansteel.nic.in/writereaddata/files/Trend%20Report%20February%202022.pdf

Investments

Steel industry and its associated mining and metallurgy sectors have seen a number of major investments and developments in the recent past. Government has taken various steps to boost the sector including the introduction of National Steel Policy 2017 and allowing 100% Foreign Direct Investment (FDI) in the steel sector under the automatic route. According to the data released by Department for Promotion of Industry and Internal Trade (DPIIT), between April 2000-December 2021, Indian metallurgical industries attracted FDI inflows of US$ 16.1 billion.

Ministry of Steel plans to invest US$ 70 million in the eastern region of the country through accelerated development of the sector.

The production capacity of SAIL is expected to increase from 13 MTPA to 50 MTPA in 2025 with total investment of US$ 24.88 billion.

In June 2021, Mr. T.V. Narendran, the newly elected CII president and MD of Tata Steel, in an interview with The Telegraph, stated that steel companies have firmed their plans to invest ~Rs. 60,000 crore (US$ 8.09 billion) over the next three years—this is was the biggest private sector investment plan announced in recent times.

Road ahead

India is the world's second largest producer of crude steel, moving up from the third position, as its steel making capacity is projected to increase to about 300 MT by 2025. Huge scope for growth is offered by India’s comparatively low per capita steel consumption and the expected rise in consumption due to increased infrastructure construction and the thriving automobile and railways sectors.

1.4 Outlook for Indian Economy

India has emerged as the fastest growing major economy in the world as per International Monetary Fund (IMF). India's economic growth slowed to 5.4 per cent in the third quarter of 2021-22 but higher than China's GDP expansion of 4 per cent during the same period and the country retained its position as the world's fastest growing major economy. The National Statistical Office (NSO) in its second advance estimates of national accounts pegged the country's growth for 2021-22 at 8.9 per cent, a tad lower than 9.2 per cent estimated in its first advance estimates

The improvement in India’s economic fundamentals has accelerated in the recent years due to impact of strong Government reforms. Among prominent revisions not due to the pandemic, India’s prospects for 2023 are marked up on expected improvements to credit growth—and, subsequently, investment and consumption—building on better-than-anticipated performance of the financial sector.

India has become the third-largest startup ecosystem in the world after the US and China, as per the Economic Survey 2021-22 . The Survey noted that the government recognised over 14,000 new startups in 2021-22 against 733 in 2016-17. With this, the total number of recognised startups in the country surpassed 61,400.

Recent Developments

With the improvement in the economic scenario, there have been various investments leading to increased Merger & Acquisition (M & A) activity. Mergers & acquisitions started off on a strong footing, hitting a four-year high at USD 30.3 billion in the first quarter of 2022, bucking the global trend where deal-making fell sharply. In volume terms, the M&A activity grew 29.6 per cent in the first quarter of 2021-22. The US was the most active foreign acquirer with USD 8.2 billion worth of deals, up 39 per cent a year ago and accounted for 70 per cent of market share in inbound M&As

1.5 National Steel Policy 2017

Steel is a product of large and technologically complex industry having strong forward and backward linkages in terms of material flows and income generation. It is also one of the most important products of the modern world and of strategic importance to any industrial nation. From construction, industrial machinery to consumer products, steel finds its way into a wide variety of applications. It is also an industry with diverse technologies based on the nature and extent of raw materials used.

In India, steel has an output multiplier effect of nearly 1.4 on GDP and employment multiplier factor of 6.8.

A vibrant Steel industry has historically been the foundation of a nation's rapid Industrial Development. On account of rapid industrial development, from a small capacity of 22 MT in FY 1991-92 prior to deregulation, India has become the 3rd largest steel producer in the world with a production of 90 MT and a capacity of 122 MT in FY 2015-16. Today, the Indian steel industry contributes approximately 2% to the country's GDP and employs about 5 lakh people directly and about 20 lakh people indirectly1. The National Steel Policy 2017 (NSP 2017) is an effort to steer the industry to achieve its full potential, enhance steel production with focus on high end value added steel while being globally competitive.

The National Steel Policy 2005 (NSP 2005) sought to indicate ways and means of consolidating the gains flowing out of the then economic order and charted out a road map for sustained and efficient growth of the Indian steel industry. However, the unfolded developments in India as also worldwide, both on the demand and supply sides of the steel market, have warranted a relook at the different elements of the NSP 2005.

India's competitive advantage in steel production is driven, to a large extent, from the indigenous availability of high grade iron ore and non-coking coal – the two critical inputs of steel production. In addition, it also has a vast and rapidly growing market for steel, strong MSME sector and a relatively young work force with competitive labour costs.

Driven by the positive demand outlook and prevailing high prices of steel in the period post 2004, the Indian steel sector witnessed a wave of investments in the states of Odisha, Jharkhand, Karnataka and Chhattisgarh. Substantial new capacity was created and existing plants were modernized. A significant portion of these investments were funded by banks and other forms of borrowings.

India became the 3rd largest producer of steel in 2015 and is now well on track to emerge as the 2nd largest producer after China. There is significant potential for growth given the low per capita steel consumption of 61Kg in India, as compared to world average of 208 Kg. Indian economy is rapidly growing with enormous focus on infrastructure and construction sector. Several initiatives mainly, affordable housing, expansion of railway networks, development of domestic shipbuilding industry, opening

up of defence sector for private participation, and the anticipated growth in the automobile sector, are expected to create significant demand for steel in the country. Further, while the main focus of the industry is on the domestic market, being in close vicinity of the developed west and developing east, provides it a strategic location that augurs well for the industry seeking opportunities for exports of finished goods and imports of some scarcely available raw materials.

The Indian steel industry is structured in between three broad categories based on route wise production viz. BFBOF, EAF and IF. BF-BOF route producers have large integrated steel making facilities which utilize iron ore and coking coal for production of steel. Unlike other large steel producers, the Indian steel industry is also characterized by the presence of a large number of small steel producers who utilize sponge iron, melting scrap and non-coking coal (EAF/IF route) for steelmaking. As on March 2016, there were 308 sponge iron producers that use iron ore/ pellets and non-coking coal/gas providing feedstock for steel production; 47 electric arc furnaces & 1128 induction furnaces that use sponge iron and/or melting scrap to produce semi-finished steel and 1392 re-rollers that rolls out semi-finished steel into finished steel products for consumer end use.

Over the past two decades, the Indian steel industry has developed capabilities of producing a wide range of value added steel at par with global best practices addressing diverse needs of the end user industries. However, India still needs to make a special effort to domestically produce number of value added products like automotive steel for high end applications, electrical steel (CRGO), special steel and alloys for Power equipment, Aerospace, Defense and Nuclear applications.

However, the Indian steel sector is disadvantaged due to limited availability of some of the essential raw material such as high grade lumpy Manganese ore & Chromite, coking coal, steel grade limestone, refractory raw material, Nickel, Ferrous Scrap etc. Due to shortage of domestic coking coal, both in terms of quantity and quality, pig iron producers/ BF operators in India have to significantly depend on import of coking coal.

In the recent past, multiple issues have also adversely impacted the steel sector, viz. cancellations of iron ore and coal mine allocations, delays in land acquisition, environmental clearances, which led to many of the projects facing significant cost and time overruns. Additionally, companies also faced substantially increased operating costs on account of increased logistics & raw material costs and other charges.

Post 2011, global prices of steel began to decline, marking the beginning of a down turn in the global steel industry triggered by slowdown in global demand and over capacities in a number of countries including China. By July 2015, prices had fallen by 50% compared to January 2011 - their lowest in decades, as cheap imports flooded world steel markets. This significant structural asymmetry between demand and supply also affected large number of Indian companies leading to surge in imports resulting in weak pricing conditions, low profitability, lower capacity utilization and even closure of capacities in some cases.

In the new environment, the industry has to be steered with appropriate policy support to ensure that production of steel matches the anticipated pace of growth in consumption. Special emphasis is needed to ensure that the industry follows a sustainable path of development in respect of environmental friendliness, mineral conservation, quality of steel products, use of technology and indigenous R&D efforts to ensure that the country can, over time, reach global efficiency benchmarks to become a world leader in steel production technology, as well as in production of high end steel.

NSP 2017 – Vision, Mission & Objectives

Vision: To create a technologically advanced and globally competitive steel industry that promotes economic growth.

Mission: Provide environment for attaining –
i. Self-sufficiency in steel production by providing policy support & guidance to private manufacturers, MSME steel producers, CPSEs & encourage adequate capacity additions.
ii. Development of globally competitive steel manufacturing capabilities
iii. Cost-efficient production and domestic availability of iron ore, coking coal and natural gas
iv. Facilitate investment in overseas asset acquisitions of raw materials.
v. Enhance domestic steel demand.

Objectives: The National Steel Policy aims at achieving the following objectives –
i. Build a globally competitive industry
ii. Increase per Capita Steel Consumption to 160 Kgs by 2030-31
iii. To domestically meet entire demand of high grade automotive steel, electrical steel, special steels and alloys for strategic applications by 2030-31
iv. Increase domestic availability of washed coking coal so as to reduce import dependence on coking coal from ~85% to ~65% by 2030-31
v. To have a wider presence globally in value added/ high grade steel
vi. Encourage industry to be a world leader in energy efficient steel production in an environmentally sustainable manner.
vii. Establish domestic industry as a cost-effective and quality steel producer
viii. Attain global standards in Industrial Safety and Health
ix. To substantially reduce the carbon foot-print of the steel industry

The current context and the long term perspectives on growth

The domestic demand backed growth of the Indian economy and consequently the steel consuming sectors has been a key trait of Indian steel industry. The decade before the liberalization of the Indian steel industry in 1991 witnessed growth in crude steel production at a CAGR of 5.2%. Post liberalization, witnessed a decadal CAGR of 6.1% which accelerated to 8.3% during 2000-01 to 2015-16. However, today the steel industry in India faces challenging external conditions manifest in slow economic growth and idle steel capacity globally. With weak global economic prospects, the

Indian steel industry will have to strongly depend on the growth of domestic consumption for its future.

The Policy

NSP 2017 covers the following policy areas –

a. Steel Demand
b. Steel Capacity
c. Raw Materials
d. Land, Water and Power
e. Infrastructure & Logistics
f. Product Quality
g. Technological Efficiency
h. MSME Sector
i. Value Addition in Stainless Steel
j. Value Addition in Alloy & Special Steel
k. Environment Management
l. Safety
m. Trade
n. Financial Risks
o. Role of CPSEs & Way Forward
p. Focus on High-End Research: Steel Research & Technology Mission of India

Steel Demand

In 2015, India was the only large economy in the world where steel demand continued to demonstrate positive growth at 5.3 %, as against negative growth in China -5.4%, and Japan -7.0%. India's growing urban infrastructure and manufacturing sectors indicate that demand is likely to remain robust in the years ahead. If India is to achieve the goal of being a "developed nation", the steel industry must play a crucial role as has been the case with all the major developed countries and East Asian countries like Japan, South Korea and China.

Notwithstanding the current challenges, Indian steel industry still has significant potential for growth, underscored by the fact that the per capita steel consumption in the country at 61 kg (incl. rural consumption at 10 kg) is much lower than the global average of 208 kg. Going forward, the accelerated spend in infrastructure sector, expansion of railways network, development of domestic shipbuilding industry, opening up of defence sector for private participation, anticipated growth in automobile and capital goods industry and the construction in urban & rural areas, are expected to create significant demand for steel in the country.

Growth in steel consumption in a country is typically linked to the economic growth and steel intensity. While growth in GDP is a crucial determinant of growth in overall consumption, steel intensity is the definitive parameter for an economy and determines the growth rate of steel demand vis-à-vis consumption over time.

It is expected that at the current rate of GDP growth, the steel demand will grow threefold in next 15 years to reach a demand of 230 MT by 2030-31**.** However, even with this demand of finished steel by 2030-31, India's per capita consumption would reach only to 158 Kgs, lower than the current global average of 208 kg.

Creation of steel demand in the country is one of the major task to be undertaken in this direction. To drive steel demand, Ministry has identified construction and manufacturing sectors like Rural development, Urban infrastructure, Roads & Highways, Railways etc. to be the key focus areas and will take necessary steps to achieve the same through following –

Steel structures are highly cost effective and have shorter lead time for erection and have greater durability with high design comfort. Hence usage of steel needs to be encouraged in all buildings and structures. Efforts will be made to emphasize the lower lifecycle costing while evaluating projects rather than looking at just the upfront cost in isolation, which would encourage greater usage of steel in Government as well as the private sector.

The Government has chalked out an extremely ambitious plan of Housing for all by 2022 as well as schemes such as Pradhan Mantri Awas Yojna, Saansad Adarsh Gram Yojna etc. These provide a huge opportunity for use of steel intensive structures and designs, usage of pre-fabricated and precast steel structures, etc. Hence, Ministry will take all necessary measures to promote the increased usage of steel intensive structures/designs under these schemes.

Commercial, Residential buildings and flyovers also provides immense opportunities. Necessary efforts will be made in conjunction with Ministry of Road, Transport & Highways to evaluate the replacement benefits of the existing bridges, pavements and crash barriers used in Roads & Highways and consider for projects in steel bridges, steel reinforced pavements and steel crash barriers respectively.

Usage of steel in railways is limited to laying of railway tracks, rolling stocks, wagons, platforms and coaches. Efforts will be made to increase the steel usage in making railway station, foot over bridges, rail coaches, construction of steel based railway colony buildings especially in seismic prone areas, construction of dedicated freight corridors & superfast rail corridors and construction of more steel bridges for saving time & capital expenditure.

The **"Make in India"** initiative is expected to witness significant investments in Construction, Infrastructure, Automobile, Shipbuilding and Power sectors, which will stimulate steel demand. Hence, efforts will be made to pass on such benefit to the domestic steel producers. Use of cost efficient and competitive **'Indian Made steel'** will pave the way for infrastructure development and construction activities in the country.

Steel Capacity

It is anticipated that a crude steel capacity of 300 MT will be required by 2030-31, based on the demand projections as mentioned above. However, achieving crude steel capacity up to 300 MT will require extensive mobilization of natural resources, finances, manpower and infrastructure including land.

Considering the competitive advantage of steel production in India, the country also has the potential to export sufficient quantities of steel and become a major player in the global market, thus mitigating the foreign exchange risk emanating out of the exposure of the industry to the global raw materials market especially for coking coal.

BF-BOF route is expected to contribute about 60 - 65% of the crude steel capacity & production with remaining 35 – 40% by EAF & IF route in 2030-31.

Demand for pig iron for merchant use, such as for castings and supplementary metallic in the electric arc or induction furnaces, is projected to increase to 17 MT by 2030-31. Similarly, demand for sponge iron is projected to increase to 80 MT by 2030-31. It is projected that the sponge iron capacity may increase to 114 MT2 by 2030-31 with around 30% share of gas based capacities under increased environmental considerations and long term availability of gas.

Creation of additional capacity for fulfilling the anticipated demand will require significant capital investment of about Rs. 10 lakh Crore by 2030-31 and will also generate significant employment in the range of 36 Lakhs by 2030-31 from the current level of 25 Lakhs depending on degree of automation resulting from adoption of different technologies.

In order to ensure optimal growth of the industry and to avoid situations of over or under capacity, the Ministry will work with all the stakeholders to monitor investments in the steel industry on a continuous basis and will also facilitate setting up of SPVs in mineral rich states of Odisha, Chhattisgarh, Jharkhand and Karnataka.

Establishment of steel plants along the coast under the aegis of Sagarmala project will be undertaken. Such plants would be based on the idea of importing scarce raw materials and exporting steel products. The Ministry will also promote cluster based approach particularly in MSME steel sector with common infrastructure on consortium approach for optimum land use, easy availability of raw materials and economies of scale.

Necessary policy environment will also be provided to promote gas based steel plants, electric steelmaking, auxiliary fuel injection in blast furnace and other technologies which will bring down usage of coking coal in steel production. Efforts will also be made to facilitate alternate route for steelmaking using indigenous coal with increased focus on improving energy efficiency and reducing GHG emissions.

Induction Furnace route of steelmaking has a number of advantages for India, namely, no requirement of coking coal, lower capital cost and smaller land requirement. This route of steelmaking is however hampered in terms of its refining capabilities. Hence, appropriate efforts will be made to promote development of consistent & cost-effective refining methods in order to produce high quality steel.

Raw Materials

Availability of raw materials at competitive rates is imperative for the growth of the steel industry.

The government has already come up with Mines and Minerals (Development and Regulation) Amendment Act, 2015 which gives greater emphasis on time bound mine development and increased stress on mineral exploration and sustainable mining operations. The Act has brought clarity on mine allocation process (through auction) and procedure for mining lease renewal and provides for reservation of any particular mine for a particular end use and put conditions permitting auction among such eligible end users.

As and when mining leases expires, suitable efforts will be made in conjunction with Ministry of Mines to facilitate auction of mineral blocks in a regular manner. Ministry will also facilitate to develop robust plans to guide future leases for start of mineral production in time bound manner in order to ensure adequate availability of iron ore.

Utilization of low grade fines lying at mine sites of captive iron ore miners will be promoted and any regulatory changes that may be required will be evaluated in conjunction with concerned ministries. Beneficiation and agglomeration industries would be strengthened through suitable support.

Transportation of iron ore fines to pelletisation units will be targeted through slurry pipelines and conveyors as it will reduce pollution and de-congest transportation infrastructure in mining areas. To encourage this 2 Projection of Sponge Iron Capacity represent the mean value based on the premise that 60-65 % of steel production in 2030-31 shall be coming through BF-BOF route and rest through EAF/IF route.

To ensure long term supply of iron ore, intensive & deeper exploration would be promoted to augment
resource base. Eco-friendly viable underground mining technique for optimal utilization of magnetite ore deposits locked in Western Ghats would also be explored in conjunction with mining research institutes.

In order to develop a strategic footprint in the global natural resource industry, acquisition of mineral assets overseas will also be facilitated through bilateral talks with the prospective nations. Steel sector players will be encouraged to acquire and develop global projects individually or on partnership basis.

Ministry of Steel in conjunction with Ministry of Mines, will facilitate creation of a uniform country-wide sales platform for bringing transparency and predictability in the process of sale of iron ore.

Iron Ore Pellets

During mechanized mining, 60 to 70% output is generated as fines below 10 mm size. Fines are also generated during transportation and handling. To economically utilize these fines, suitable agglomeration process is necessary for converting them into sinters or pellets.

Till the recent past, domestic steel industry was mainly using higher grades of iron ore and a higher proportion of lumps due to their easy accessibility and availability. However, there is a pressing need to utilize low grade iron ores including slimes and dump fines which are stockpiled at different mine heads.

Hence, optimal use of existing low grade iron ore resources with special emphasis on conservation of high grade ores will be encouraged. As of 2015-16, there exists pelletisation capacity of about 85 MT with a capacity utilization 32.5%. Impetus will be given to **Pellet industry** as it helps in mineral conservation by acting as direct feedstock in Blast Furnace in place of high grade iron ore.

Coking Coal & Non-Coking Coal

About 85% of the coking coal requirement of the domestic steel industry is presently being met through imports. Ministry of Steel will coordinate with Ministry of Coal to increase availability of coking coal through **overseas asset acquisition** and will also ensure that **sufficient number of modern coking coal Washeries get established**. Suitable fiscal measures will also be taken to support the rising requirement in the steel sector.

Furthermore, deliberations will be held with Ministry of Coal to persuade CIL to create special coal linkage e-auction window for steel players to ensure supply of coal to steel sector. Ministry of Steel will also facilitate periodic auction of coking coal blocks as it will encourage the steel industry to develop its own dedicated coking coal mines.

Efforts will also be made to facilitate allocation of indigenous coking coal reserves in the country exclusively to steel sector with no diversion of such coal to any other sector.

To ensure long term availability of coking coal, Ministry of Steel in conjunction with Ministry of Coal will facilitate exploration & optimal utilization of deep seated coking coal reserves. Efforts will also be made to expeditiously implement Jharia Action Plan to improve the domestic availability of coking coal.

Integrated steel plants will also be pursued to reduce their coking coal consumption at par with global best practices by resorting to auxiliary fuel injection technologies like

Pulverized Coal Injections (PCI)/ Cold Dust Injection (CDI) or natural gas/ syngas injection along with PCI/ CDI.

Natural Gas

Under the Paris Treaty (COP 21), India intends to reduce the emission intensity of its GDP by 33-35% by 2030 from 2005 levels. In order to achieve this target, India needs to find energy efficient resources that are affordable and also available. Natural Gas is one such greener alternatives available.

Given the future potential of gas based technology, in terms of up-gradation of coal based DRI capacities in the MSME sector to gas based route, need for captive gas based power plants for the sector and the alternative of injecting natural gas in blast furnace to reduce dependence on imported metallurgical coal (both coking and PCI), ensuring firm supply of natural gas is imperative to boost the confidence and investment in the gas based steelmaking technology.

In case of gas based steel plants which have been stranded due to lack of supply of natural gas from domestic sources, options will be evaluated in coordination with Ministry of Petroleum and Natural Gas for restoration of domestic gas supply to steel sector. Efforts will also be made to remove the cascading effect of anomalies in the tax structure.

To ensure long term availability of natural gas, Ministry of Petroleum & Natural Gas will be approached to explore new reserves of natural gas. The technology of coal gasification to produce syngas for subsequent usage in DRI plants would also be encouraged.

Limestone, Manganese Ore and Chromite Ore

Ministry will suitably facilitate the increased exploration efforts to raise resources of limestone, manganese and chromite ore in the country. In the case of steel grade limestone, high grade low phosphorus manganese ore and high grade chromite lumpy ore, the steel industry is likely to remain dependent on imports. Suitable measures will be taken to encourage imports of these materials since they are available in limited quantities. Ministry will also facilitate in exploring the possibility of optimally utilizing the high grade limestone available in Himachal Pradesh and Rajasthan in an environmentally sustainable manner. The industry will also be encouraged to acquire such assets globally to maintain a steady supply of these materials to the growing industry. Necessary efforts will be made for greater exploration of manganese and chromite ore.

Ferro-Alloys

Ferro-alloy is a power intensive industry. Hence, captive power generation in the ferro-alloys plants will be extensively supported. Since the demand for ferro-alloys is likely to grow along with steel production in the country, the industry may be encouraged to set

up larger units to achieve adequate economies of scale. Efforts will be made to provide necessary raw materials linkages and stable supply of power to grow Ferro-alloys units on priority.

Refractory Raw Material

India is not endowed with high quality reserves of key refractory raw materials viz. bauxite (refractory grade) and magnesite and is largely dependent on imports. Suitable measures and procedural simplifications will be done to support the rising requirement of refractories in the steel sector.

Geologically, fire clay, an important raw material for making refractories, exists concurrently with coal deposits. However, there have been difficulties in full utilization of the domestic resources found alongside coal deposits. The potential of fire clay extraction will be examined in order to raise supplies of the same to the domestic industries.

Nickel

Nickel has been under constant demand from the ferro-alloys and alloy / stainless steel industry. Nickel is practically unavailable in the country and the entire quantity of unwrought and other forms of the nickel needs to be imported. Hence, the industry may be encouraged to acquire such assets globally to maintain a steady supply to the industry. Simultaneously, R&D will be pursued to extract Nickel from the lateritic ore overburden available in Sukinda Valley, Orissa.

Ferrous Scrap

In order to promote use of scrap based steelmaking technologies inter-alia to reduce GHG emission intensity in the country, actions will be initiated to increase availability of ferrous scrap. Options will also be evaluated in coordination with other concerned ministries to develop a scrap segregation (quality-wise), collection, processing and recycling policy.

In order to ensure availability of sufficient quantities of good quality scrap, establishment of an organized and environment friendly steel scrap processing units within the country will be facilitated by promoting modern steel shredding plants.

In order to promote increased use of scrap based steel-making in the country, efforts will be made in coordination with Ministry of Power to ensure availability of electricity to the sector.

Land, Water & Power

The growth plans of the Indian steel industry have also been hindered by difficulties in land acquisition. Many projects have stuck due to delays in acquisition of adequate land at the preferred locations due to policy and procedural issues. In order to reach

crude steel capacity of about 300 MT, additional land requirement is estimated to be ~91,000 acres considering green field expansion. To help in early implementation of projects, Ministry will coordinate with respective State Governments to ensure timely availability of litigation-free lands to the industries.

The formation of steel clusters (especially for MSME steel units), service centers and steel processing centers will be facilitated. Creation of related common infrastructure on partnership basis will be promoted to optimize land use. Small and medium steel enterprises, including FDI projects, will be encouraged to be set up in industrial corridors and in clusters under PPP (Public Private Partnership) to ease land acquisition.

It has been observed that the water allocation for steel industry is generally accorded low priority. But it is forecast that by 2030-31, the steel industry will annually require approximately 1500 million cu. meter of water.

Keeping this in view, the Ministry will coordinate with respective State governments to allocate water to steel projects on priority basis. Water conservation at all levels will be encouraged and the industry's efforts will be supported.

Considering the importance of water as a scarce resource, there has been a major thrust by the Government on reduction of discharge from the steel plants which will require innovative solutions and techniques to effectively recycle treated waste water. Hence, the steel industry will be encouraged to pursue plans and strategies to reduce specific water consumption per tonne of steel produced.

Since steel is an energy intensive industry, Ministry will focus on availability of power to steel making facilities. The power required by the industry is estimated to increase to 27,717 MW by 2030-31. Post de-allocation of coal blocks, various units in steel sector, especially the sponge iron plants, have been procuring power at high cost. Ministry of Steel will deliberate with Ministry of Power to make power available to such units through open access.

Ministry of Steel will facilitate the use of waste heat recovery in Steel plants in consultation with other ministries. Efforts will also be made to facilitate usage of captive power for MSME sector and remove the cascading effect of anomalies in the tax structure.

In view of impending growth scenario in steel sector, Ministry of Steel will facilitate mechanism of Special Purpose Vehicles (SPVs) for Greenfield capacity additions. Steel SPV would acquire the land, get the necessary statutory approvals, water linkage and iron ore linkage and develop the minimum necessary infrastructure for setting up of steel plants. The Steel SPV would thereafter be put to open bidding in a transparent manner for setting up of the steel plant by interested parties. Similarly, the mining SPV will provide long term iron ore linkage to the Steel SPV.

Infrastructure & Logistics

Since bulk of the capacity additions are likely to come up in the three eastern states of Odisha, Chhattisgarh and Jharkhand, Ministry of Steel will pursue for the adequate and timely infrastructure growth in these regions to address the increased industry requirement in areas such as **railways, roadways, power generation and distribution etc**.
With the increase in steel demand and production, the requirement of adequate infrastructure will further
increase. Government will need to invest heavily in development of **evacuation infrastructure** to minimize turn-around-time as well as to build the necessary linkages to reduce the length of haulage. Ministry of Steel will also encourage steel players to **promote better plant layout design, engineering, technologies and optimum use of economic capacity**.

With plans to have large number of blast furnaces in future, the use of pellets shall also increase, requiring grinding of ores/fines to ultra-fine size, hence **increased investment in slurry pipelines**. This will be encouraged through suitable policy support from the government.

Alternative modes for transportation of raw materials such as **slurry pipelines and conveyors** will go a long way in reducing the problems of pollution and congested transportation network in the mining areas. To encourage environment friendly transportation of raw material, efforts will be made to accord all the benefits available to the infrastructure industries, to slurry pipelines also.

Transportation of raw materials and finished goods through **inland waterways and coastal shipping** will also be promoted. Necessary efforts will be made in conjunction with Inland Waterways Authority of India along with other concerned ministries to facilitate debottlenecking of inland waterways transportation through dredging, modernization of jetties, simplifying the approval process for environmental clearances & coastal regulation zone (CRZ) clearances, improved connectivity with road through dedicated corridors and rail etc.

To encourage export opportunities and be competitive, the Government of India is contemplating **port-led development of steel clusters under the aegis of Sagarmala program**. Establishment of coast based steel plants will suitably be undertaken in conjunction with Ministry of Shipping.

Given the expected growth in demand in steel production and the corresponding requirement for raw materials, the port infrastructure in the country, especially at coking coal importing ports needs to be significantly strengthened. Such ports will be identified in conjunction with the steel industry and would be taken up with Ministry of Shipping to ensure uninterrupted supply of coking coal to steel industry.

Product Quality

Bureau of Indian Standards (BIS), has formulated a large number of Indian Standards for most of the iron and steel products produced in the country. Actual implementation of these standards by the industry is however limited, resulting in large scale production, imports and use of sub-standard material, putting infrastructure and public safety at risk.

Quality Control Order: Adoption of the standards by producers and users will be facilitated and mandatory quality certification will be ensured. Recently the Steel and Steel Products (Quality Control) Order and Stainless Steel (Quality Control) Order that mandates Bureau of Indian Standards certification for certain products was introduced. The implementation of this order will be closely monitored in conjunction with Bureau of Indian Standards. Thirty Three (33) steel products have already been notified under the mandatory quality certification mark scheme of BIS. Efforts will be made to bring in additional steel products, which are used in critical endues applications, under the mandatory scheme to ensure protection of human health, environment, and safety.

MSME sector units, particularly the small re-rolling mills and Induction Furnace Units lack in-house quality testing facilities. Quality testing facilities would be set up in steel hubs and already established facilities would be further strengthened to cater to possible rise in demand.

Apart from the adherence to conditions under Steel and Steel Products (Quality Control) Order, Ministry of Steel is also facilitating the production of quality steel, particularly in MSME sector by carrying out R&D and technological interventions and providing financial assistance. More steps in this direction will be encouraged.

Technological Efficiency

Though the choice of technology will be determined by entrepreneurs based on techno-economic considerations, Ministry of Steel would encourage adoption of technologies, which:

- Are conducive to effective & efficient utilization of domestic resources with minimum damage to environment and production of high-end and special steel required for sophisticated industrial and scientific applications.

Minimize environmental damage at various stages of steel making.

Optimize resource utilization and facilitate modernization of the steel industry so as to achieve global standards of productivity and efficiency.

Led to the development of front end and strategic steel based materials. Improving the techno-economic performance of steel units is crucial to improving competitiveness of the industry. Ministry of Steel, in association with suitable agency, will constantly monitor techno-economic performance of all the steel plants within the country vis-à-vis

the global best practices. Furthermore, increased use of prepared burden in charge mix and greater use of PCI in blast furnaces will also be promoted.

Steel companies will be encouraged to have strategic joint ventures for production and development of technologically more advanced products. Transfer of technology for production of Automotive Steel and other special steels including Product Development/ Acquisition of Technology for Boiler Quality Plates and Alloy Steel Tube Material, Electrical Steel will be facilitated.

Ministry will encourage the research institutes within the country to develop less resource intensive and less energy intensive steelmaking technologies as well as new products.

MSME Steel Sector

India over the years has developed a strong MSME sector (comprising of DRI-EAF/IF route based steel
producers and rolling mills) which is unique to India. It embodies the entrepreneurial and innovative strengths of Indian steel industry which turned the unavailability of coking coal – a key input for BF-BOF route into an opportunity.

However, there exists large variations amongst various units in terms of scale of operations, product-mix and technology. The MSME sector, including sponge iron industry, plays an important role in providing employment, meeting demand of some special products required in small volumes and local demand of steel in hinterlands. Apart from this, the sector is also highly export oriented which helps in earning foreign exchange for the country.

Various measures as mentioned below will be taken to improve the performance of MSME steel sector and sponge iron industry- Availability of raw materials will be ensured by facilitating auction of non-coking coal exclusively for steel/ sponge iron sector and increasing the iron ore availability in the domestic market.

Adoption of energy efficient technologies in the MSME steel sector will be encouraged to improve the overall productivity & reduce energy intensity.

Small and medium iron and steel making units will be encouraged to be set up in the proposed industrial corridors and clusters for optimal utilization of land and reach economies of scale.

Value addition in Stainless Steel

Though India is 3rd largest producer of steel globally, it is still a net importer of stainless steel used in high-end applications. With increased demand of steel and need to build 200 MTPA additional capacity by 2030-31, considerable capacity addition of stainless will also be required. Like most segments of the Indian steel sector, stainless steel industry has also been facing difficulty over the last 3-4 years. Today, the

domestic stainless steel industry has a low capacity utilization of around 50% due to the surge in low priced imports and fall in prices.

Hence, necessary efforts will be made to protect the existing & upcoming stainless steel facilities from unfair trade practices through suitable trade remedial measures.

Besides, price consideration, import of stainless steel takes place on quality considerations. Country is dependent on import of most of the super duplex, super austenitic and high alloyed varieties of stainless steel for stringent end use applications. Ministry will encourage steel producers to have strategic ventures in production and development of technologically more complex products including high end varieties of stainless steel.

To counter threats from competing materials, promotion of stainless steel through mass campaigns, particularly in rural areas will be encouraged. Greater use of stainless steel in residential or commercial constructions in coastal and earthquake prone areas of the country will also be promoted. Use of high quality stainless steel in drinking water pipelines, water storage, packaging of food grains etc. will be promoted to prevent intake of hazardous impurities.

Value addition in Alloy & Special Steel

While large varieties of value added steel products are now being produced indigenously but the country is still dependent on import of several high performance & value added steel products like electrical steel, automotive grade steel and steels for specialized use in defence, space and nuclear applications.

With better demand prospects and mega expansion plans in the pipeline, there is a need to sharpen the focus on alloy & special steels as it guarantees better premium to both steel makers and consumers. These products are mainly finished steel and are termed so depending on their treatment or their end use in automobile and consumer durable sectors. Hence, necessary efforts will be made to collaborate with foreign players for technical and strategic cooperation for this purpose.

For the past couple of years, demand for alloy & special steel, or value-added steel, with superior quality to meet stringent application norms of various market segments, has been growing. Future growth of Indian steel makers will also be driven by these value-added products. Production of these premium grade products will not only help them improve realizations but will also add to the topline growth of steelmakers.

Ministry will encourage steel producers to have strategic ventures in production and development of these technologically more complex products including high end varieties of alloy steel and electrical steel.

Environment Management

While steel companies are themselves addressing the energy & environment issues in the plants through technological upgradation/ modernisation, and/or diffusion of energy

efficient & environment friendly technologies in the plants, Ministry will facilitate improvement in the energy & environment scenario of steel plants through various forums/ mechanisms.

Ministry will facilitate the formation of a forum to chalk out best practices and promote policies and programs that encourage and expedite the transition to a clean energy economy. Apart from the adherence to these stringent energy efficiency parameters, steel companies will also be encouraged to adopt best available technologies & practices to provide clean & green environment.

Energy & Environment management is an on-going process and is directly related to the technologies adopted by the iron & steel plants. So far, Ministry has successfully implemented certain mechanisms such as NEDO model projects in CPSEs and UNDP-AUSAID-MOS steel project in steel re-rolling mills to facilitate improvement in energy efficiency. Efforts will further be made to scale up these mechanisms with enlarged coverage in steel re-rolling mills and induction furnace units.

Considering all waste materials as an economic asset, Ministry will encourage the steel companies to develop a Waste Management Plan for additional impetus on zero-waste or complete waste recycling. Concrete efforts will further be made by Ministry to promote use of iron & steel slag in alternate uses like road making, rail ballast, construction material, soil conditioner etc. Simultaneously, steel plants will be pursued to set up SMS slag weathering/ steam ageing plants to enable them to supply processed/ sized SMS slag for road making, rail ballast etc.

Ministry of Steel will also facilitate the formulation and adoption of standards at par with global best practices with regard to particulate matter emissions, SOx & NOx, water consumption and zero or near zero liquid discharge.

India has recently signed Paris Declaration (COP 21) under which intends to reduce the emission intensity of its GDP by 33-35% by 2030 from 2005 levels. Towards this end, Ministry of Steel has already submitted the Intended Nationally Determined Contributions (INDC) for reducing GHG emissions in iron & steel sector which inter-alia projects CO2 emission of 2.2 – 2.4 tonnes per tonne of crude steel in BF-BOF route and 2.6 – 2.7 tonnes per tonne of crude steel in DRI-EAF route by the terminal year of 2030. Ministry will find ways and means in consultations with industry to achieve aforesaid standards at par with the global best practices to the extent possible.

Capacity additions through coal based routes will have far reaching implications for India in terms of environmental degradation. Hence, necessary efforts will be made to have a judicious mix of production routes to reduce the carbon footprint of steel sector in line with the INDC targets.

Safety

Ministry of Steel will continuously monitor the safety performance of all its steel companies including those in private sector through periodic reviews. Necessary

efforts will be made to encourage the development of clearly defined safety standards and goals to become a zero accident workplace.

Ministry of Steel will coordinate with steel companies to ensure that on the job trainings on maintaining a safe workplace are provided to employees of the steel companies. Small sized units which cannot afford to conduct such trainings on their own will be facilitated by Steel Research and Technology Mission of India (SRTMI) for organizing the same

Trade

India was a net exporter of steel in 2013-14. However, due to global downturn in steel demand and excess capacities in major steelmaking countries such as China and Japan, India witnessed a significant surge in imports in 2014-15, which continued in 2015-16 as well.

Given the cyclical nature of steel industry, there would be situations of unfair trade practices in the future also. To prevent occurrence of the same, Government will continue to be vigilant and will intervene in the market as and when required with suitable trade remedial measures in line with WTO guidelines and/or India's Foreign Trade Policy to protect the interests of the domestic producers.

Steel industry will be encouraged to be competitive and to develop a global presence, not just in base grades of steel, but also in high quality steel, which are currently produced by selected few international steel companies. Ministry of Steel will also deliberate with Ministry of Commerce to ensure that export production is zero rated with regard to various central & state taxes and levies.

In addition, certain trade restrictions have been imposed on Indian steel products by other countries. Hence, domestic steel industry will be encouraged to convey their grievances during trade remedial proceedings with those countries.

Considering the importance of information in today's world, the existing institutions such as Joint Plant Committee (JPC) and the Economic Research Unit (ERU) will be further strengthened to meet the requirement of industry and market information related to steel and its raw materials. Continuous strategic research in the steel and related areas, constant tracking of developments in global trade, global investment in the steel industry, emerging technologies in steel & its related areas and data on new mining assets in iron ore, coal, etc. in foreign countries will also be supported. Continuous research on international and domestic steel demand will also be encouraged and risks of investments in foreign countries in steel and related industries will be continuously assessed.

Financial Risks

Given the enormity of requirement of financial resources to add the required steel capacity and the current conditions of steel industry, mobilizing adequate capital for the

industry will be a challenging task in future. Hence, the steel industry will be encouraged to reduce capital costs and remain innovative in developing appropriate structure of the capital to minimize debt and service equity.

Ministry of Steel will also make necessary efforts to identify bad debts in the steel sector. Such companies will be encouraged to lower their Debt/EBITDA ratio by adopting appropriate debt restructuring in consultation with banks as per the RBI guidelines.

Role of CPSEs and Way Forward

The Companies Act, 2013 was enacted on 29th August 2013 replacing the Companies Act, 1956. In addition, the Ministry of Corporate Affairs has also notified Companies Rules 2014 on Management and Administration (March 2015), Appointment and Qualification of Directors (January 2015), Meeting of Board and its powers (March 2015) and Accounts (October 2014). The Companies Act 2013 together with the Companies Rules provide a robust framework for corporate governance. These statutory provisions are also applicable to CPSEs.

In the current scenario, steelmaking CPSEs need to not only compete with private integrated steel players and cater to the requirements of the MSME steel sector but are also required to be globally competitive. In order to provide economies of scale, CPSEs will be encouraged to increase focus on their core competencies and divest their non-core assets through mergers and restructuring.

As of now, CPSEs have primarily focused and invested more in brown-field expansion of similar steel capacity with limited value addition in terms of high end product development. Ministry will encourage the CPSEs to develop a policy for future investment, so that impetus could be given for development of value added steel capacity and adoption of latest technologies at par with global best practices.

Besides, the CPSEs will also be encouraged to take leadership role in development of steel industry & the community, adopt a more inclusive business model, increase their CSR spends, invest in R&D for indigenous design & engineering and product development for replacement of import. Further, CPSEs will also be encouraged to take lead in promoting steel usage through developing steel intensive structural designs for roads, railways, bridges, crash barriers etc. with proper technical consultations and setting up of service centers for more customized and de-centralized product delivery.

Further to encourage synergy across similar CPSEs, efforts will be made to ensure appointment of independent directors across similar / independent CPSEs.

Focus on High - End Research: Steel Research & Technology Mission of India (SRTMI)

In India, substantial R&D in Iron and Steel sector is currently being carried out by the leading steel companies like SAIL, Tata Steel, JSW Steel, etc. who have accomplished

some significant work in the areas of raw material beneficiation, agglomeration and product development. However, in general, major focus of R&D is limited to day to day operations and hence, lacks disruptive innovation.

India's R&D investment in steel sector is limited not only in absolute terms but also as percentage of turnover which is 0.05 – 0.5% as against 1% in leading steel companies abroad. The Indian steel companies need to evolve a time bound action plan to enhance their R&D expenditure to at least 1% of the turnover.

Efforts will be made through joint collaborative R&D programmes to create manufacturing capabilities for development of process and products in synergy with natural resources of the country with an aim to minimize damage to the environment.

Ministry of Steel has taken full cognizance of the technological scenario in Indian Steel Industry and has initiated a fresh move for preparation of a comprehensive blue print for promotion of R&D in Iron & steel Sector. To bring in all the stake-holders into one platform and promote steel research on themes of critical and vital national importance, an institutional platform called **"Steel Research and Technology Mission of India"** has been established with an objective to spearhead R&D of national importance in iron & steel, creating state-of-art facilities to conduct cutting-edge research, develop expertise & skill development, manage human resources and bolster a tripartite synergy amongst industry, national R&D laboratories and academic institutes.

In order to boost innovation in the steel sector (future technologies), a time bound action plan will be evolved under the aegis of SRTMI to enhance the R&D expenditure of Indian steel CPSEs. The Ministry through SRTMI will also encourage corporates in steel sector, private and public sector alike, to direct certain sums from their profits towards continuous industry collaborative research. Apart, they would also be encouraged to set up their own steel technology centres and steel sector oriented research and education wings at universities in order to focus on technology based solutions for development of high quality, low cost steel products and to build greater interface between academia, R&D institutions and industry.

Product development is yet another challenge faced by the Indian steel industry which has given rise to import of most of the value added products like automotive steel for high end applications, electrical steel like CRGO & amorphous steel as well as special steel and alloys for the Power Equipment, Aerospace, Defense and Nuclear applications. Production of these value added, front end, and strategic products will be facilitated through acquisition of foreign technology by setting up of joint ventures, or subsidiaries of foreign companies or by indigenous development. Measures will also be taken to ensure development of all such special steel and alloys to minimize import dependence.

Indian steel industry is currently importing technology & critical equipment and systems for steel plants. Hence, necessary efforts will be made under the aegis of SRTMI to raise the level of R&D and acquire best in class manufacturing capabilities to develop all these equipment and systems.

CPSEs will be encouraged to reduce manpower and overhead expenses based on domestic and peer group benchmarking. Besides, the CPSEs will also be encouraged to right size their manpower over time through Superannuation/ Separation/ intakes in conformance with technological advances and suitably exercise the option of Voluntary Retirement Scheme (VRS) to improve labour productivity.

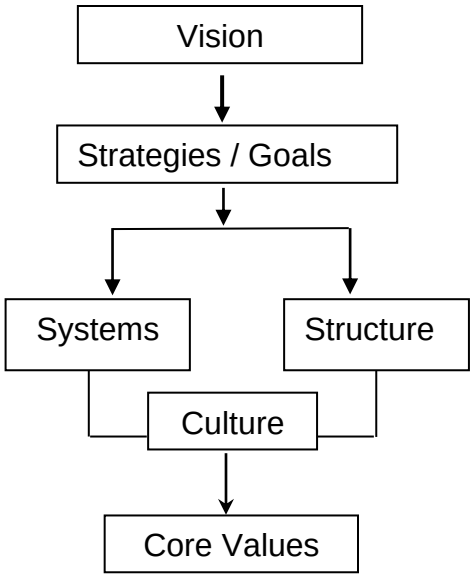
As a part of skill development initiative, the Ministry will coordinate with the technical institutes under its aegis and INSDAG to re-align the education system to attract, facilitate and generate steel domain experts.

Chapter – 2

Vision, Culture and Core Values

2.1 Introduction

In an organization Mission/Vision leads to strategies. The long-term strategy leads to systems and structures. The right system and structure is driven by culture. For work culture to be conducive each member in the organization should have similar values and exhibit norms of behaviour in line with culture and values.



SAIL Vision

To be a respected world-class Corporation and the leader in Indian steel business in quality, productivity, profitability and

Vision depicts the aspirations of an organization and gives substance to its existence. It defines boundaries for action and sets strategic direction for the organization. It can be compared to a beacon, functioning like a lighthouse for a ship.

It is a distant goal that is always a challenge as the marketplace place throws up new and tougher challenges in the form of better technology, products and increased competition. The vision is never static and continuous focus on this long term aspect should be the focus of any organization that desires to excel.

The Customer is seen to provide context for all our endeavors. The vision of SAIL has been evolved with this reality in mind. SAIL Vision was articulated in the Directors' Workshop at Jodhpur. The SAIL Vision takes into account the realities of the environment and the core concern of the organization.

Vision 2030: Long term strategic plan to steer the company towards a target of 50 million tonnes of hot metal production, thereby meeting the strategic objectives of

maintaining leadership position in Indian steel sector and a position amongst the top steel companies globally.

2.2 Culture

In the most general sense, “Culture” could mean a ‘way of life’. Organization culture refers to the traditions, attitudes, beliefs and practices followed in an organization by the constituent members as an acquired habit. However, culture by itself cannot be observed. It can only be reflected in the observed behaviour of the employees : behaviour towards co-workers, towards customers, towards outsiders and most importantly towards ones’ job.

For an organization to have a distinct culture, it is necessary that members of the organization behave in a given way in response to various stimuli every time. Culture of an organization is a consistent behaviour pattern that the employees imbibe as a part of their routine and which is consistent with a majority of the people at all times. Organization culture develops over a period of time and does not change overnight. It is a reflection of the observed attitude, values, norms, beliefs and responses by influential levels of the organization.

SAIL is committed to inculcate and sustain a culture of creativity, involvement and innovativeness among employees to tap their creative potential. SAIL is also committed to building lasting relationships not only with employees but with all stakeholders for maximizing mutual benefit for sustained business while upholding the highest ethical standards. SAIL is committed to making a meaningful difference in the peoples’ lives.

One should remember that in the final reckoning, it is the customer and not the employee alone who will measure customer satisfaction. It is important to undertake periodic reviews of the prevailing culture to ensure congruence between the existing culture and the requirements of the business environment. It may, therefore, be necessary to define and then cultivate a desired culture.

2.3 Core Values

Consistent with Company’s vision, goals and strategies, SAIL adopted the following four Core Values in 1995:

1. Customer Satisfaction
2. Concern for People
3. Consistent Profitability
4. Commitment to excellence

The meaning, rational and thrust of each of these Core Values is presented here.

Customer Satisfaction: Customer comes first every time.

Customer satisfaction is the first priority of every employee and the purpose of every job. We do not compromise this value because we believe that this alone can enable us to achieve the vision of attaining market leadership.

Concern for People: Talent of our people is our greatest asset.

We believe that developing competence and commitment of our people for enhancing their contribution, is important for achieving customer satisfaction, and thereby the prosperity of the company and of the employees.

Consistent Profitability: Consistent profitability is essential for growth.
We believe that consistent and significant profitability must be essential outcome of all our activities. This is necessary for modernization, growth and market leadership.

Commitment to Excellence: SAIL does it better.
We are committed to harnessing the full potential of all our resources, through creativity, continuous improvements and teamwork. We *believe* that this is important for making SAIL the best organization so that our customers, employees and shareholders have a sense of pride.

Norms of Behaviour
The behaviour of everyone should reflect priority to the Core Value of customer satisfaction in relation to all other Core Values. Since our vision is to achieve market leadership through customer satisfaction, it is critical to establish and nourish all those behaviour, which we directly or indirectly contribute towards enhancing level of satisfaction of our customers on a continuing basis.

Some examples of core values are given below:

(a) Customer Satisfaction
  (i) Order booking should be communicated to Production Planning and Control (PPC) on the same day by the marketing branches.
  (ii) The PPC should start with quality and delivery commitment to customer.

(b) Concern for People
  (i) Concern for safety and health of our employees and quality of their work-life should always guide all our decisions and actions.
  (ii) Every manager must communicate core-values both by words and actions behavioral deviations reflecting non-adherence to Core Values must be discouraged.

(c) Consistent Profitability
  (i) We must continuously innovate methods to reduce costs in order to attain higher profitability.
  (ii) We must use all resources optimally and avoid the tendency of asking and giving more resources.

(d) Commitment to Excellence
  (i) Rated capacity should be considered the minimum benchmark rather than the maximum limit.

Besides measuring performance against past performance level and the target, Performance should also be evaluated against the potential to ensure 100 % achievement of potential in due courses.

Chapter – 3

SAIL: An Overview

3.1 Formation and Growth of Hindustan Steel Limited (1959-1973)

When the Government of India decided to enter into the field of Iron and 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.

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 form 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.

3.2 Formation of Steel Authority of India Limited (SAIL)

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.

3.3 Present Status of SAIL

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.
Three special steel plants at Bhadravati, Durgapur and Salem produce a wide range of special steels, special alloy steels and stainless steel.
Chandrapur Ferro Alloy Plant, (CFP) erstwhile Maharashtra Elektrosmelt Ltd. (MEL) has become a Unit of SAIL w.e.f. 12/7/2011. Chandrapur Ferro Alloy Plant is the only Public Sector Unit engaged in production of Manganese based 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 over 62,000 as on 1.4.2022. During FY21-22, the company has clocked its best-ever performance in production and sales while achieving an all-time high revenue from operation of Rs.1,03,473 Crore and EBITDA of Rs.22,364 crore. .

3.4 Expansion & Modernisation of SAIL:

Steel Authority of India Limited (SAIL) has undertaken Modernisation & Expansion of its integrated steel plants at Bhilai, Bokaro, Rourkela, Durgapur &Burnpur and special steel plant at Salem including raw material resources and other related facilities. The Expansion Plan of SAIL, besides capacity enhancement, adequately addresses the need of SAIL Plants towards eliminating technological obsolescence, energy savings, enriching product mix, pollution control, developing mines & collieries to meet higher requirement of key inputs, introduce customer centric processes and have matching infrastructure facilities in the Plant to support higher production volumes.

The Modernisation & Expansion Plan envisages increase in capacity of hot metal, crude steel & saleable steel as follows:

(Million Tonnes)

Items	Capacity Before Expansion	Capacity after Expansion
Hot Metal	16.58	23.50
Crude Steel	15.22	21.40
Saleable Steel	14.60	20.20

(December 2021)

Under the Modernisation &Expansion Plan of SAIL, new large size Blast Furnaces (>4000 m3), new state-of-the-art Rolling Mills such as Universal Rail Mill and Bar & Rod Mill at Bhilai Steel Plant, 4.3m wide Plate Mill at Rourkela, Universal Section Mill and Wire Rod & Bar Mill at IISCO Steel Plant, Medium Structural Millat Durgapur and Cold Rolling Mill with coupled pickling line & tandem cold Mill at Bokaro Steel Plant have been installed.

The Modernisation and Expansion at Rourkela, Burnpur, Durgapur, Bokaro and Salem Steel Plants has been completed and various facilities are under operation, stabilization & ramp up.

Technological Shift

Technology	Before Expansion	After Expansion
BOF Steel Making	79%	100%
CC Route	71%	94%
Pelletisation Plant	No	Yes
Coke Dry Quenching	Partial	Yes
Top Pressure Recovery Turbine	No	Yes
Auxiliary Fuel Injection in BF	Partial Coverage	Full Coverage
Desulphurization of Hot Metal	Partly	100 %
Beam Blank Casting	No	Yes
Coupled Pickling & Tandem Mill	No	Yes
Beneficiation Plant	Partial	Full

Upto December 2021

3.5 Different Plants & Units of SAIL

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. The production capacity of Hot Metal, Crude Steel & Saleable Steel after completion of Modernisation & Expansion Programme (MEP Plant/unit wise) is as under:

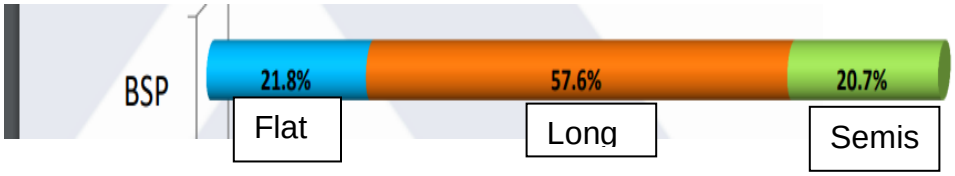
Hot Metal – 7.5 MT (Million Tonnes)

Crude Steel – 7 MT

Saleable Steel – 6.56 MT

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, heavy structurals, merchant products and wire rods. Almost all units in this integrated steel plant are armed with ISO: 9001 Certification. Plate Mill and Dalli Mechanised Mine of Bhilai Steel Plant have received the ISO: 14000 Certification for its Environment Management System. The Plant is also accredited with SA: 8000 certification for social accountability and the OHSAS-18001 certification for Occupational Health & Safety.

Product Mix:



Product Mix
Semis
Rails & Structural
Merchant products
Wire & Bar rods
Plates

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, Aktiengeselischaft, 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 profuse Continuous Casting route since 1998.

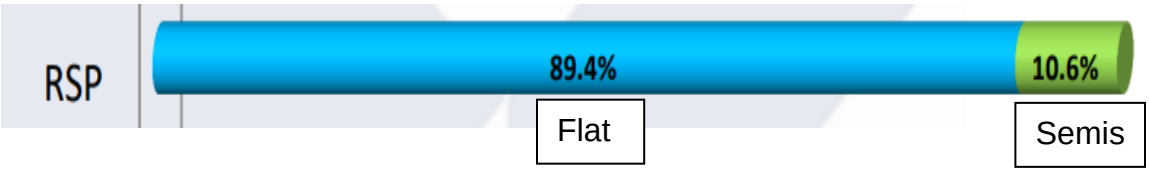
RSP is the only Plant having Pipe Plants. The Plant has undergone modernization upgradation in two phase involving around Rs.500 crores. The modernization process of RSP started in 1988. The Phase-I of modernization completed in 1994 and Phase-II modernization completed in 1997-98. After modernization, 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 Melting Shop-II, Tonnage Oxygen Plant-II etc. 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.

Production capacity (In Million Tonnes Per Annum)

	Pre-Expansion	Post-Expansion
Hot Metal	2	4.5
Crude Steel	1.9	4.2
Saleable Steel	1.67	3.9

Product Mix:



PRODUCT-MIX RSP
Plate Mill Plates
HR Plates
HR Coils
ERW Pipes
SW Pipes
CR Sheets & Coils
Galvanized Sheets (GP& GC)
Silicon Steel Sheets

Durgapur Steel Plant (DSP)

Durgapur Steel Plant (DSP) set up in late fifties is a leading producer of long products and is the pioneer in manufacturing and supply of forged Railway Wheels & Axles in the country. DSP started production with an initial crude steel capacity of 1 MPTA (million ton per annum) in 1959, which has been progressively increased to 1.8 MTPA during the modernization in nineties and further to 2.2 MTPA during recently completed Modernization & Expansion Plan (MEP). The present Plant capacity is given below.

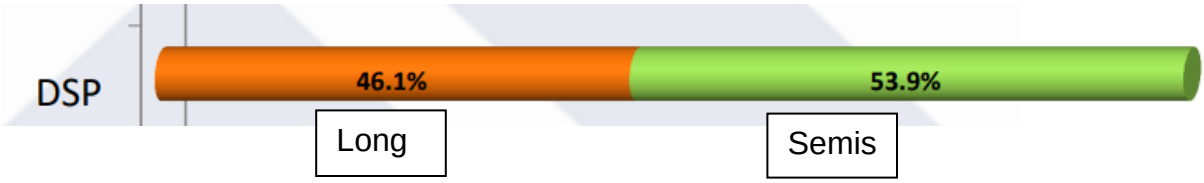
	Hot Metal	Crude Steel	Saleable Steel
Capacity (MTPA)	**2.40**	**2.20**	**2.12**

Unique feature of this plant is its Wheel & Axle Plant for making forged wheels and axles catering to Indian Railways. Wheels are tested in International Test House and found of higher standard. Over the years plant has developed various types of wheels as per need of Railways.

DSP's management systems are accredited with ISO 9001 standard for quality, ISO 14001 standard for Environment, ISO 50001 for Energy, ISO 27001 for Information Security,ISO 45001 for occupational health & safety and SA 8000:2014 for Social Accountability. Products from DSP's state of the art MSM has been accredited with stringent CE marking certificate to promote their export.

Situated at a distance of 158 km from Calcutta, its geographical location is defined as 230 27' North and 880 29' East. It is situated on the banks of the Damodar river. The Grand Trunk Road and the main Calcutta-Delhi railway line pass through Durgapur.

Product Mix:



Product-mix
Merchant products
Structural
Wheels and Axles
Semis

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 form 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.

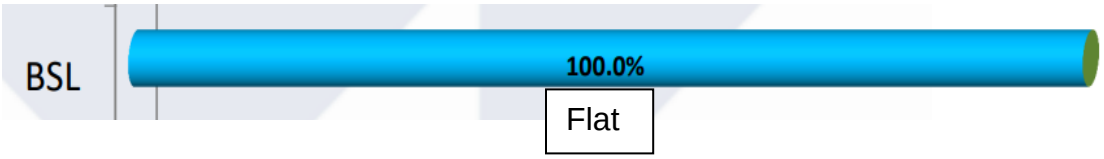
The Plant is hailed as the country's first Swadeshi Steel Plant, built with maximum indigenous content in terms of equipment, material and know-how. Its first Blast Furnace started on 2nd October 1972 and the first phase of 1.7 MT Ingot steel was completed on 26th February 1978 with the commissioning of the third Blast Furnace. All units of 4 MT stage have already been commissioned and the modernisation taken subsequently has further upgraded this to 4.65 MT of liquid steel.

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.

Bokaro is designed to produce flat products like Hot Rolled Coils, Hot Rolled Plates, Hot Rolled Sheets, Cold Rolled Coils, Cold Rolled Sheets, Tin Mill Black Plates (TMBP) and Galvanised Plain and Corrugated (GP/GC) Sheets. Bokaro has provided a strong raw material base for a variety of modern engineering industries including automobile, pipe and tube, LPG cylinder, barrel and drum producing industries.

Product Mix:



Product-mix
HR Coils
HR Plates and HR Sheets
CR Coils and Sheets

IISCO Steel Plant (ISP), Burnpur

ISCO held the proud distinction of being the owner of India's "oldest unit producing pig iron by modern methods" at Kulti on the banks of river Barakar near Hirapur. An open-top blast furnace set up in 1870 by a company known as Bengal Iron Works Co. (BIW) founded by James Erskine pioneered production of iron in India in 1875. The same unit at Kulti also pioneered steel production in India through small open-hearth furnaces in 1904-06. BIW was absorbed by IISCO in 1936 and steel making started as a regular measure in 1939. Another company named Steel Corporation of Bengal (SCOB), incorporated in 1937, was also amalgamated with IISCO in 1952. SCOB's Napuria Works and IISCO's Hirapur Works in unison came to be known as the Burnpur Works of IISCO. The Burnpur Works underwent two overlapping expansion in 1953 and 1955, increasing its production capacity to 1 million tonnes of ingot steel and 0.8 million tonnes of saleable steel.

As the flagship business enterprise of Martin Burn House, IISCO had acquired iron ore mines at Gua and Chiria in what is today's Jharkhand state and collieries in Chasnalla and Jitpur (also in Jharkhand) and Ramnagore (in Bengal). These captive sources of high quality raw materials gave IISCO a major competitive edge and enabled it to establish a prestigious reputation in domestic and foreign markets. It also became the first Indian blue chip company to have its shares traded at the London Stock Exchange. The Burnpur Works of IISCO reached its pinnacle of performance during the 1960s and produced more than a million tonnes of ingot steel.

Despite growth plans, however, a combination of factors drove the company into stagnation and decline, resulting in lack of investment for technology upgradation to meet emerging market competition. IISCO was nationalised in 1972 and became a wholly-owned subsidiary of SAIL in 1979. The Indian Iron & Steel Company (IISCO), a SAIL subsidiary, was amalgamated with SAIL on 16th February 2006 and renamed IISCO Steel Plant (ISP). This full-fledged integrated steel plant is one of India's oldest. Established as an industrial enterprise in 1918, IISCO produced iron from an open-top blast furnace at Hirapur (later to be called Burnpur) in West Bengal for the first time in 1922. The plant was progressively upgraded to a capacity for production of 4.26 lakh tonnes of saleable steel and 2.54 lakh tonnes of pig iron annually.

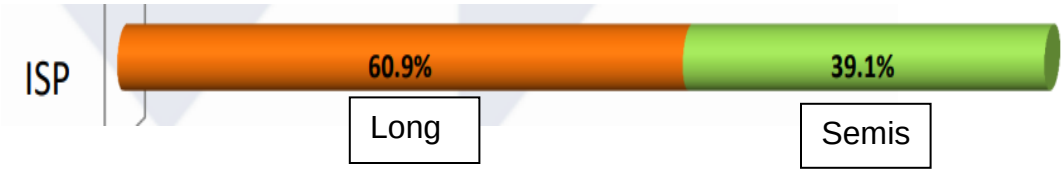
Situated at a distance of about 200 kms from Kolkata in Burnpur on the banks of the perennial Damodar river in West Bengal, ISP is well connected by both South Eastern and Eastern Railways and National Highway 2. Its proximity to Kolkata and Haldia ports is an additional strength.

After undergoing a modernisation-cum-expansion programme, the crude steel capacity of the plant has been raised to 2.5 million tonnes per year. The facilities have been designed to produce best quality product with minimal environmental impact. The facilities include:

UNIT	FACILITY	ANNUAL PROD. CAPACITY
Coke Oven Battery	7 m tall x 74 ovens	0.88 MT gross coke
Sinter Plant	2 x 204 m2	3.88 MT gross sinter
Blast Furnace	1 x 4161 m3	2.70 MT hot metal
Basic Oxygen Furnace	3 x 150 tonne	2.50 MT crude steel
Billet Caster	2 x 6 strand	1.67 MT
Beam Blank Caster	1 x 4 strand	0.83 MT
Universal Section Mill	-	0.85 MT
Bar Mill	-	0.90 MT
Wire Rod Mill	-	0.55 MT

The plant manufactures a range of products, over some of which it holds exclusive market dominance. Iron & steel produced by it has been acknowledged as being of the finest quality.

Product Mix:



Product-mix
Wire Rod, TMT, Re-bar
Structurals
Semis for sale

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 9001 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.

Product Mix

ASP has a diverse product portfolio of over 400 grades catering to critical end-use by strategic sectors like, Defence, Railways, Automobiles, Power Plants, Heavy Engineering & Manufacturing Industries, including Steel Plants.

ASP's product basket includes Carbon Constructional Steels, Alloy Constructional Steels (Ni bearing, Cr-Mo bearing & Cr-Ni-Mo bearing), Case Hardening Steels, Die Blocks, Creep Resistant Steels, Spring Steels & High Mn Steels (Hadfield). ASP manufactures high impact resistant steels (armour grade steels) for Defence application and special steels for Naval application. ASP also manufactures Stainless Steels (Austenitic, Ferritic & Martensitic), including colouring of stainless steel plates for decorative applications.

ASP’s value added products includes Working Rolls like CRM ,Tandem, Reversing, Silicon Mill Rolls, Table rollers, Foot rollers, Cladded Rollers, Guide Rollers, Ring

rollers, Concast segment rollers, Crane wheels, Wheels for slag cars,/ladle cars/transfer cars ,Wheel-Axle assemblies, Peel Heads, Beater Arm, Beater Head, Pull rods, Toothed Casings & bushes, Vertical/floating /Pinion shafts, Bearing Housings, Grate bars, Hammers, Pinion/Gears, Couplings, Springs, Shear Blades, Liners of (Hadfield Manganese Steel) and many more for sister units and private customers.

Salem Steel Plant (SSP)

Salem Steel Plant (SSP), is a premier producer of international quality stainless steel in India. Commissioned in 1981, Salem Steel Plant, a special steels unit of Steel Authority of India Ltd, pioneered the supply of wider width stainless steel sheets / coils in India. The plant can produce austenitic, ferritic, martensitic & low-nickel stainless steel in the form of coils & sheets with an installed capacity of 70,000 tonnes / year in Cold Rolling Mill & 3,64,000 tonnes / year in Hot Rolling Mill. Its steel melting shop can produce 1,80,000 tonnes of slabs per annum.In addition, the plant has country's first top-of-the-line stainless steel blanking facility with a capacity of 3,600 tonnes / year of coin blanks & utility blanks / circles.

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.

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 sub-pantries 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.

Facilities added: •Steel melting Shop – Electric Arc Furnace (55 T); AOD Converter (60 T); Ladle Furnace (60 T); Single Strand Slab Caster. • Roll Grinder for Hot Rolling Mill • Cold Rolling Mill Complex

Production (MTPA) :

Crude Steel: Actual(20-21) 10.0 and After Expansion 0.26 18
Saleable Steel Actual (20-21) and After Expansion 0.26 0.34

Visvesvaraya Iron & Steel Plant (VISP)

Visvesvaraya Iron and Steel Plant (VISL) is a pioneer in production of high quality alloy & 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, ingot teeming, continuous casting, 1600 Tonnes-hydraulic-high-speed forging press, a fully automatic horizontal long forging machine with high programmable Logic Controller system for a semi-automatic and automatic mode of operation. VISL has an installed capacity of 2,16,000 tonnes of hot metal and 98,280 tonnes of alloy & special steels.

VISL has received the ISO / TS 16949 certificate for steel production through rolled and forged routes and pig iron production.

Chandrapur Ferro Alloy Plant (CFP)

Chandrapur Ferro Alloy Plant, (CFP) erstwhile Maharashtra Elektrosmelt Ltd. (MEL) has became a Unit of SAIL w.e.f. 12/7/2011. Chandrapur Ferro Alloy Plant is the only Public Sector Unit engaged in production of Manganese based Ferro Alloys in the Country.

CFP has an installed capacity of 1,00,000 TPY Ferro Manganese. The product range of CFP includes High Carbon Ferro Manganese, Silico Manganese and Medium/Low Carbon Ferro Manganese. The Plant is accredited with Quality Assurance Certificate ISO 9001:2008. CFP's major production facilities include two nos. of 33 MVA Submerged Electric Arc Furnaces for the production of ferro alloys, two nos. Manganese Ore Sintering Plants, Furnace gas based Power Plant, Mechanized Crushing and Screening System for Ferro Alloys and 1 MVA Electric Arc Furnace for the production of MC/LC Ferro Manganese with Lime Calcination and Manganese Ore Roasting Unit.

SAIL Refractory Unit (SRU)

The erstwhile Bharat Refractory Limited (BRL) has been merged with SAIL with effect from April 2007. Following merger it has now been renamed as SAIL Refractory Unit (SRU). It caters to the refractory needs of all SAIL Plants. Main objectives of SRU are:

- To meet refractory requirement of SAIL Units qualitatively, quantitatively and with timely delivery.
- Continuous up-gradation of quality to achieve longer life and enhance equipment availability.
- Innovation in collaboration with RDCIS to meet tailor made requirement of SAIL units.

SRU has four production units, out of which three are situated in Jharkhand and one in Chhatisgarh. The units at Jharkhand include Bhandaridah with a production capacity of 26,000 tons of Tap Hole Mass for Blast Furnace, various Castables and Fire Clay

Bricks, Ranchi Road (50kms from Bokaro) with a production capacity of 7,500 tons of Basic Masses and Magnesia carbon Bricks and IFICO, Ramgarh with a production capacity of 42,000 tons of Slide Gate Plate, different types of Castables and High Alumina Bricks. The unit at Chhattisgarh is situated in Bhilai is engaged in producing the entire range of basic and silica refractories. It also carries out calcination of lime in its high capacity rotary kiln, which is further used by Bhilai Steel Plant for iron & steel production.

Captive Mines

SAIL has the second largest mining outfit in the country after Coal India Ltd. Spread over the mineral rich states of Jharkhand, Odisha and Madhya Pradesh, 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.

Name of mines of BSL/RSP/BSP

BSL	1 Kiriburu Iron Ore Mine 2 Meghahatuburu Iron Ore Mine 3 Gua Ore Mine 4 Manoharpur Ore Mine 5 Bhawanathpur Limestone Mine 6 Tulsidamar Dolomite Mine
RSP	1. Ramnagar Colliery 2. Chasnala Colliery 3. Jitpur Colliery 4. Bolani Ores Mines 5. Barsua Iron Mine 6. Kalta Iron Mine 7. Taldih Iron Mine
BSP	1. Dalli Rajhara Mines 2. Nandini Limestone Mine 3. Hirri Dolomite Mine 4. Mahamaya Iron Ore Mine 5. Kuteshwar Mines

Central Coal Supply Organisation (CCSO)

Central Coal Supply Organization (CCSO), a unit of SAIL, is situated in Dhanbad District of Jharkhand and has branch offices at Kolkata, Asansol, Adra and Bilaspur.

CCSO with its skilled man-power looks after the daily movement of Indigenous washed coking coal and boiler coal to SAIL steel plants; BSP, RSP, DSP, BSL and ISP by continuous follow up and liaison with the CIL subsidiaries such as Bharat Coking Coal Limited (BCCL), Dhanbad, Central Coalfields Limited(CCL), Ranchi, Western Coalfields Limited (WCL), Nagpur, Eastern Coalfields Limited (ECL), Sanctoria (W.B), South Eastern Coalfields Limited (SECL), Bilaspur, Mahanadi Coalfields Limited (MCL), Sambalpur (Orissa) and different Railway Zones.

The major functions of CCSO are as follows-

- Actual assessment of quality of coking coal at loading points by proper sampling and analysis.
- Monitor the loading and weighment of coal rakes to minimize the transit loss.
- Linkage of raw coal from BCCL and CCL to TATA and Chasnalla washeries for enhancing washed coal.
- Finalization of long term and short term MoU with the coal companies.
- Centralized payment and settlement with the coal companies.
- Study of different coking coal with Central Mines and Fuel Research Institute (CMIFR), Digwadih and RDCIS, Ranchi for its usage.

Central Marketing Organisation (CMO)

SAIL's marketing set-up, the ISO 9001 certified Central Marketing Organisation, is India's largest industrial marketing set-up. CMO is primarily responsible for marketing of carbon, alloy and special steel products produced by the steel plants of SAIL.

Backed by a strong ERP system, CMO's network of 4 Regional Offices, 37 Branch Sales Offices, 43 operational Warehouses (23 Departmental & 20 CA yards) equipped with mechanised handling systems, and 9 operational Customer Contact Offices function in a synchronised manner to deliver quality SAIL steel to every corner of the country.

Even as SAIL strengthens India by participating in vital projects of national importance, it is steadily meeting the needs of small steel consumers in remote areas of the country by making SAIL steel available through the company’s ever-widening distributor-dealer network. Apna SAIL shops across the country have emerged as the preferred destination for small consumers aspiring to uplift their lifestyles.

This strategic initiative is also important in view of the company’s long-term objective of providing a countrywide framework for ease of procurement and supply of essential steel items for the common Indian.

Extensive customer contact along with product and segment specialisation, close monitoring of order servicing and feedback analysis through a Customer Satisfaction Index are established norms at CMO. The customer-friendly approach of CMO is

backed by practical after-sales service. Through the process of Key Account Management, CMO provides singlewindow service to key customers across the country for every business transaction from enquiry to order booking, order tracking to delivery, and even consultancy and after-sales service.

CMO's International Trade Division

International Trade Division (ITD) – an ISO 9001 accredited unit of SAIL's Central Marketing Organisation at New Delhi – undertakes exports of Mild Steel products and Pig Iron produced by SAIL's five integrated steel plants. Ever ready to meet the exacting demands of CMO's international customers, ITD maintains a close liaison with customers as well as production units to cater to the customised requirements of its international customers, in terms of quality, quantity and sizes.

ITD has successfully established the brand name SAIL globally by supplying Rails, Structurals, Merchant products, Wire Rods, Re-bars, Plate Mill Plates, Hot Rolled Coils, Hot Rolled Plates / Sheets, Cold Rolled steels, Galvanised steels, Cold Rolled Non-Oriented (CRNO) coils, Stainless Steel sheets/coils, Chequered Plates, Slabs, Billets, Blooms and Pig Iron, besides cut-to-size Hot Rolled and Cold Rolled materials in all continents. Most products are covered by stringent certifications such as CE marking, TUV and 'U' mark required by sophisticated end uses in European markets.

SAIL products have berthed successfully at Japan, China, Korea, Taiwan, Vietnam, Philippines, Singapore, Malaysia, Thailand, Indonesia, Australia, Mexico, Europe (UK, Germany, France, Belgium, Italy, Spain, Netherlands, Portugal), Sudan, Oman, UAE, and many more, as well as in neighbouring countries such as Myanmar, Bangladesh, Sri Lanka and Nepal.

SAIL Consultancy Division (SAILCON)

SAIL Consultancy Division, 'SAILCON' is an ISO : 9001 certified quality organization and the single window consultancy division of Steel Authority of India Limited (SAIL). SAILCON provides customized solutions in the fields of engineering, technology and management to clients globally. SAILCON offers state-of-the-art consulting, technical & operational assistance and training & management services backed by over 15000 experts in various disciplines, who are regular employees of the company.

'SAILCON' has actively undertaken ventures by drawing its strength from the extensive and varied expertise embedded in SAIL plants and units in the iron and steel making and allied areas and served its esteemed customers as per their requirements. Technical and Management Training services are its forte and these services have been availed of by several organizations in private and public sector within India and abroad.

'SAILCON' has executed assignments within India and abroad covering countries like Egypt, Saudi Arabia, Iran, Qatar, Thailand, Nepal, Philippines etc.

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 Plant Performance Improvement (PPI), Product Development (PD), Scientific Investigation and Development (SID), Basic Research (BR) and Technical Services (TS).

RDCIS has around 180 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, takes initiatives to develop special steel products utilizing the modernized production facilities at steel plants.

RDCIS also offers technological services to various organizations in the form of Know-how transfer of technologies developed by RDCIS; Consultancy services; Specialized testing services; Contract research; Technology Awareness Programmes.

SAIL Safety Organisation (SSO)

SAIL Safety Organization (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 Departments 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 on Safety, Health & Environment in the steel Industry (JCSSI), a bipartite forum which addresses steel plant safety, health & environment issues with active involvement of management and central & plant level trade unions and provides

guidelines to the member organizations 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 which was started in 1982. 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 conceptualisation, 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. MTI designs company-wide HRD interventions, organizes senior level management workshops, conducts problem solving workshops for middle level executives and also leadership interventions for Junior level executives. MTI also offers some selected programmes to executives of other organisations. In recent past it has conducted programmes for JPC, NALCO, NINL, NTPC, HEC, MECON and UCIL.

MTI, as a corporate institute, monitors the overall progress of training activities in SAIL. It conducts network meetings for selected and important programmes. E-abhigyan, the e-learning portal of SAIL has been developed and maintained by MTI with vast technical and managerial learning repositories and facility for online assessment and certification. E-abhigyan has helped in creating an anytime anywhere e-learning system for all employees of SAIL.

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. 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.

Directorates at Corporate Office and SAIL Board

Directorates at 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:

Technical, Projects & Raw Material Directorate

Finance Directorate

Personnel Directorate

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 organizations and Government Departments.

SAIL Board

The SAIL Board comprises of Four Functional Directors, two Government Directors & two Independent Directors and is headed by Chairman, SAIL. It enables 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 organizational 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. Organizational development to maximize 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.
- Centralized control of Finance, Sales, Purchase/ Import of inputs.
- Capital investment decisions beyond power delegated to plant CEOs.
- 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 organization to assist in problem identification and resolution.
- Projection of corporate image of the Company through media to the public in general.

Chapter – 4

Importance of MOU for SAIL

4.1 Concept of Memorandum of Understanding (MOU)

The concept of MOU arose from the report of Arjun Sengupta Committee. SAIL was among the first Public Sector Undertakings to enter into MOU (first time in 1987-88). Since then, SAIL has been entering into MOU with the Ministry of Steel.

Purpose of MOU

The purpose of the MoU is to measure the performance of SAIL on key selected parameters against the targets agreed upon so as to improve the critical performance indicators of the organization. The MOU envisages the performance expectations of Govt of India from SAIL. The MoU enables SAIL to operate as an efficient public sector commercial enterprise within the broad policy objectives set by the Government and the requirements of Parliamentary Accountability.

4.2 The MOU Document

The MoU is prepared in the basis of MoU guidelines issued by Department of Public Enterprises (DPE). The document includes statements on the Parameters, weightage assigned to each parameter and the targets for performance for the MoU year.

- The targets are based on audited accounts for the previous year.
- Vision provided by the Administrative Ministry is also considered for Benchmarking.
- CAPEX targets of CPSEs — as per Budget Document of Union Govt.
- Target for Expenditure on R&D/Innovations Initiatives is based on PBT of previous year and achievement to be confirmed based on Annual Report of CPSE for the the MoU year.
- Proportionate marks for achievement of 50% to 100% Targets -Applicable to all except for parameter on CAPEX achievement by 3rd Quarter.
- No marks for achievement below 50.00% of Targets.

4.3 The MOU parameters for performance assessment of CPSE

The parameters included in the revised MoU process are market oriented reflecting the shareholders' interest in terms of growth in revenue, return on net worth, asset turnover ratio and market capitalisation for listed CPSEs. Adequate weightage has been given to productivity linked parameters pertaining to CPSE's core operations.

The parameters are further indexed to past performance of the CPSE; vision of the Administrative Ministry; sectoral benchmarking and peer comparison (if any). All the parameters are quantifiable and verifiable from the documents in public domain

Besides certain government's priorities/ programmes such as procurement from GeM, MSE sector, etc. are also included for compliance by CPSEs, the non-compliance of which would result in deduction of full marks i.e., there would not be any partial deduction.

MoU Rating: The MoU rating of CPSEs will be assigned as per the following Table:

MoU Score	MoU Rating
>= 90	Excellent
>=70	Very Good
>=50	Good
>=33	Fair
<33	Poor

Assistance sought by SAIL from Ministry of Steel

SAIL seeks support from MoS on the issues such as

i. Availability of quality and quantity of coking coal, power and railway wagons.
ii. Assistance in removal of infrastructural constraints like ports and rail movements etc.
iii. Assistance in getting Environment clearance from Ministry of Environment and Forest for the projects.
iv. Renewal of mining leases etc.

Timelines are fixed for sending draft MOU, final signed MOU & performance evaluation Report of the previous year

4.4 Annual Business Plan (ABP)

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 ABP, 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.

Benefits

MOU and ABP 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 ABP 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 ABP 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 ABP, which in the form of a booklet is treated as the ‘holy book’ of the unit. Sufficient challenge is built in the targets of ABP, 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 ABP are the stepping-stones.

Chapter – 5
Company Strategies

5.1 Introduction

Johnson and Scholes (Exploring Corporate Strategy) define strategy as follows:
"Strategy is the ***direction*** and ***scope*** of an organization over the ***long-term:*** which achieves ***advantage*** for the organization through its configuration of ***resources*** within a challenging ***environment***, to meet the needs of ***markets*** and to fulfill ***stakeholder*** expectations".

Corporate strategy highlights the issues vital to the organization, measures corporate performance and envisions the competencies required for future sustenance.
Such issues are of great importance for SAIL, as we navigate the competitive, fast changing, and highly global steel business. The need of the hour is to adopt rigorous and appropriate strategies to realize the full potential in the coming decade.

SAIL is one of the largest industrial entities and the leading steel producer in India today. Its main strengths include diverse range of quality steel products, large pool of technical and professional manpower, 100% integration in iron ore and a nationwide distribution network. Being one of the few companies in India with multiple plant locations, it has the unique advantage of being able to grow to a scale of around 48 million tonnes of crude steel by expansion at existing locations.

Steel sector in the past 2 decades has experienced challenging periods interspersed with opportunities for growth and wealth creation. The evolution of steel business environment and corporate strategy responses of Indian Steel Majors fall into two distinct stages

— first, during the ***'Planned Self-Reliance'*** oriented economy till the 1980s
— second, during the transition decade of the 1990s and the **'Post Libelization Era'**.

Various aspects of these stages, have left a distinct imprint on the business profile, mindsets and behavioural characteristics of the Indian Steel sector.

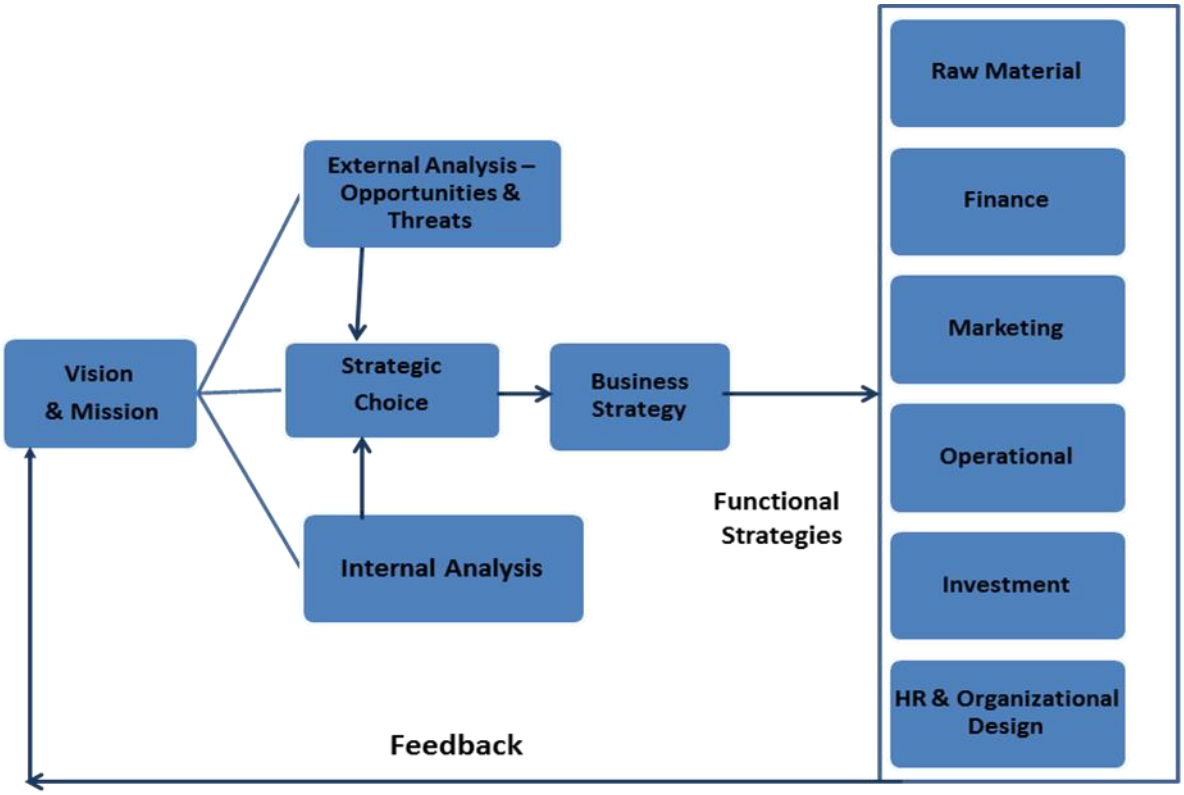
Post 1990s,the dramatic changes in the Indian economy made it critically important to understand how the steel sector and in particular individual steel producers are moving into the global economy. Therefore, it has become imperative to

Key Reforms for the steel Sector

- **Iron and steel removed from the list of industries reserved for the public sector**
- **Licensing for capacity creation and investment removed**
- **Provision for automatic approval of foreign investment through equity up to 100%**
- **Pricing and**

take note of various operational choices available to SAIL for decision making, the constraints imposed by the external environment, as well as the outcomes in terms of firm performance, profitability, growth, and competitiveness.

5.2 Strategy formulation



This approach has been followed by SAIL for analyzing business environment and then charting a future course of action. The approach is based on a system of continuous improvement where the result of one analysis becomes the input for the next. The stages involved are as follows

1. Vision and mission – any business strategy is guided by the vision and mission of the company for direction and priorities. Various factors and conditions are examined to ensure that they are in line with what is envisioned for the Organization.
2. Opportunities and scenarios are then analyzed for feasibility according to position and condition of the organization. This includes analyzing the internal position (strengths and weaknesses) as well as external factors (outside opportunities and threats) related to the company
3. Based on such analyses strategic options are formulated, which project several possibilities. The best option among these, is selected after careful

consideration and a broad business strategy is prepared which illustrates the overall direction of action

4. This business strategy is now broken down to the individual components (Operational, Finance and Marketing) which enumerate detailed action plans for each section

This approach has been used for the formation of a series of corporate plans for the company which has been based on the changing scenarios in the Indian steel industry.

5.3 SAIL's tryst with Corporate Plans

As the largest steel producer in the country, Steel Authority of India Limited (SAIL) has always believed in structured planning for the Company, percolating down to the units. The planning culture has contributed not only to SAIL's growth, but also - given the steel sectors strong backward and forward linkages - to that of the nation. The formal long range planning process, initiated in 1986 in SAIL saw publication of two corporate plan documents, one in 1987 and second in 1992. Both the earlier Corporate Plans had a perspective of around 15 years with 5 year mile stones, five yearly reviews. However the exercise of drafting a new Corporate Plan in late nineties was not under taken, as by then it has become apparent that changed business environment necessitated fundamental changes in Company's business. This called for a detailed restructuring plan rather than traditional long rage growth plan.

- **Corporate Plan -2000, May 1987, up to 2000 AD**

  - This was the first corporate plan of the company which was envisioned for 15 years with 5 year milestone. This was aimed at retaining the 60% market share that SAIL enjoyed in those days

  - It focused mostly on modernization and technological up gradation in all plants thereby improving capacity and productivity of production units. The plants to be modernized in the initial phase were DSP, RSP & BSL

- **Corporate Plan - 2005, Feb. 1992, up to 2005 AD**

  It was drafted when the steel market had transformed under economic reforms introduced in 1991-92. CP – 2005 aimed at

  - Financial target - PAT/NW ratio of 12% minimum

  - It followed up a de-centralized planning approach with drafting of *Unit Perspective Plans*

  - Chief Executives meeting resolved conflicting objectives across units' viz. interplant investment allocation, product mix decisions, etc.

Some of the goals to be achieved were:

- SAIL to become a dividend paying company
- Exports identified as thrust area
- New Areas such as - Environment, by-products were introduced

Highlights 1992-97

- SAIL becomes a dividend paying company (maiden dividend 1992)
- Peak profit of Rs.1319 crore during 1995-96
- SAIL issues GDR which were listed in London Stock Exchange
- SAIL becomes a Navratna company

- **Turnaround Plan - August 1998, up to 2003 AD**

SAIL's financials after showing consistent profits from 1984-85 to 1997-98, came under strain during 1998-99 on account of number of reasons. During the period 1998-99 to 2002-2003, SAIL focused on a turnaround and restructuring plan. To overcome the adverse situation and attain a position of sustainable profits, SAIL successfully scripted the largest turnaround in the corporate history of India. To effect the turnaround SAIL took simultaneous initiatives in

(i) Restoring financial foundation

(ii) Organization restructuring

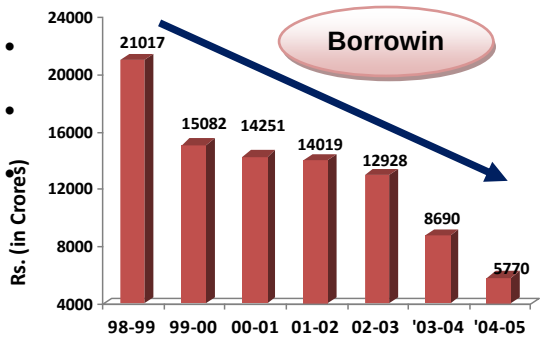
(iii) Marketing initiatives

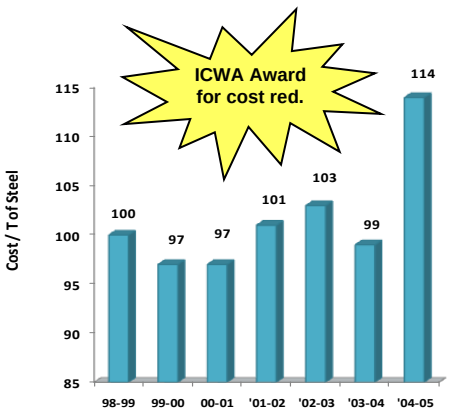
(iv) Cost Reduction

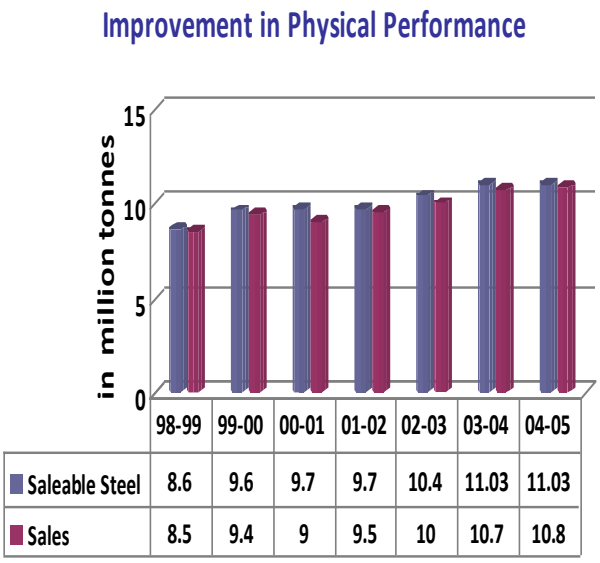
(v) Manpower Rightsizing

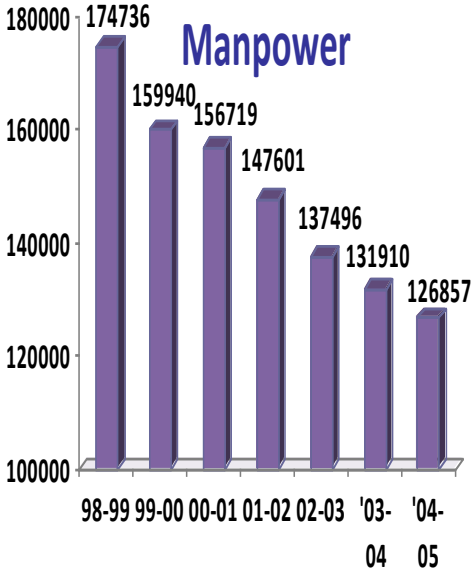
(vi)

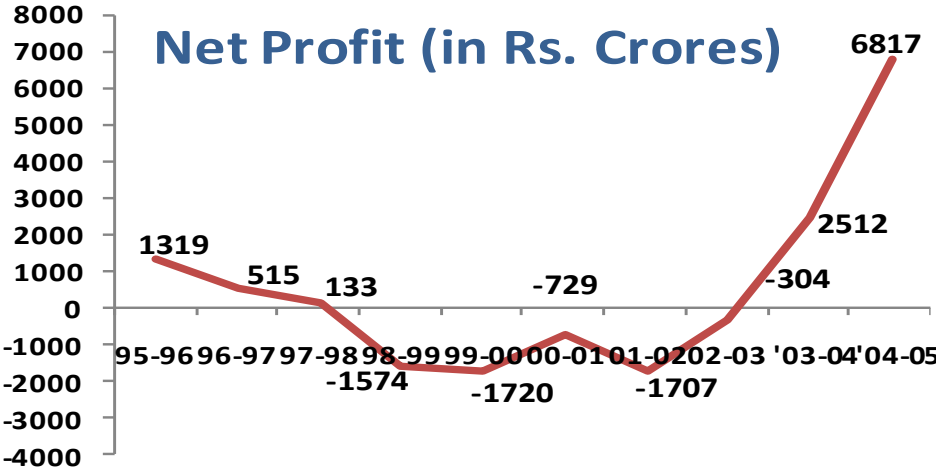
- The outcome of the initiatives in above areas are shown in the graphs below:











- By the last quarter of 2002-03. SAIL had turnaround and was well poised for a growth plan to tap the rapidly expanding steel market.

- **Corporate Plan – 2012, July 2004, up to 2012 AD**

  The turnaround and the buoyancy returning to the industry provided a fitting backdrop for SAIL's long-term vision. It was incumbent upon SAIL to capitalize on emerging opportunity and improve further its profitability and market position by building a truly competitive organization at a global level. SAIL's long-term strategic orientation is for building a robust organization with strong fundamentals.

Corporate Plan-2012 was designed in the year 2004 as a medium- and long-term business strategy for SAIL. Initially, it set out the blueprint for increasing the company's production capacity of hot metal to 23 million tonnes and of saleable steel to 20 million

tonnes, along with related/enabling business activities. In pursuit of these targets, a comprehensive company-wide Modernization -cum-Expansion Plan (MEP) was drawn up, encompassing investments in plants as well as mines.

In the process of making Composite Project Feasibility Report (CPFR) it emerged that it would be possible for SAIL's hot metal capacity can be increased to 26 million tones and saleable steel to 23 million tones.

CAPACITY EXPANSION PLAN		
Unit : mtpa	**2016-17 (Actual Production)**	**After Expansion**
Hot metal	**15.7**	**23.5**
Crude Steel	**14.4**	**21.4**
Saleable Steel	**13.8**	**20.23**

Post global economic meltdown of 2008, the targets of Corporate Plan-2012 were moderated. The revised MEP, currently under implementation, targets a hot metal production capacity of 23 million tonnes and saleable steel production capacity of 20 million tonnes, to be progressively commissioned during 2012 and 2013.

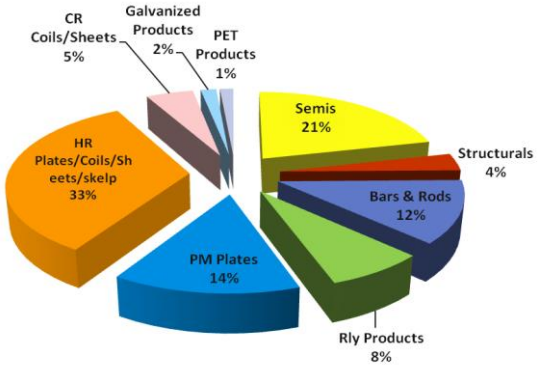
In the intervening period, the domestic steel market witnessed an impressive annual growth of 10%, well surpassing the 7-8% growth projected in 2004. India attracted widespread global interest and investment proposals for new steel projects started pouring in. Almost all existing primary steel producers launched their own brown- and green-field expansion projects as well. Consequently, with SAIL's crude and saleable steel production showing only modest increases of 1-1.5 million tonnes since 2004-05, the company's market share has dipped, which is likely to reverse only after commissioning of the facilities being installed under the ongoing MEP; with the ongoing MEP, following outcomes are targeted.

Expansion Plan: Technological Shift

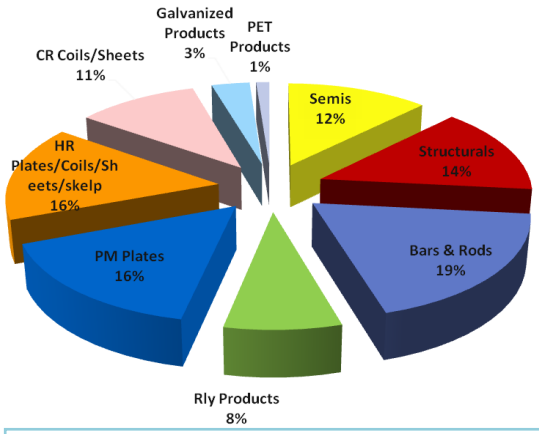
Technology	Current Status	Post Expansion
BOF Steel Making	**79 %**	**100 %**
CC Route	**71 %**	**94 %**
Pelletization Plant	**No**	**Yes**
Coke Dry Quenching	**No**	**Yes**
Top Pressure Recovery Turbine	**No**	**Yes**
Auxiliary Fuel Injection in BF	**Partial Coverage**	**Full Coverage**
Desulphurization of Hot	**Partly**	**100 %**

Metal		
Beam Blank Casting	**No**	**Yes**
Coupled Pickling & Tandem Mill	**No**	**Yes**
Beneficiation Plant	**Partial**	**Full**

- **New Products added post expansion:**
  - Auto grade CR Products, Galvanealed Coils/ Sheets
  - Plates/ Pipes to meet up to API 100 Grade specification
  - Rails for Metro-Railways
  - Increased production of Rails and wheels to meet the increasing requirements of Indian Railways
  - Wider Plates in the size of 4300 mm



Present Product Mix of



Product Mix of SAIL post expansion

5.4 SAIL Vision 2030

SAIL Vision-2030 is designed as a medium- and long-term business strategy for SAIL. It sets out the blueprint for increasing the company's production capacity of hot metal to 50 million tonnes and of crude steel to 48 million tonnes, along with related/enabling business activities to catapult SAIL into the top league of metals and mining companies at the global level.

In a rapidly expanding domestic market for steel, Vision 2030 focuses on - broadening the customer base, increasing exports as well as retail sales and de-risking the business by means of forward integration in steel intensive businesses. Based on the SWOT analysis of SAIL phase-wise strategies have been formulated in key strategic areas such as market leadership with a global orientation, production & product-mix aligned with current trends in the steel business, achieving complete integration of key inputs/raw materials with the entire steel making process, improvement in techno-economic parameters and efficient manpower deployment.

SAIL over the medium term would plan to retain market dominance in infrastructure & construction sectors while developing a strong presence in the value added products arena. To expand customer base and explore new market segments several new products and mills have been envisioned. Further, hot metal production through alternate smelting process shall also be targeted.

New mines along with beneficiation units would be developed to meet the required production of hot metal. Pellets capacity of around 15 million tonne is being planned. Options like owning dedicated rail tracks and specialized wagons, developing new ports on the eastern coast and exploring inland waterways would help SAIL for seamless management of logistics for the incremental steel volumes.In its pursuit of excellence, SAIL would target continual improvement in areas of land utilization, steel making technology, manpower productivity, energy management, and sustainability. Further, HR strategy of SAIL focuses on re-structuring of company and synergizing employee engagement in line with the company's growth plan.

Over the years SAIL has also worked towards forming Joint Ventures / Strategic Alliances with domestic and International companies.

SAIL's Major Joint Ventures/Strategic Alliances

FOCUS AREA	ALLIANCE PARTNER	OBJECTIVE
RAW MATERIALS	ICVL, MOIL, TATA STEEL	**International Coal Ventures Ltd** set up as JV with CIL, RINL, NMDC and NTPC to acquire coal assets globally JV with MOIL to produce ferro-manganese and silico-manganese to lower cost of steel production S&T Mining – JV with Tata Steel for acquisition and development of coal blocks/mines
ENERGY	NTPC, DVC	JVs with NTPC and DVC for power plants for captive consumption
STEEL	NMDC, ArcelorMittal	MoU has signed with **M/s ArcelorMittal** to explore the possibility of setting up an automotive steel manufacturing facility under a Joint Venture (JV), in India MoU has been signed with MoS-GoI , Govt of Chhattisgarh, NMDC for setting up of an Ultra Mega Steel Project in Bastar Area of Chhattisgarh state
CEMENT	JAYPEE GROUP	Bhilai Jaypee Cement Ltd. -Slag based cement plant of 2.2 million tonne per annum capacity with grinding unit at Bhilai & clinkering unit at Satna
SHIPPING	SCI	JV with Shipping Corporation of India for shipping of imported coking coal
WAGON MANUFACTURE	RITES	JV for manufacture of specialized wagons
E-PORTAL	metaljunction	JV with Tata Steel to promote e-commerce activities in steel and related areas

Having braved the lows and relished the highs, SAIL has withstood the test of time, and come out on top as the country's leading steel producer. As SAIL prepares to commission the new facilities, there is a need to plan for a new horizon. **'Vision 2030'** is expected to define the roadmap for the company beyond the ongoing expansion plan.

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Chapter - 6

Raw Materials for Steel Plants

6.1 Mines of SAIL

The Steel Industry is a raw materials intensive Industry. The importance of raw materials in the steel industry cannot be over emphasized. It affects the Techno-Economics of the Steel Industry. SAIL has the second largest mining outfit in the country spread over the mineral rich states of Jharkhand, Odisha and Madhya Pradesh. The Mines are responsible for supply of consistent quantity and quality of raw materials to steel plants. Specific mission is to achieve rapid expansion and optimisation of its production capacity, improvement in technology and quality and profitability with better service to steel plants. The composite picture of demand of Iron ore is given in Table No. 1

Table – 1: Demand of Iron Ore

RAW MATERIALS

Year	Hot Metal (mtpa)	Iron Ore Consumption (mtpa)	Linkages of Iron Ore
2020-21	16.582	27.355	Existing Mines
Post Expansion	23.46	39	The capacity of existing mines at Kiriburu, Meghahatuburu, Bolani & Gua are being ramped up to meet the requirement of Iron Ore for post ongoing phase of expansion New Pellet Plants - 4 MTPA capacity at Gua, 1 MTPA at Dalli and 2 MTPA at RSP has been planned for utilization of accumulated Iron Ore Fines & Generated Fines In addition to the above, new mechanised Iron Ore Mines are being developed at Rowghat and Taldih

Raw materials like iron ore, limestone, dolomite, manganese ore and coke are used for iron making in steel plants. It is preferable to have low ash content in the coke, low gangue material in the iron ore and fluxes to increase furnace productivity. In order to ensure consistency in quality and quantity of major raw materials SAIL has a number of captive mines. The mines were in the beginning captive to respective steel plants. As our demands grew stringent in terms of quality, it was felt necessary that the mines be brought under one umbrella.

Raw Materials – Ore : Capacity after expansion (December 2021)

RAW MATERIALS – Iron Ore

Mine	Existing Capacity* (mtpa)	Capacity* after ongoing expansion (mtpa)	Remarks
Kiriburu	5.50	5.50	• Expansion at Kiriburu has already been completed whereas Meghathaburu is being ramped up to meet the requirement of the ongoing expansion plan. • At Bolani, processing plant has been upgraded to 7.0 mtpa and is under stabilization. • At Gua, FC/EC are now in place. Capacity augmentation may take about 40 months from award of contract. **Depleted resources and quality constraints
Meghathaburu	5.00	6.50	
Bolani	7.00	10.00	
Gua	4.00	10.00	
Rajhara, Dalli	8.70	7.00**	
Barsua, Kalta, Taldih	7.00	ROM-16.00	Expansion through MDO route for Taldih mines for 7 MTPA under progress. Process for grant of EC for 16 MTPA RoM (Barsua-4 + Taldih-8- + Kalta-4) is under progress.
Rowghat	-	12.00	• MDO has been engaged w.e.f. 25.09.2017 for development of 14 MTPA mine. • Interim mining to the tune of 3 lakh Tonne Per annum started on 05.02.2021
Chiria	0.75	ROM-7/15	Capacity to be expanded contractually to 1.5 MTPA after availability of FC for Sukri. Further expansion will be taken up after availability of lease extension/Forest Clearance

* Finished Product capacity unless specified

▪ **The entire requirement of the increased capacity is planned to be met through captive mines**

SAIL Mines Benefits:

i. Strategic and need based networking
ii. Proper development of mines and optimum utilization of assets.
iii. Create synergy in mining operations.
iv. Reduction in dependence on non-captive sources by increasing asset utilization/ productivity and inter-plant transfers.
v. Perspective planning and development of new sources.
vi. Centralized responsibility to organize supply of raw materials to plants of desired quality and quantity.
vii. Proper emphasis on mine planning and long-term development of the mines.
viii. Integrated approach for development of new mines and scouting for new mineral areas.

ix. Gainful utilization of surplus resources of mine in others

6.2 SAIL Mines

Consistent and improved quality of iron ore is crucial for achieving desired blast furnace performance levels. The current production from the operational iron ore mines have to be augmented to meet SAIL's future requirements for which substantial development of mines will have to be taken up. The probable Iron Ore reserves with SAIL is approx 2390.82 MT. Presently, SAIL manages 8 iron ore mines and 3 operating flux mines.

Mines	State	Year of Commissioning	Rated Capacity (in MT)	Finished Production (2020-21)(in MT)
Iron Ore				
Kiriburu Iron Ore Mine	Jharkhand	1964	5.50	3.83
Meghahatuburu Iron Ore Mine	Jharkhand	1985	5.00	2.96
Bolani Ore Mines	Odisha	1960	6.50	6.24
Barsua Iron Mines	Odisha	1960	3.00	2.26
Kalta Iron Mine	Odisha	1966	2.50	2.49
Gua Ore Mines	Jharkhand	1919	4.00	3.10
Manoharpur Ore Mine	Jharkhand	1901	1.5	0.55
Taldih Iron Mine	Odisha	2016	1.00	1.09
Flux				
Kuteshwar Limestone Mines (Limestone)	Madhya Pradesh	1974	2.32	0.782
Bhawanathpur Limestone Mine (Limestone)	Jharkhand	1979	0.12	-
Tulsidamar Dolomite Mines (Dolomite)	Jharkhand	1970	0.30	-

To meet the enhanced iron ore requirement, the following strategies are being planned to be adopted :

- Development of new blocks
- Increased production from existing mines to their potential
- Improving the quality of iron ore by suitable beneficiation
- Achieving operating efficiencies by economic scale of operations

The major linkage for raw materials are in keeping with economics of transportation though it will be pertinent to mention that in order to provide smooth supply of raw materials to Steel Plants there is no specific source as such and raw material is provided as and when required from source which is best suited at that juncture.

SAIL is however, not self-sufficient in fluxes due to poor quality and high cost. Only Kuteshwar Limestone mines are suitable for meeting the requirement for iron making purpose. The mine is being augmented to a higher capacity. Operations for producing iron making grade dolomite form Tulsidamar is to be continued.

Chapter – 7

Transportation in Steel Industry

7.1 Introduction

Steel Making is very large and integrated system. The success of steel production largely depends upon the mode of transportation and their regular supply of various feeding points. Similarly in the process of making steel lot of movements such as hot metal, slag, heat trains, finished steel, scrap etc. to be done on scheduled basis. The success of smooth production basically depends on their movements.

The finished products also get the priority in despatching them to the customer to get the continuous inflow of money, which is the main objective of any organisation.

7.2 Layout of Internal Transportation System in ISPs

Layout of traffic system network should be such that without delaying the smooth and safe operation takes place. To design an ideal layout, a careful thinking should be given keeping in mind the various parameters such as incoming raw material, their monthly and daily plan, unloading plan, shunting arrangements etc.

Similarly loading bays and tracks in shipping bays should be given careful thinking for quick loading to avoid delays in loading because loading delays results in heavy detention of wagons increase in turnaround times and consequent demurrage.

Liaison with Railways

Success of any transportation largely depends on the close co-ordination of the industry with Railways. Since Railways is the key supplier of wagons for Raw material loading such as Coal, Iron Ore, Lime stone, Dolomite, Manganese Ore etc., a very close liaison is to be maintained with Railways.

For this co-ordination meeting are taking place on quarterly/monthly basis between Railways and plants. These meetings are helpful for meeting plant requirements in time. The monthly & quarterly requirements of plant are given to Railways well in advance to fulfill industries requirement at regular intervals. The performance by plant and Railways are jointly reviewed in meeting and problems are sorted out and strategies for better movements are decided in those meetings.

Similarly for despatching of finished product and bye-product on daily basis and in monthly basis, indent for the rakes as per destinations are given by PPC and TRM to railways for placement of empty wagons for loading. Handing over the rakes to railways within the stipulated time is also being done to maintain the turn around times and reduce the demurrage.. The success of despatch largely depends on the close co-ordination of loading and handing over of the rakes in time.The rakes are normally of 59 wagons in case of BOXN type with single destination or 43 type (concurred) with multiple destination. This results in continuous inflow and out flow of wagons.

Road Transport

Though the steel industry largely transport their material by Rail, many times to cater the customers at door step dispatches are done by road.The dispatches by road is a requirementof the steel plants to meet the target of saleable steel.. Many times low quantity and shorter distance makes it economical to use road transport. This system is faster also. The railways normally discourage movement of low quantity of raw material, over shorter distance.

The road transport proves many times very useful for steel plants.

Demurrage

Demurrage is charge levied by Railways for detaining Railway Wagon inside the plant area beyond specified time allowed for particular type of wagon.

Railways impose this charge for deviation from the stipulated turn round types for the place rakes. The lesser the turn round Railways earn more freight and plant pays less demurrage.

Demurrage control

To control the demurrage, the wagons should be unloaded in allotted free time and return the wagons back to Railways. The efficient handling of wagons largely depend upon quick marking of wagons, sending them to respective siding, unloading, removal of wagons by forming rake and handing them over to Railways.

Since steel plant has a very large network of tracks and siding daily inventory is to be taken and all information regarding empty and unloaded wagons to be analyzed and decision for removal and unloading of wagons should be taken with the help of information generated by centralised inventory and demurrage control unit.

The demurrage is an unproductive expenditure and also affects the rake availability, meeting are being done at different levels in these plants to avoid detention of wagons and to reduce demmurrages.

Shipping Practices

The job of steel plant is not complete till we have sold our finished product to the customer. The loading and despatch largely depend on shipment department. The shipping department is having with them the Rolling plan for various mills and loading plan which is given to them by CMO/local marketing department. As per loading programme shipping department ask Traffic department for supply of wagon. Shipping department organise loading documentation etc.

Despatch Advice

After loading is over Shipping department issue Despatch Advice which indicates about Name of consignee, Type of material, quantity of material, destination, number of pieces, their approximate weight etc.

After loading is over with certificate of Railway TXR these wagons are removed from siding, weighed, forwarding note is prepared. The forwarding note is given to Railway

goods clerk who after carefully checking, invoices the wagon. The rake is formed and handed over to Railways for movement to respective destination.

7.3 Role of Supervisors in Controlling Cost Related to Transportation

Normal work of any integrated steel plant is possible only when its transport system works well. Any failure in the functioning of this system will disrupt the working of the entire plant. The transport system connects one shop of the steel plant with the other shop and is itself connected with all of them. This system serves all the units and all the production units in turn are dependent on it.

To enable the transportation system to play its role properly, it is necessary that the production units of the steel plant maintain their production parameters according to certain schedule and provide advance information about this to the transport department so that the later can also prepare movement schedules matched with each other and compact schedule is made, and if the operation is done according to this, economy in production is achieved.

It is therefore, necessary that production departments prepare their schedule in advance in consultant with Production Planning Control department and TRM so that it can also prepare its movement schedule to serve the production units as well.

The supervisor must adhere strictly to these production schedules as well as the movement schedule to make production and despatch of materials smooth and effective.

A strict discipline should be maintained in upkeep of Railway tracks/fitness of Wagons and locomotives.

Chapter – 8

Relations with External Agencies

8.1 Introduction

SAIL occupies a pre-eminent position in the Indian Iron & Steel Industry. While it contributes around 26% of plain carbon steel availability in the country, its contribution to pig iron availability is as high as 70%. There are hundreds of items of plain carbon steel that the company produces at its integrated steel plants and markets throughout the country largely through a network of stockyards. SAIL plants also produce a large variety of by-products, coal chemicals and fertilizers. In addition, SAIL is a major supplier of alloy steels and stainless steel.

Hardly any situation can be envisaged in our operation, right from the conception and construction of a steel plant to production and marketing when interaction with a large number of organisations, agencies and individuals is not involved. Being a Public Sector Company, our obligations to all concerned are quite high. These obligations largely arise from policies, rules and regulations framed by the Government from time to time. These are too numerous to permit a detailed enumeration here. In all areas of activity Government approvals continued to be mandatory, until very recently, when the pricing of steel was decontrolled.

The Memorandum of Understanding (MOU) with Department of Steel has vested SAIL with a higher degree of functional autonomy and responsibility. Though revisions in the distribution policy for iron and steel has increased our functional autonomy and has brought us into more direct contact with our customers, different Government polices such as Industrial, Fiscal, Foreign Trade, Licensing and Plan Targets will largely determine the business environment for SAIL. In addition, other policies such as reservation in employment, pollution control, peripheral development etc. also will have a bearing on our activities and performance.

8.2 Area of Interaction

The first aspect of relations with external agencies is the area of SAIL's activities, which call for an interface. These can be classified as follows:

i. Investment in capacity creation and capacity maintenance
ii. Organising production
iii. Marketing of products
iv. Interface with Government and Ministry

Within each of the areas of interface mentioned above, the important external agencies and individuals with whom SAIL has to interact are detailed below.

Capacity Creation and Capacity Maintenance

Regulating agencies:

Planning Commission, Department of Steel, Public Investment Board (PIB), Ministry of Industry, Chief Controller of Imports & Exports (CCI & E), Excise Department, Various

concerned Departments of State Governments, Bureau of Indian Standards (BIS) and Reserve Bank of India etc.

Funding agencies:

Finance Ministry, EXIM Bank, external sources such as the World Bank, bilateral trade agreement with other countries.

Design and consultancy organisation:

MECON, M N Dastur & Company, foreign collaborations, BHEL, foreign equipment suppliers etc.

8.3 Organizing Production

Sources of Inputs:

Coal Controller, Coal India Limited (CIL), State Electricity Board (SEBs), Public Sector Power Plants, Public and Private Sector Mineral Companies, Suppliers of Refractories and Spare Parts. Oil and Petroleum companies, banks especially State Bank of India for cash & credit and foreign suppliers for inputs such as coking coal, refractory etc.

Workforces:

Employment Exchanges of different states, Universities and Professional Institutions for campus recruitment, representative organisations of the executive and non-executive employees of the company, Labour and Law courts, Tribunals.

Transportation:

Railways, road transports, shipping lines in the case of inputs that are being imported.

8.4 Marketing of Products

Customers, major buyers:

customer groups and associations - representing foundries, re-rollers, tube makers, wire drawing units, automobile manufactures, SSIC's, Fertilizer dealers; Conversion agents for mild steel and stainless steel.

Regulating agencies:

SPC, Ministry of Agriculture for Fertilizer Allocation, CCI & E, DGTD, various State Government departments such as Directorates of Industries, Sales Tax, Weights and Measures, Local bodies such as Municipalities etc.

Finance:

State Bank of India, other banks and financial institutions.

Extent of Dependence

Dependence on external agencies will continue to be substantial in almost all areas of SAIL Operations. For purpose of production the plants are largely dependent on infrastructural support from Railways, SEBs, CIL, vendors etc. Similarly for reaching the material to the ultimate consumer, SAIL is largely dependent upon the Railways for transportation of the required material to the right destination.

8.5 Interface with Government and Ministry

SAIL is answerable to the Department of Steel for fulfillment of targets for project implementation, production and levels of customer satisfaction.

Parliamentary Committees
SAIL is a Public Sector Unit (PSU) and is answerable to various Government agencies. From time to time committees of Parliament such as the Committee on Public Undertakings, the Public Accounts Committee and Committee on Official Languages visit our units to satisfy themselves whether the Company is discharging the responsibilities entrusted to it.

Regulatory Authorities

Department	Government Authorities
Coke Ovens	Director of Explosives (transfer and use of products.)
Mechanical Maintenance	Chief Boiler Inspector Factory Inspector Inspector (Weights & Measures)
Electrical Maintenance	Chief Electrical Inspector State Electricity Board
Traffic	Divisional Superintendent, Railways Controller of Purchase & Stores General Manager, SE Railway, Kolkata
Safety Engineering	DIHS, State Government State Labour Department National Safety Council
Pollution Control	Central and State Pollution Control Department DIHS, State Government
Personnel	DIHS, State Government Registrar or Trade Union Assistant Labour Commissioner

8.6 Important Stake Holders

a) Customer Groups

During the past few years SAIL has been laying greater emphasis on direct interaction with major customers and customer groups. This effort includes; holding dialogues with customers, visits to their offices and factories. The customers in turn are invited not only to interact with us in customers' group meetings but also to visit our plants. These interactions with the customer groups take place from the highest level down to the branch level. This is an area where additional thrust is being made with a view to achieving a lasting and mutually beneficial relationship. It is expected that such increased tempo of interaction will lead to quality improvement, product development, timely deliveries and product-mix rationalization.

b) Public

Our interface with the public at large, as distinguished from our customers, has largely been confined to sporadic media coverage. This has led to a situation where today the public at large is not adequately informed of the tremendous contribution made by SAIL to the national exchequer. The contribution of SAIL in developing a strong infrastructural and industrial base for all round economic growth of the country, reaching steel to remote, backward and strategic parts of the country besides generating employment and providing to the workforce amenities expected from a model employer. In fulfilling the aforesaid objectives, however, substantial costs are incurred with the result that the single criterion, by which the efficiency of an enterprise has come to be judged of late, namely profit, does not get the necessary priority.

c) Unions and Associations

SAIL has all along endeavored to be a model employer in fulfilling the reasonable expectations of its workforce. SAIL's expectation in return has been that everyone in the company will contribute to achieve the objectives of the company. For achieving the aforesaid twin objectives, reliance has been placed on an approach of participative management, which is very successful in its objectives.

In case of executives there is an association and there are unions for non-executives. There is only one negotiating body on various matters in case of non-executives as well as executives at the all-India level, whereas all the units of SAIL have got a separate set of unions for non-executives and association for executives. The unit level unions and association do not directly negotiate on any matter with SAIL's corporate management. However, once a national level agreement between the company and the non-executives union has been reached, the individual units hold a separate set of negotiations with their recognized union to adopt the same at the unit level. The process for executives is slightly different in this respect. The agreement on major issues reached at the national level is implemented straight away in all the units of SAIL.

d) Infrastructure

Coal, power and rail movement have been termed as infrastructure as these are critical basic inputs for industry in general and steel sector in particular. Infrastructure support is vital for uninterrupted production. Availability of these vital resources has been lagging behind the demand. In view of the critical nature of these inputs a Cabinet Committee on Industrial Infrastructure is monitoring the availability of these scarce inputs in the country and its allocation to the priority sectors.

To give an idea of the importance of these inputs for the steel industry, every tonne of saleable steel that we produce requires approximately 2 tonnes of coal (coking/non-coking), 600 units of electricity and 6.5 tonnes of rail traffic both inward and outward.

Steel plants are one of the largest bulk consumers of these infrastructure facilities. Practically, the entire coking coal produced in the country is consumed by the steel plants. Nearly one-third of the power generated by DVC is consumed by SAIL steel plants in the Eastern Region. About 15% of the total railway traffic in the country is on account of SAIL steel plants.

e) Coal

Steel plants need good metallurgical coal for conversion to hard coke, which is required as a fuel and reductant in blast furnaces. In this process of conversion, the volatile matter in the coal is expelled which forms the coke oven gas, which is used as fuel in steel plants.

All over the world, coke from coking coals with ash level of less than 10% are used in the blast furnaces. Unfortunately, a large part of Indian coking coals have a very high ash content of nearly 25%. Such coals cannot be used in the steel plants. These have to be washed to a level of around 17% ash. The reserves of coking coal in India are also limited and are located mostly in Jharkhand and Bengal coal fields. The availability of these coals is not keeping pace with the increasing requirements of the steel industry. Coal India Limited is the major supplier of coking coal. In addition, TISCO and ISP, Burnpur have captive coal mines and washeries.

In order to optimise the productivity of our blast furnaces and also to make good coke and to meet the shortfalls in the availability of coking coal, it was necessary to import low ash coking coal. The low ash, high strength coking coal has resulted in higher productivity and lower coke rate. SAIL has a Central Coal Supply Organisation (CCSO) at Dhanbad, which arranges supply of indigenous coal to the steel plants.

SAIL also requires 3 to 4 million tonnes of non-coking coal for the power generating units in the steel plants.

f) Power

The steel plants need a large amount to power and are heavily dependent on public utilities like DVC and SEB. There is a chronic shortage of power in the country.

Disruption in power supply causes havoc to steel plant operations. Initially steel plants were

provided with only so much generating capacity as is required to take care of essential loads which could not be shut off from the angle of safety of various plant units, when the external power supply to steel plants is disrupted. This minimum generation has always to be maintained in the steel plants and the balance requirement is met from external agencies. These power plants are also for the process steam generation and blowing. Process steam is an essential requirement for steel plant operations. However, in view of the endemic shortage of power particularly in the Eastern Region and consequent heavy losses or production suffered by the plants (in 1986-87 we lost 0.54 million tonnes of saleable steel due to power shortage) SAIL decided to go in for captive power stations. SAIL added a total generating capacity of 420 MW comprising 7 units of 60 MW each: 3 in Bokaro and 2 each at Rourkela & Durgapur raising the captive power capacity to 695 MW in the various steel plants. Our average requirement of power is over 600 MW. However, SAIL cannot remain independent of external utilities as rolling operations create sudden surges in load, which can only be absorbed by a large grid system. Under restructuring, these power plants are being run as joint ventures.

Chapter – 9

Environment Management in SAIL

9.1 Introduction

Environmental management system (EMS) refers to the management of an organization's environmental programs in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environmental protection. The term can also refer to software systems for organizational environmental management.

Environmental Management System (EMS) linked with ISO:14001 is a systematic framework to manage the immediate and long term environmental impacts of an organisation's products, services and processes. Implementation of EMS has helped SAIL plants and units to ensure their performance being always within the applicable regulatory requirements. All the integrated steel plants, major units and warehouses of SAIL are in compliant with EMS ISO: 14001 Standard.

An Environmental Management System (EMS):

- Serves as a tool to improve environmental performance
- Provides a systematic way of managing an organization's environmental affairs
- Is the aspect of the organization's overall management structure that addresses immediate and long-term impacts of its products, services and processes on the environment
- Gives order and consistency for organizations to address environmental concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes
- Focuses on continual improvement of the system

The industrialization in India for its economic growth, apart from its advantages, has brought pollution problems in the environment. Awareness about control of this pollution in industries has increased today, both in public sectors as well as in Government. SAIL, has adopted pollution control as one of the thrust areas to give better working environment, in and outside its units thereby achieving increase in production. The ISO 14001 addresses the standard for Environment Management and the process of certification to the standard in different SAIL units is on.

9.2 Environment Management Division

SAIL set up a multi-level organisation "Environment Management Division" (EMD) at Kolkata. This division started functioning from 28th June 1988. This division functions under the Directorate of Corporate Planning and is headed by a senior executive.

Objective and Function

The formation of a full fledged Environment Management Division (EMD) was conceived keeping in view the enactment of environmental laws by the Government of India and upgradation/ modernisation of SAIL steel plants and mines to the world standards through various technological developments.

The Corporate Environment Management Division thus started functioning as a nodal agency for pollution control and environment management in SAIL with the following objectives;

- Maintaining a pollution free atmosphere around the steel works and mines
- Providing education and massive awareness through publicity
- Liaisoning with State & Central Regulatory agencies in environmental matters concerning SAIL
- Adopting significant developments in other steel industries around the world for their implementation and assimilation in SAIL plants / mines.
- Ensure co-operation and co-ordination with all Environmental Control Departments of Plants / Mines.

Responsibilities

1. Develop Data bank and expertise :
    a. On existing legislation and information on environmental protection. Status on pollution control in the plants for co-ordinating with statutory authorities
    b. On latest trends and developments in pollution control and waste management technology and techniques
    c. To assist steel plants in implementation and transfer of latest technology and details of special equipment in the relevant areas.
2. Monitoring and Control
    a. To continuously monitor the environmental impact of the SAIL plants operation and bring it within the acceptable limits.
    b. Identify action plans for different units towards pollution abatement measures and monitoring facilities both for short term and long term measures
3. Environmental Clearance
    a. For proposals requiring approval by SAIL - scrutinising and clearing the same from environmental angle.
    b. For proposals requiring Government approval, scrutinising/checking the same from environmental angle and submitting to the Government for clearance.
    c. Follow up with the Central Environment authorities for obtaining environment clearance from Government.

    d. Co-ordinating and submitting various clarifications required by Central authorities in (c) above for environment clearance.
    e. Interaction with RDCIS, CET & other units of SAIL during preparations of EIA reports to ensure that various aspects required by Central authorities are incorporated.
4. Studies
    a. To get studies conducted on environmental management and pollution control measures.
5. Liaison & Interaction
    a. Liaison between SAIL and MoEF, State / Central Pollution Control Boards. (Regulatory agencies)
    b. Organising regular meetings of pollution control departments of plants, Project departments, RDCIS etc. Keeping in view the above responsibilities, the following activities are performed;

6. Pollution Control
   Assessment of air, water and noise pollution and necessary follow-up to :
    a. Identify areas where strengthening of pollution control measures are required
    b. Facilitate in preparing action plans for reactivating existing non-functioning or malfunctioning pollution control units
    c. Monitor the progress of action plans for implementation of the various conditions stipulated by regulatory bodies while issuing environmental clearance of investment proposals.
    d. Organise environmental training programmes
    e. Assess investment proposals from environment angle
7. Waste Management
    a. Keeping account of the type and amount of waste generation.
    b. Keeping account of the type of waste recycled inside the plant or township
    c. Identification / development of market, either for the waste as it is or after processing the same, in consultation with CMO and RDCIS, wherever required and taking suitable measures for filling up the gap between generation and utilisation / recycling of the waste.
8. Implementation of EMS linked to ISO 14001
    a. Design, implement and maintain EMS linked to ISO 14001
9. Build up environmental awareness through
    a. Training/seminars/workshops
    b. Celebration of World Environment Day, Earth Day, Environment Month, Mines Environment and Mineral Conservation Week, Safety Week etc
    c. Special environmental reporting initiatives
    d. Publication of in-house journals
    e. Wide coverage through local TV net work in townships of SAIL
10. Environment management & technology initiatives taken up in various units of SAIL
    a. Clean Technology Development for plants and mines
    b. Clean Development Mechanism

c. Special environmental reporting initiatives
d. Phasing out of Ozone Depleting Substances (ODS)
e. Greenery development

An environment policy in SAIL has been made and it is given in the following table:

Corporate Environmental Policy

Steel Authority of India Limited, one of the leading steel producers of India, in its endeavour to strengthen environment management and maintain clean and sustainable environment in and around its plants, mines & other units is committed to:

i. Protect the environment by integrating sound environmental practices for control and prevention of pollution from all its activities.

ii. Comply with legal and other requirements pertaining to the environment, forests and wildlife and to go beyond.

iii. Systematic approach of environment management by accreditation with Environment Management System.

iv. Contribute towards mitigation of climate change through adoption of measures to reduce emission of greenhouse gases, enhancing green coverage, adopting energy efficient technologies, enhancing use of green energy.

v. Promoting innovative environment-friendly processes and products.

vi. Ecological restoration of degraded mined out landscapes.

vii. Integrate principle of "reduce, recover, recycle and reuse" in its operations for conservation of natural resources, including water, to ensure sustainable future.

viii. Continual improvement of environmental performance by setting challenging targets, transparent reporting system and robust review mechanism.

ix. Continuously monitor emissions, discharges and ambient air quality and uplink with SPCB and CPCB portals for self-regulation of environmental deviations, if any.

x. Communicate environmental performance to all stakeholders through annual report, Board report, Corporate Sustainability Report and all such means from time-to-time.

xi. Engaging employee for commitment and responsibility towards environment protection through capacity building.

xii. Promoting environmentally responsible behaviour amongst all stakeholders.

9.3 Pollution in Steel Plants

Coke Oven

Particulate emission of different sizes visible, smoke from tar, leads and stand pipe of battery, release of carbon-monoxide, sulphur-dioxide, nitrogen dioxide and other pollution from chimney due to the following activities of coke oven operation:

a) Material handling operations like handling from wagons, transportation by conveyors, storing, crushing, and loading of coke.

b) Oven charging, coke pushing, and quenching.

c) Leakages around poorly sealed coke-oven doors and lids.

d) Drawing gaseous emissions to a collecting main for separation of Ammonia Tar, Phenol, etc. which cause pollution.

For controlling emissions during handling of materials, scrubbers have been provided for controlling gas leakages from various parts of batteries. Special types of sealing materials are being used with state-of-the-art-technology. Dust separation systems are being installed in coke oven areas.

By Product Plant (coal chemicals)

a) Various types of products are being extracted from Coke Oven gas and cleaned gas is being sent to various consumers for heating purpose through pipelines.

b) Entire phenolic water generated from CO & BPP are sent to BOD Plant as it contains high phenol, cyanide and ammonia. This effluent is being treated in BOD Plant and the treated effluent is being used for quenching of coke, thus avoiding water pollution.

Sinter Plant

Sintering process uses various types of raw materials such as coke, ore, lime dust etc. and the sinter is fed to Blast Furnace for making hot metal. Huge amount of materials are being processed in Sinter and pollution is controlled by providing ventury scrubbers, ordinary scrubbers and multi-cyclones. Of late, these multi-cyclones are being replaced with Electro-Static Precipitators (ESP). The entire effluent generated in the shop is being sent to sludge compartment and the water is being recycled.

Lime Calcination Plant

Lime is fed into different kilns for making calcined lime for SMS. The atmospheric emission includes particulate matter from handling, crushing, screening, conveying and transfer points. ESPs and bag filters have been provided to various points of pollution.

Blast Furnace

Hot metal is extracted from Blast Furnace and the BF gas is passed through cyclone and finally ESP of Gas Cleaning Plant. The cleaned gas is fed into the pipelines to be used as a fuel. Carbon Monoxide gas are generally found in an around the BF vicinity for which detection meters have been provided.

L D Process

LD process consists of converters through which steel is made. During blowing process for making steel huge amount of gas is generated which is passed through ventury scrubber and the cleaned gas is passed through the chimney. However, gas having rich CO are being collected into gas holder after cleaning and this gas is also being used as fuel. Various types of pollution generated from transportation are being controlled by gas filters and ventury scrubbers provided in the shop.

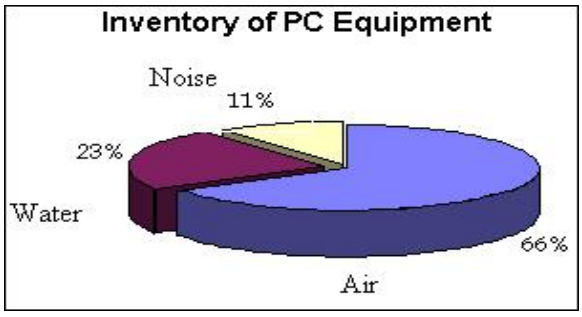
Foundries

Potential sources of particulate emissions of foundries are from Ingot Mould Foundry, Steel Foundry, Iron & Copper Foundry, transportation of sand, operation of electric furnaces, cupola generate emissions which are being controlled by pollution control equipment like wet scrubbers.

Power Plant

Power Plant is a potential source of emission from burning of middling coals, which are being used in boiler for generating steam. The fly ash generated due to burning of coal is arrested in ESP and finally discharged through bunkers diluting with water. The water is being recycled again in the system. The pollution due to transportation and crushing of coals in the shop is being controlled by wet scrubbers and pulse jet bag filters.

In SAIL, over 1000 air pollution control equipment in the form of bag filters, ESPs, Ventury scrubbers, cyclones are operating at its various plants. For tackling water pollutants, over 200 control devices are in place including BOD plants. As a leader in the steel industry in India, SAIL has frequently been the first to introduce the latest available technologies in the area of pollution control.



Measures to Control Pollution

Air Pollution

Air quality is assessed to evaluate the existing ambient conditions and to predict the anticipated conditions after any development. Air pollution comes from many different sources: stationary sources such as factories, power plants and smelters and smaller sources such as dry cleaners and degreasing operations sources such as windblown dust and volcanic eruptions, all contribute to air pollution. Air Quality can be affected in many ways by the pollution emitted from these sources.

Soil Pollution

The soil resource is a vital component of our environment and the monitoring of soil properties is essential in achieving sustainable land use. The objective of the

assessment is to determine the potential of soil in an area and identify the impacts of urbanization and industrialization on soil quality.

Water Pollution

In most of the Steel Plants, the polluted water is being collected in various compartments and dust is settled and clear water is being recycled. Only make-up water is being drawn from the source. The water collected in the ponds are also recycled in various shops.

Noise Pollution

The noise pollution in areas such as compressor plants are being arrested by providing a special type of enclosure. Snort valve silencers are being provided in BF. However, where there is no possibility of reduction of sound, personal protective equipment are being used by the employees.

Waste Management

The waste generated from various shops are being recycled in the plant, kept at a specified place or sold. Coke Breeze, tar sludge and BOD sludge are being recycled in the Plant. The slag generated from BF and SMS are being granulated for cement plant and also used for replacement of flux in Sinter Plant, Blast Furnace, Steel Melting Shop. Slag is used on the railway tracks and making roads inside and outside the plant. Hazardous waste materials are being recycled and sold through the supplier authorized by Govt. of India. However, the hazardous waste materials, which are not being disposed off in a eco-friendly manner are kept in a safe place under protected area. Special type of pits are being made in all the Steel Plants for dumping of the non-usable hazardous waste. After filling, pits are being covered with soil and bushes/grass are grown on that surface.

Conclusion

With the enactment of comprehensive Anti-Pollution Act by the Central Govt. and the laying down of tolerance limits for various discharges by the Central as well as State Pollution Control Boards, SAIL – as the sole custodian of Public Sector Steel Plants identified environment managements as one of the key thrust areas. The setting up of Environmental Management department in different Steel Plants with well defined tasks and responsibilities, Central Environmental Management Division at Calcutta and Environmental Waste Management Laboratory at RDCIS, Ranchi are steps in that direction. SAIL is becoming a pioneer and a trendsetter in the field of Environmental Control amongst the public sector undertakings in this country. The modernization programme of different steel plants are bring about ecological modernization with massive investments for pollution control technology.

Chapter - 10

Major Services in Steel Plants and their Role

10.1 Foundry

It is an establishment where metal objects are produced by melting metal and pouring it into moulds. Like many other production processes, e.g. forging, stamping, pressing, rolling, machining, etc. casting also is a fundamental metal forming method which is used in industries. Foundry products which are known as castings do find a wide variety of application in any integrated steel plant and that is why every integrated steel plant of our country (like Tata Steel, ISP, RSP, BSP, BSL and DSP) is having a captive foundry of its own.

Some of the products of steel plant foundries:

Ingots moulds, bottom plate, bottom stool (or half bottom plate), Pig mould for Pig Casting machine, Break blocks for locomotives, Trumpet, Guides for Merchant Mill, Hammers, Charging box end, full charging box, charging bar, slipper pads, bushes (of different sizes and types) for Bearing, Chilled, Aluminum shots, Axle bush draw bar link, Cover carriage, Splasher Plate etc.

10.2 Repair Shops

All SAIL Plants have been provided with centralized workshop to facilitate repairs and reconditioning of components, sub-assemblies and to meet a sizable volume of their spare requirements.

The repair shop of SAIL Plants broadly carries out two types of activities viz.

i. Production of spares and consumable items required by the plants.

ii. Repair and reconditioning of different component parts, sub-assemblies and assemblies.

The efficient operation of an Integrated Steel Plant to a great extent depends upon the proper upkeep of installed equipments, which calls for elaborate maintenance systems and facilities. Carrying out scientific maintenance of equipments requires the right spares of the right quality and in the right quantity in the right time. Their non-availability can result in the postponement of shut downs and preventive maintenance and the sections have to be fully equipped with spares, sub-assemblies and assemblies. The latest concept of the modular replacement of assemblies and sub-assemblies which minimize downtime and ensure better quality of repairs, places still higher demand on captive engineering shops.

Repair shops of steel plant are basically engineering workshops for forging, machining, heat treatment and fitting and dismantling. Usually each repair shops consists of Forge shops, Fabrication shops, Machine shops, Tool Room, Fitting and Dismantling shops.

Welding / Fabrication Shop :

Welding is a materials joining process used in making welds. This is a highly versatile process used for day to day and regular repair of plant equipments. The main Welding processes are :

a) Oxyfuel Gas welding – Use the heat produced by a gas flame for melting the base metal and if used, the filler metal. Pressure may or may not be applied.
b) Arc Welding – A fusion welding process wherein union of work piece is produced by melting the surfaces to be joined with the heat energy obtained from an A.C. or D.C source.
c) Resistance Welding – A group welding process, which produces union of metals with heat obtained from resistance offered by the work to the flow of electrical current through the parts being joined.

Fabrication Shop

Welding, forming and fitting are the three basic processes used mainly for fabrication of metal structures / equipments. This is very important for repair /manufacture of steel plant equipments and structures. Fabrication Shop is generally equipped with Profile cutting machines, Plate Bending machines, Shears, Welding machines of different types, Hydraulic presses, facilities for heating & Material handling etc.

Forge Shop

Forging is a process of shaping metal by application of force and heat or by application force alone.
Forging is the shaping of metal either by i) impact or ii) steady compression between a hammer or ram and an anvil .Forging hammers are to make stock / blanks for various spares.

Forging is a process of plastic deformation of metal. In case of forging, the plastic deformation of metal is achieved by applying force of sufficiently high magnitude so that the stress developed within the work material is greater than the yield stress when “permanent set” takes place within the work material. However, in most of the cases, the work material is heated and with little force the plastic deformation in work material is achieved. Therefore in forge shops the following equipments are installed: forging hammer and press.

Fabrication at structural shop:

Fabrication means joining together. In fabrication shops the usual, work materials are plates, sheets, angles, channels, joists and other structural materials. In fabrication shops these materials are first “marked” and are then cut to size as per markings by either gas cutting or shearing or punching or by any other operation. Properly sized materials are then given shape by bending or pressing or by any other methods. After cutting, marking, and shaping, the structural are fabricated by riveting or by welding. The usual fabrication shop equipment are E.O.T crane, JIB crane, Gas cutting torches, Profile (gas) cutting machines, shearing machine, drilling machine, plastic bending

rolls, bending machine, hydraulic press, gas welding sets, electric arc welding machines, submerged arc welding machines, metal arc welding machine (MAG) etc.

Welding at Fabrication Shop:

Welding is a materials joining process used in making welds. This is a highly versatile process used for day to day and regular repair of plant equipments. The main Welding processes are :

a) Oxyfuel Gas welding – Use the heat produced by a gas flame for melting the base metal and if used, the filler metal. Pressure may or may not be applied.
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Machine Shop

Machining operation in general means removal of extra material in the form of “chips” from the work body with the help of a machine tool. Different conventional machining operations depending upon the method of removal of material, the relative motion between the work and the cutting tool, etc. the various machining operation are given different names e.g. turning, boring, facing, knurling, milling shaping, slotting, hobbing, drilling, reaming, grinding etc. To carry out these conventional machining operations, machine shops of SAIL units are equipped with all types of conventional, general types of machine tools.

Machining is an important method of shaping metal parts and especially of finishing them to close dimensions. Machine Shop consists of light and heavy Machining Sections equipped with lathes, planers, Horizontal and Vertical Boring machines, Gear cutting machines, Slotting machines and Grinders for manufacturing and repair of equipment spares like Shafts, Liners, Gears, rolls etc. Balancing machine determines the unbalance of rotating parts. Balancing mass is added/ removed to balance these parts, which is essential to maintain rotating equipments against unbalance and breakdown.

Electrical Repair Shop

Electrical Repair Shop (ERS) is critical repair shop of Electric Motors. Apart those Load Lifting Magnets, Welding Machines, Brake Coils, Reactors, Slip ring are also repaired/manufactured in Shop. Main activities of ERS are overhauling all (medium repair) of motors, which includes dismantling, clearing, change of broken damage, parts varnishing and testing. For burnt motors (Stator and Rotor) winding are replaced/repaired and tested after necessary repair and overhauling.

10.3 Gas Utilities & Water Management

Gas Utilities consists of following sections:

(a) Oxygen Plant

Oxygen Plant supplies Oxygen, Nitrogen and Argon for steel making, blast enrichment, scaring and allied processes. Air separation units & Hydrogen Plants are provided. Air is supplied by steam-driven compressors and electric driven compressor. Turbo-compressors, Turbo-blowers and Nitrogen compressors are provided to supply these gases to various consumers. Plant also include oxygen filling station for filling cylinders for medical and maintenance purposes. Pressures storage vessels for oxygen nitrogen and argon along with oxygen gas holder are provided to take care of fluctuating demands of consumers.

(b) Acetylene Plant

Acetylene gas is produced from calcium carbide and filled in the cylinders. Filled cylinders are supplied to consumers through Stores all over the Plant. The main consumers of Acetylene Plant are Continuous Casting Shop where acetylene is used for cutting slab through cutting torches.

(c) Protective Gas Plant (PGP)

It is used for providing inert atmosphere in Annealing and Galvanizing furnaces of CRM. Protective Gas is a physical mixture of 95% of pure nitrogen and 5% hydrogen.

Water Management

Water Management involves total supply and disposal of water system in the plant. Different systems are as follows:

1. Procurement & storage of raw water.
2. Industrial/Technical clean water system: Used for cooling of various technological equipments/application/products.
3. Industrial/Technical contaminated water system: Used for cleaning and cooling of various technological processes like Gas Cleaning Plants, Scale flushing, de-dusting units etc.
4. Drinking water system: Water is treated at water treatment plants and distributed in plant and township.
5. Soft Water and DM (De-Mineralized) water system: Water is chemically treated and distributed to consumers, such as boilers, furnace cooling etc.
6. Domestic sewage water: Collection, treatment and disposal of domestic waste water.
7. Storm water: Collection and disposal of rain water.
8. Industrial waste water: Collection, treatment and disposal of various industrial waste water.

For handling of different types of water, it has numerous pump houses containing sump pit, pumps and motors, valves and pipelines, settling tanks, cooling towers and pipeline network throughout the plant and township.

Disposal of storm water during heavy rains is a major responsibility of Water Management Deptt. to prevent flooding of underground tunnels and cellars.

10.4 Research and Control Laboratory (RCL)

Research and control laboratory plays a vital role in maintaining and improving the quality of products. The essential function of a research and control laboratory is to impose necessary control measures on (i) the metallurgical and other processes employed and (ii) the material used to ensure economic production of quality materials.

RCL has four wings:

1) Metallurgical
2) Chemical
3) Inspection
4) Research & Development

All these wings of research and development laboratory work in conjunction within themselves as well with production units as a team of helping observance of technological discipline and ensuring excellence of quality.

Metallurgical mainly covers all the process control laboratories attached to different production shops like coke ovens, blast furnace, steel melting shops, rolling mills, foundry etc. Process control laboratories 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-structure etc.

Some of the sophisticated equipments/instruments used for these controls are:

Thermo-vision camera, digital pyrometers, ultrasonic flaw detectors, quanto-vac slag analysers, nucleonic guage variation detector and adjuster, (to control guage variation of hot rolled coils in BSL)

Test pieces from each production units are taken to the laboratory for testing and ensuring that the products confirm to the standards of different specification before dispatched to the valued customers.

The R & C laboratory also investigates failed spare parts for causes of failure, so that the shops are properly guided to procure spares of desired quality.

Chemical sections collect samples from incoming raw materials as well as from the intermediate products for analysis of chemical composition and size fraction. There are 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 metamorphosis from iron ore to steel.

It is finally the inspection wing, which sorts out the good from the bad. Tested quality, off grade, commercial grade, 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 minimized by proper fitment into grades, to help earn more.

Finally, packaging of the products is equally important so that the products reach its destination in a sound condition. This is also inspected before dispatch.

Inspection group also observes scarfing operation of different intermediate products like slabs, blooms etc. to avoid defects in the final product.

10.5 Refractory Engineering

Refractory Engineering Department (RED)

Refractories are vital for steel industry. The performance of refractories considerably influences the production, productivity and economics of the plant. The successful performance of refractories is primarily governed by its quality. Refractories play a very vital role in the achievement of target for steel production. With changing pattern of steel making there is an ever-increasing demand for newer types and better quality of refractories. Technological improvements in steel plants and in refractory production have gone hand in hand. The steel industry is the largest consumer of the refractories. 60-70 % of the refractory produced, is being used by steel makers.

The function of the Refractory Engineering Department is to look after the refractories maintenance of all the Units lined with refractory and acid resistance materials in the plant. Capital repair of these units are also planned and executed by this department.

Refractory Material Plant (RMP)

This department handles lime stone. Raw lime stone is crushed and fed into the kilns (Rotary/Vertical shaft) and is burnt under high temperature to produce lime which is used as a flux in Steel Melting. Lots of dust produced here for which electrostatic precipitators are installed to prevent pollution and environmental control.

10.6 Capital Repair Group

The function of this group is:

i) To plan and supervise capital repair of all the major shops.

ii) To execute routine repair of all the major shops.

The main objective of this department is to facilitate adequate availability of vessels and furnaces for optimum production and to reduce the cost of steel production by bringing down the consumption of spares & refractories.

Chapter – 11

Major Functions in Steel Plants and their Roles

11.1 Production, Planning & Control (PPC)

Production, Planning & Control (PPC) is concerned with the organisation & planning of a manufacturing process. The highest efficiency in production is obtained by manufacturing the required quantity of product, of the required quality, at the required time, by the best and most economical method. Production, Planning & Control is a facilitating service or tool to achieve this target. This function translates the market requirements/forecasts master production schedule, works out the raw material and other input requirement and prepares the detailed departmental production schedule for different time periods (annual, quarterly, monthly, weekly, and daily).

The function of Production, Planning & Control is always dynamic not merely a static one. Designing, Production, Planning & Control depends on the following factors:

i. Size of Production.
ii. Size of the plant.
iii. Type of Industry or the field of specialisation.
iv. Dynamic Market Demands , Policies &strategies of Competeetors

11.2 Management Services Department

Management Services Department (also known as Industrial Engineering Department (IED) helps in developing effectiveness and efficiency in any organized socio-economic activity. Management Services Department helps managers in visualizing wastages in their areas of work, improper methods or distribution of work and other organizational lapses. It also assists managers at all levels in introducing systems and achieving effective utilization of resources within their control. Broadly speaking, Resource optimisation, Productivity improvement and Systems design have been the broad objective of Management Services Department.

Main Functions

Incentive & Reward scheme
Special Studies Related to Performance improvement, Logistic management & Improvement in working environment and man-machine systems
Systems Design & Improvement
Procedural Order related to production, dispatch and various other financial and materials management aspects
Manpower Planning
Contract Evaluation & Management
Suggestion Scheme

11.3 Medical & Health Services

Medical and Health Services form an important welfare service in any industry. The function of medical department is to provide comprehensive health care services which include preventive, promotive, curative and rehabilitative service to the community. Industrial Health Unit and Public Health Department are also integral part of the health service. In case of any unforeseen accident , immediate relief measures and treatment will be provided to the affected employees. Planned health chekup programmes are also conducted for all the employees at regular intervals of time.

11.4 Town Administration

The Public Sector Industries were established in the early fifties with the twin objectives of speedy economic development and as instruments of social change. These objectives envisaged setting up of gigantic Steel Plants in virgin areas. They had to create infrastrucural facilities both for the Plant and for the township. The Township should conceive to represent the total unity in diversity – Social, cultural, linguistic, religious, economic strengthening the basic ties which binds the employees together. This not only provides physical assets for the improvement of the life of the citizens in making the best possible use of the amenities and facilities. “Welfare and Amenities are the two sides of a coin”. Caring for amenities is caring for the welfare of the people, which in turn makes the employees to work with greater enthusiasm, higher motivation, thus bringing about higher and higher Productivity.

Chapter – 12

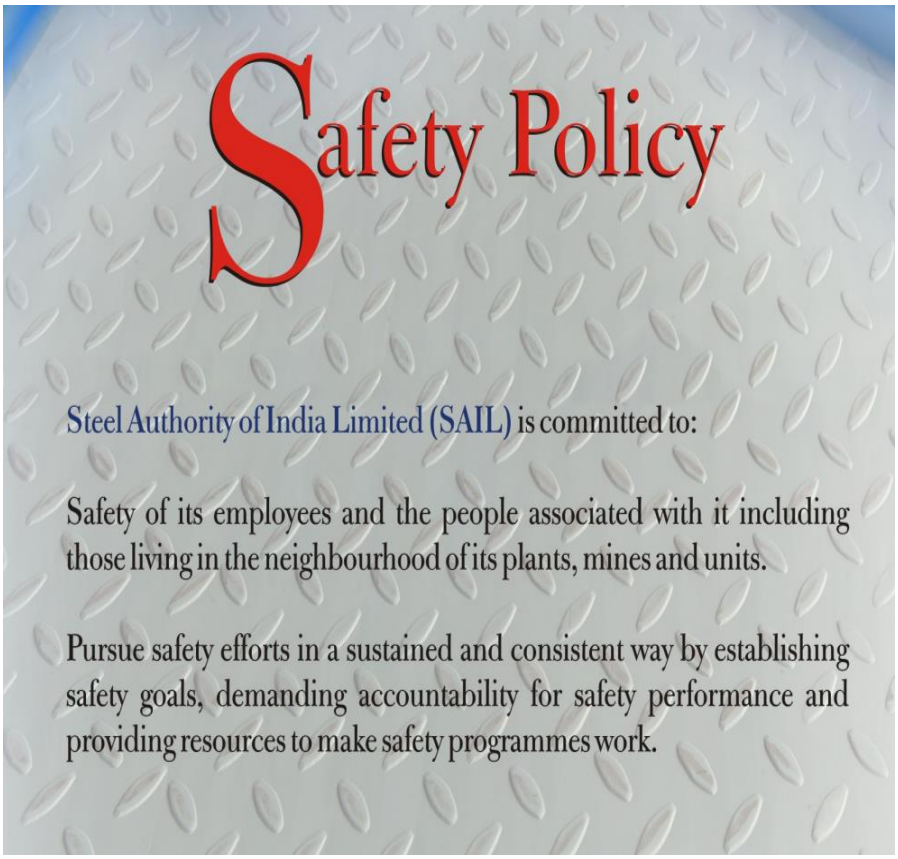
Safety and Health Management in SAIL

12.1 Safety management System and Practices

Iron and Steel making is a continuous process industry with complex technology. SAIL recognizes the importance of maintaining a healthy & safe work environment. At Corporate level, SAIL Safety Organisation (SSO) coordinates and monitors the operational and fire safety activities. In each plant/ unit of SAIL, Safety Engineering Department (SED) is having infrastructural facilities to ensure operational safety & fire prevention related aspects. SEDs periodically undertake awareness generation drives and campaigns in respective Plant/Unit. Departmental Safety Officer (DSO) & Safety steward in each department / shop ensures adherence to laid down standards & safe working procedures.

SAIL is having a well defined Occupational Health & Safety Policy. Keeping aligned with Organisation's policy, SAIL plants individually are having OH&S policy. Objectives and targets are achieved through established OH&S management programmes. Special thrust is being laid upon Safety issues involved during execution & commissioning of the projects.

Safety Policy of SAIL



Guiding Principles

- Excellence in health & safety supports excellent business results.
- All accidents can and must be prevented.
- All employees are responsible and accountable for maintaining safety standards.
- Safety standards to be incorporated in all work procedures.
- Imparting training to create safety consciousness and to work safely to be key element of safety programmes.
- Safety to be enhanced through participative committees and other fora.
- Comprehensive and regular audits of the safety performance to be conducted.
- All work practices & procedures to be in consonance with Statutory Rules and Regulations on Safety.

SAIL gives adequate emphasis on safety of human resources and assets of the Company along with production and productivity, cost reduction and quality. In 1988, a Corporate Safety Unit named SAIL Safety Organisation (SSO) was set up to coordinate and monitor the safety activities and to provide strong corporate thrust on safety management in the Company. The major functions of SSO are:

a) To coordinate, monitor, promote and enhance the safety, fire services standards of Plants/Mines.
b) Formulation of corporate safety action plan.
c) Development of policies of systems and procedures for workplace improvement.
d) Advice to Plants/Units/Mines in matters relating to safety.
e) Competence through training that includes the development and empowerment of employees.
f) Encouraging awareness and responsibility among employees.
g) Tracking of performance - specifically by organizing meetings and discussion.
h) Maintaining Incident/Accident Management Information System
i) Conduct periodic audits of Safety Management System.
j) Carrying out secretarial functions of JCSSI.

Concerted efforts are made and participative approach is adopted in controlling the OH&S risks in accordance with the H & S Policy to ensure conducive work environment for all the persons involved in the steel making process, be it regular or contractual employees, a senior officer or doorman, visitors & vendors to the premises as well as society at large. Strategic initiatives and Periodic drives are jointly undertaken for enhancing awareness and maintaining sound consciousness level on safety & health related issues which is ultimately helping in implementation of Safe & Healthy work practices. Visible concern of top management and Trade union representatives & employees are demonstrated through effective functioning of the bi-partite forums like Central/Apex Safety Committees, Departmental Safety Committees

with adequate representation from workers' side. The committees meet at scheduled intervals and discuss & deliberate all issues pertaining to safety, health & welfare of the employees in a collaborative manner thereby playing a pivotal role in enhancing OH&S standards. The committees help in monitoring & review of promotional activities undertaken and advise on effective occupational health and safety programmes.

While the SAIL plants have been achieving the targets of production, considerable improvements have been brought in the standards of safety and occupational health at workplace due to the sincere commitment and dedicated efforts of all concerned for putting systems, procedures & improved work practices in place. Wholehearted involvement of management as well as workers is ensured for effective health & safety drives / campaigns undertaken. The views of bi-partite forums are considered while revising the Hazard Identification and Risk Assessment (HIRA) documents and Occupational Health and Safety Policy of the organisation. To ensure safe & healthy work environment, both management and workers' representatives reiterate their commitment to develop, promote and enforce the best standards for safety, occupational health and environment protection and maintain specified standards of OHSAS 18001: 2007, ISO 9001:2008 & ISO 14001:2004.
Most of the SAIL plants/units have adopted and implemented OHSAS 18001: 2007, an internationally recognized standard in the area of Occupational Health & Safety Management that supports and promotes good OH&S practices. This has helped in establishing systems and procedures at workplace. HIRA documents are developed for identified areas with control measures by ensuring involvement of all concerned which are updated periodically to bring down the risks to acceptable range. Due emphasis is laid upon preparation and adherence to safe commissioning procedures for new and upcoming facilities, identification of all types of hazards and evaluation & control of work related risks for adoption of proactive strategies, strict adherence to properly developed protocols and SOPs/ SMPs/ SWPs, organising trainings on Fatality Risk Control and BBS for minimizing at risk behaviors.

Three tier Safety Audits are being conducted at plant and unit premises as mentioned below:

- By Safety Engineering Deptt. of respective Plants and Units as per schedule
- By SAIL Safety Organisation, Ranchi associating executives from sister Plants/units
- By external agencies viz. National Safety Council, Regional Labour Institute, OHSAS auditors etc.

Essential Ingredients of Safety management System and Practices in SAIL:
Due emphasis is given on safety of human resources through OHSAS- 18001 certification covering the occupational health and safety issues of all regular employees, contract personnel, visitors and any other persons at the work places.

Management commitment:

The Company is visibly committed towards preventing occurrence of accident in plants/units. Safety performance is being monitored at the highest level of management i.e. Chairman and Director's level as well as by the Chief Executives of respective Plants & Units.

Systems and Procedures:

SOPs & SMPs are formulated in consonance with statutory rules and regulations on safety. For hazardous & critical jobs involving multiple agencies, systems like Permit to Work (PTW) and Protocol incorporating safety provisions exist and are monitored for strict adherence. Safety surveillance during all major Capital repairs/ Shut down jobs is ensured for safe completion. All the employees of SAIL are covered by the formal joint management-worker health and safety committees and are communicated, consulted on Health & Safety issues. All the contractual workers are imparted safety and work environment related training.

SAIL has developed safe & healthy working environment for all its employees and those living in the neighbourhood of its installations. Various types of trainings /workshops are organized for educating all concerned regarding first aid, occupational hygiene and health, stress management, preventive care for occupational diseases, awareness on HIV/AIDS etc.

Health and safety committee with joint representation facilitate a positive health and safety culture. 100% employees are covered under safety and welfare committees at plant/units. These committees are generally called for meeting once a month and all issues related to health & safety, such as the organizational commitment, maintenance of good health, safe environment, welfare of employees, security of plant etc. are communicated, consulted and discussed thoroughly. Contract workers are imparted training on safety and environment issues.

Training:

Training forms an important component of implementing an effective safety strategy. Continuous education, training, counseling, prevention and risk-control programmes are organised to assist workforce members, their families and other community. Area specific workshops are conducted and job specific safety training is imparted to the workers. Safety related information is also broadcasted through local TV network at plant townships. Training on safety is also imparted to the Central Industrial Security Force (CISF) deployed for ensuring security in and around the plants. In addition to the training on security practices, occupational health and safety related training is also provided to the security staff. All CISF personnel are trained on Human Rights aspects at their individual training camps as per standard training procedure of Government of India (GoI) for security personnel.

Periodic review of safety performance is made at top management level of respective plants/ units as well as centrally at Organisation level through scheduled Heads of Safety meetings of SAIL plants /units.

Role of JCSSI:

Joint Committee on Safety, Health & Environment in Steel Industry (JCSSI) is a unique bipartite forum at national level that was formed in 1973. It has representation from major central trade unions and management of major steel producing companies namely SAIL, RINL, Tata Steel, JSW Steel, Dolvi, JSW Steel, Vijayanagar Works, Essar Steel, Neelachal Ispat Nigam Ltd, Bhushan Steel, Hospet Steels, Mecon Limited and M N Dastur & Co. The members jointly evolve recommendations/ action plans for ensuring safe & healthy work culture. All secretarial functions are centrally being performed by the SAIL Safety Organisation (SSO), Ranchi. Annual meeting and award function are organized at Ranchi as well as member plant locations.

With a view to inculcate safety consciousness, JCSSI organizes seminars, workshops, training programmes, safety competitions like poster design, calendar design and essays for the employees of its member organizations. JCSSI conducts interplant competitions on safety issues and gives awards to the winning plants, mines and individuals.

12.2 Occupational Health

SAIL has set benchmarks in the area of 'Occupational Health Service'. SAIL has established full-fledged OHS Centres equipped with modern equipment at its all units. SAIL is committed to the values of giving priority for improving workers' health by covering 100% employees under OHS programmes. Multi disciplinary, Multi dimensional OHS Centre of Bhilai Steel Plant emerged as a National OHS Centre and is also functioning as a Central Nodal Agency to monitor occupational health activities in different SAIL units.

To provide comprehensive health care, Preventive, Curative, Promotive and Rehabilitative health services are being rendered through integrated approach. For keeping work environment friendly, compliance to the requirements of OHSAS 18001: 2007 & SA 8000: 2008 certification and central audit being made.

Infrastructures available for following are being effectively utilised:

Preventive: Occupational Medicine Clinic, Periodical Medical Examination, Industrial Hygiene Survey setup, Computerized Health Information System (HIS).

Promotive: Awareness programmes, Trainings on Industrial Hygiene and First Aid, Stress Management, AIDS Control, Life Style Diseases, Special programmes for working women, Celebration of Special Days.

Curative: General OPD, Pharmacy, Plant casualty services with Disaster Management facility. Round the clock Ambulance services, Eye wash Fountains, Minor OT.

Rehabilitative: Disability assessment following any work injury through Disability Medical Board. Redressal of complaint cases from work places / departments, Job rotation based on deviation found in PME & recommendations of DMB being implemented by redeployment committee, Follow up & Feedback documented.

Facilities: Lung Function Test, Biochemical investigation, Clinical Pathology, Digital X-Ray, Vision Test, Health Education & Training, OHS Library, ECG, Psychology, Health Information System, Audiometry etc.

Salient activities undertaken by OHS centres:

- Employee Wellness Programme & Vision Conservation Programmes. Tests on Audiometry Pulmonary function, ECG, Chest X-ray.
- Work place monitoring surveys at identified locations of various departments including exposure assessment for contractual workers in project areas.
- Under biological monitoring, Urine phenol estimation & Pathological tests for the employees of Benzol Rectification & Recovery Plant.
- Under Health Education drives, awareness programmes on First Aid, Stress management, Workplace Hazards, Life style diseases, AIDS and Workshop for Women organised.

Occupational Hygiene aspects taken care through Work Place monitoring, Personal sampling, Area sampling for Dust, Noise, Heat Stress, Gas / Chemical, Radiation, illumination. Based on various surveys conducted, Data analysis, Hazard quantification, Reporting to respective department with recommendations for control measures and follow up is made for its compliance.

Categories of OHS programmes

Workers

First aid, work place hazards and prevention, AIDS awareness, diabetic counseling, stress management programmes, occupational psychology counseling, application of ergonomics in the work area, effect of environmental pollution on health, gas safety.

Families

AIDS awareness, family planning, communicable diseases like TB, polio, typhoid, malaria etc.

Communities

Family planning, mother and child health, immunization, nutrition, blindness control, AID awareness, personal hygiene.

Chapter – 13

Total Quality Process

13.1 Introduction

Quality may be defined as the degree to which a set of inherent characteristics fulfils requirements. These inherent characteristics may include the following:

- Physical (e.g. mechanical, electrical, chemical or biological characteristics)
- Sensory (e.g. related to smell, touch, taste, sight, hearing)
- Behavioral (e.g. courtesy, honesty, veracity)
- Temporal (e.g. punctuality, reliability, availability)
- Ergonomic (e.g. physiological characteristic or related to human safety)
- Functional (e.g. maximum speed of an aircraft)

The concept of total quality represents the way a company runs its business and it needs a structure approach embracing –

- Quality improvement
- Quality control

Just-in-time concept & other business improvement activities to mobilise for organised creation of beneficial change in the business with outcomes as –

- Continuous cost reduction
- Elimination of variability
- Reduction in plant downtime
- Increase in yield
- Just-in-time concept and
- Improved human relations

The concept of Total Quality differs from the conventional sense of quality in a way that total quality 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 engulfs everybody at all levels and at all stages of the process as a user, as a processor, as a supplier for Quality performance and is with the main objective of satisfying the needs & requirements of the customer both internal and external. This customer perception is the essence of Total Quality thinking which directs a project team for quality improvement to apply Total Quality techniques using all of the statistical and problem solving, skills in the right environment together with various behavioural concept just introducing Total Quality is not enough. There must be clear objectives which are known to all levels of employees. It is the teamwork, which gives real power to Total Quality.

13.2 Total Quality Management

Four major element of total quality

Systems	Processes	Management	People
*Quality Audit *Quality Assurance	* Process Capability *Process control *Process improvement	*Style *Teamwork Cross Functional The power house of Total Quality	Management of people through participation in voluntary improvement activities

The tools and concepts used in Total Quality consist of a number of techniques collectively called “Seven Quality Management Tools” –

a. Pareto Analysis/Diagram
b. Cause & Defect Diagram
c. Stratification
d. Check Sheet
e. Histogram
f. Scatter Diagram
g. Graph & Control Chart

It is the interaction between these which makes Total Quality a real fire arm and which needs emphasis on the following points –

a. Strive for thorough policy control
b. Aim at priorities
c. Aim at problem solving
d. Coordinate with various departments – quality, cost & production
e. Smooth PDCA cycles
f. Data cycles and fact finding

Supervisor’s Role in TQP-

1. Study the existing cultural pattern
2. Identify those aspects, which need change
3. Secure active participation of others involved – including customer participation as well as his active assistance
4. Start on a small scale and use results to broaden application
5. Make Quality improvement project by project and in no other way
6. Make use of available tools

7. Make studies with application of simple to sophisticated tools of SQC
8. Provide sufficient for mental change to take place
9. Training and self-development programmes should be carried out as planned
10. Avoid surprises
11. Build Quality into the products during manufacturing

13.3 Awareness of ISO Standards

International Organization for Standardization (ISO) is a world body constituted by 91 national standard making organizations including our BIS (Bureau of Indian Standards). ISO 9001 is the model for Quality Management System. It is the outcome of a need for having world parity in standards for meeting customer requirements. The need for adapting ISO 9001 by the Indian industry gains significance with the functioning of the European market and the trust given by the Government for boosting our export. ISO 9001 defines a bare minimum of quality standards for products/services being acceptable at international levels.

ISO 9001 sets out the criteria for a quality management system and is the only standard in the family that can be certified to (although this is not a requirement). It can be used by any organization, large or small, regardless of its field of activity. In fact, there are over one million companies and organizations in over 170 countries certified to ISO 9001.

This standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement. These principles are explained in more detail in ISO's quality management principles. Using ISO 9001 helps ensure that customers get consistent, good-quality products and services, which in turn brings many business benefits.

The objective of ISO 9001 is to provide a set of requirements that, if effectively implemented, will give you confidence that your supplier can consistently provide products and services that:

• Meet your needs and expectations

• Comply with applicable regulations

ISO 9001 adopts a risk-based ("preventive") approach to quality that covers a wide range of topics, including your supplier's top management commitment to quality, its customer focus, the adequacy of its resources, employee competence, process management (for production, service delivery and relevant administrative and support processes), quality planning, design of the products and services it provides, review of incoming orders, purchasing, the appropriate monitoring and measurement of its processes, products and services needed to ensure conformity, its processes to resolve customer complaints, corrective actions, and a requirement to drive improvement.

Quality Management Principles

There are 7 Quality Management Principles. These are:

a. Customer focussed organization

b. Leadership

c. Engagement of people

d. Process approach

e. Improvement

f. Evidence based decision making

g. Relationship Management

These principles are not listed in priority order. The relative importance of each principle will vary from organization to organization and can be expected to change over time.

ISO 9001Certified Areas

All plants and Units ISO QMS certifications in their area. BSP has received Integrated Management System (IMS) Certificate by a single certifying agency (M/s DNV), integrating QMS, EMS, OHSAS & SAMS - becoming the first SAIL unit and among few corporate houses in India to achieve this unique distinction..

Quality Policy of SAIL:

Chapter 14
Suggestion Scheme/Quality Circles

14.1 Suggestion Scheme

The Scheme provides an opportunity for promoting creativity through constructive thinking, recognition for individual ingenuity and chance to participate in the development of the company.

Definition of 'suggestion'

(i) All ideas concerning the following aspects pertaining to the Plant are acceptable as suggestions:

a) Reduction of cost, waste, spillage, maintenance, hazards and possibilities of accidents
b) Increase of utility, quality, yield or output of products.
c) Conservation of materials, energy, power, time on process
d) Improvement of the product or its design.
e) Rationalisation of work, materials, or methods.
f) Simplification of practices, procedures and processes.
g) Improvement in advertising and sale of products or new sources of revenue.
h) Improvement in civic problems traffic, hygiene and cleanliness.

(ii) <u>The following aspects are however outside the scope of the scheme:</u>

a) Matters concerning organization.
b) Matters within the sphere of Industrial Relations and collective bargaining.
c) Replacement of facilities such as machines tools and other machinery and equipments.
d) Extension of existing practices and equipments of the Plant.
e) Items to which the management has already given consideration and on which action is pending, postponed or abandoned.
f) Company's policy matters.
g) Any other matter decided by the management.

Processing of Suggestion

The awards may be a combination of any of the following:

(a) Cash award.
(b) Token Gift.
(c) Letter of appreciation from a senior officer/HOD.
(d) Certificate of merit from Head of Works or CEO/Head of the Unit.

Wide publicity is given to the deserving suggestions through different agencies. The deserving cases are referred for coveted awards such as Prime Minister's Shram Awards & Viswakarma Rashtriya Puraskar etc.

The benefits for the organization are:

i. Development of coherent problem solving methodology.

ii. Increased production / productivity
iii. Enhanced motivation
iv. Improved quality
v. Better employer - employee relationship
vi. Improved employee involvement.

14.2 Quality Circle (QC)

In the field of quality, Japanese QC approach has proved to be a great national force in spreading of QC movement across the country as well as intensifying the quality circle activities in every plant.

A Quality circle is a small group of employees who volunteer to help in solving departmental problems within limited resources.

Quality Circles are based on a set of techniques that involve individuals who work together in the problem solving process. Because there is scope for improvement in every work, people who face the specific problems come together to identify, to investigate and find solutions to those problems.

Problems do not just happen; these are a result of various actions taken in the past. Different goals, work schedules, tasks and changes can all create problems. Some problems are caused by materials, methods or machinery and very complex problems can arise due to combined effect of people, materials, methods and machinery.

For quality circle to be more effective, it usually consists of four to ten employees concerned within the same area. Quality circles offer a sense of pride and accomplishment. The opportunity to have a say in the job, to be the expert, to think and participate with co-workers in selecting and solving problems in concerned work area brings better job satisfaction. It fulfills the desire to be recognised along with the co-workers for significant contributions to quality and productivity improvement.

There are different levels of competitions for Quality Circle teams starting from organisational level, regional, national to international level. Various QC teams from SAIL have competeted in international level forums and brought laurels for the company.
