

INDUSTRY AND COMPANY AWARENESS



स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
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. By 1970, world steel production had reached 595 MT from 189 MT in 1950. However during 1970-2000, rate of growth of steel production somewhat slowed down due to static steel demand in the developed economies of USA, Europe, Japan and USSR and various geo-political crises such as the oil crisis of 1970s, Afghansitan war Of 1980s and Asian currency crisis of 1997.

World Steel production gained further momentum due to rise in production and demand in Asia particularly in China. In 1993, China overtook US and in 1996, it overtook Japan, as the top producer of steel. Since 2000, world steel production has grown rapidly on account of explosive growth of steel production in China. From a production figure of just 131 MT in 2000, China's crude steel production rose to 1,013 MT in 2022 which was 54% of total world steel production. Steel production temporarily dipped in 2008 due to global financial crisis and in 2016 due to production clampdown by China. But otherwise Chinese steel production since 2000s have seen a steady growth rate.

As per OECD (Organisation for Economic Co-operation and Development), following several years of decline until 2018, global steelmaking capacity has posted four consecutive years of growth in the period 2019-2022. The latest available information (as of December 2022) suggests that global steelmaking capacity grew to 2,459.1 MT by the end of 2022, an increase of 1.3% over 2021.

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 iron produced 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.

In the beginning, iron 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 the first successful Iron Works in America, was founded in 1646. 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

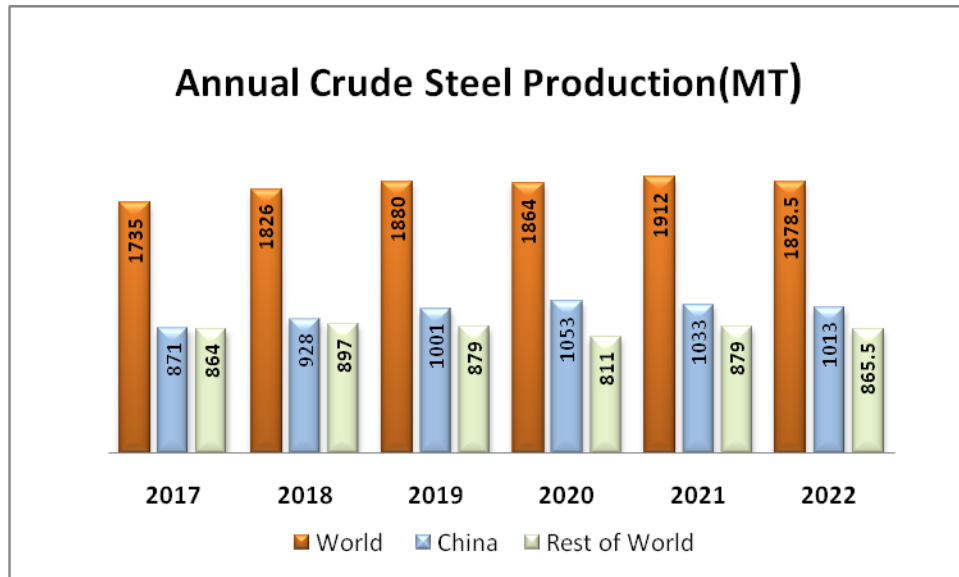
Crude steel production 2022 (WSA)

Total world crude steel production was 1,878.5 MT in 2022, down by 4.2% over 2021. India was the second largest producer of steel in the world in 2022. List of top ten producers of steel in the year 2022 is given below:

Rank		2022	2021	%2022/21
1	China	1 013.0	1034.7	-2.1%
2	India	124.7	118.2	5.5%
3	Japan	89.2	96.3	-7.4%
4	United States	80.7	85.8	-5.9%
5	Russia (e)	71.5	77	-7.2%
6	South Korea	65.9	70.4	-6.5%
7	Germany	36.8	40.2	-8.4%
8	Turkey	35.1	40.4	-12.9%

Rank		2022	2021	%2022/21
9	Brazil	34.0	36	-5.8%
10	Iran (e)	30.6	28.6	8%

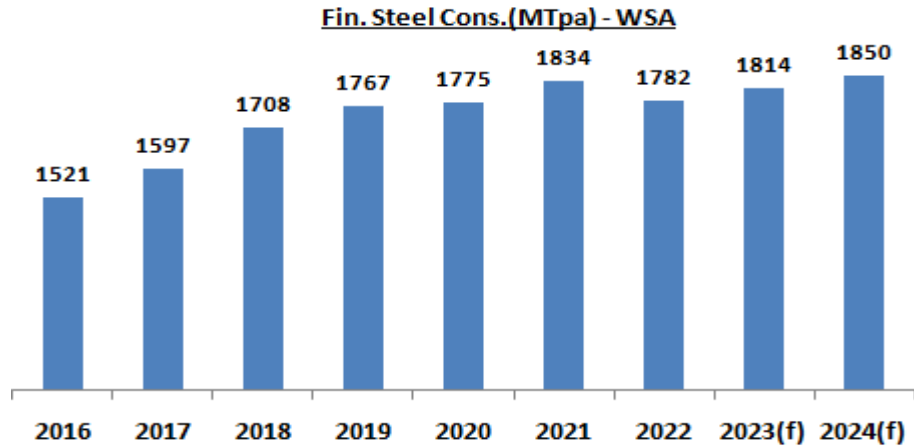
Total Production of Crude steel; from 2017 to 2022-World, China, RoW



World Steel Demand (WSA)

The World Steel Association forecasts that the world steel demand will grow by 1.8% in 2023 and reach 1,814.5 Million T after contracting by 3.3% in 2022. In 2024, world steel demand will see a further increase of 1.9% to 1,849.1 Million T. China's finished steel consumption in 2023 is expected to grow by 2.0% to 939.3 MT. Finished steel consumption in developed economies is likely to come down by 1.8% to 1814.5 MT in 2023 while the same in India is likely to shoot upto 126.1 MT, up by 8.6%.

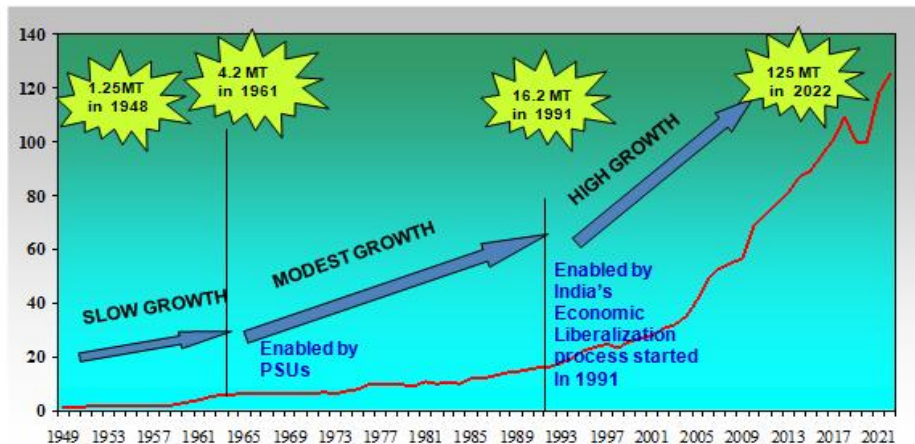
As per WSA, world steel demand has been feeling the impact of the high inflation and interest rate environment. Since the second half of 2022, the activities of steel using sectors have been cooling sharply both for most sectors and regions as both investment and consumption weakened. The situation continued into 2023, particularly affecting the EU and the US. Considering the delayed effect of the tightening monetary policy, WSA expects steel demand recovery in 2024 to be slow in the advanced economies. Emerging economies are expected to grow faster than developed economies.



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 crude steel production. Further growth is expected in the medium to long term. 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.

India was the world's second largest steel producer in CY'2022 with a production figure of 124.7 MT, up by 5.5% y-on-y. In CY'2023, India is likely to produce 145 MT of crude steel.



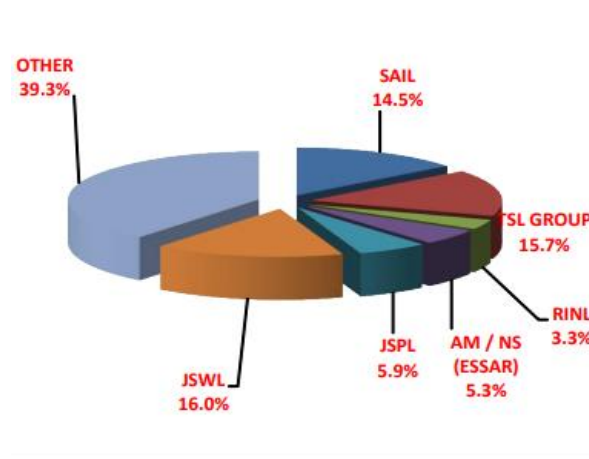
Period	Production for sale (MT)	Import (MT)	Export (MT)	Consumption (MT)
2017-18	104.9	7.5	9.6	90.7
2018-19	101.2	7.8	6.3	98.7
2019-20	102	6.7	8.3	100.0
2020-21	95.1	4.7	10.7	94.1
2021-22	113.5	4.6	13.5	105.7
2022-23	121.3	6.02	6.71	119.7

Market Size

India's current crude steel production capacity stands at 161 MTpa.

PRODUCER-WISE SHARE OF PRODUCTION

April – March 2022-23(Prov.)



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.

Crude steel production by Process Route		
Process Route	Percentage share (%)	
	2018	2022*
Basic Oxygen Furnace (BOF)	45	46
Induction Furnace (IF)	29	31
Electric Arc Furnace (EAF)	26	23
Total	100	100

Outlook for Indian Steel industry

Following the initial spurt in domestic steel prices, due to onset of Russia-Ukraine war in February, 2022, prices started coming down from April, 2022 onwards, to mirror the falling international prices and weakening raw material prices. Imposition of Export Duties on Finished Steel by the Government of India in May, 2022, further accelerated the price decline. Consequently, in November, 2022, India's Finished Steel Exports were only 0.34 MT, down by 53.1% over the previous year. As a result, many Indian mills opted for maintenance shutdowns due to non-remunerative steel prices. Such curtailed exports and falling steel prices, led to the domestic steel majors recording huge financial losses in Q3 of FY 2022-23.

However, domestic steel prices started rising from December onwards supported by rising international steel prices and better performance by domestic end-user industries.

While Indian Finished Steel Exports during the Financial Year 2022-23 were 6.71 MT, down by 50.2% as compared to previous financial year, imports were up by 29.0% to 6.02 MT. India's Finished Steel Consumption during the year was 119.17 MT, up by 12.7% as compared to CPLY. Meanwhile domestic steel producers stayed on course to expand their production capacities.

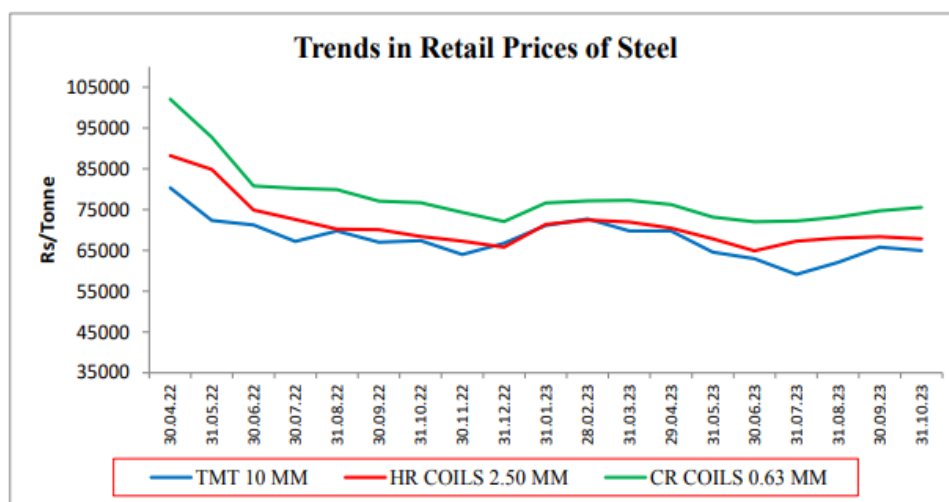
To promote production of Specialty Steel in India, the Ministry of Steel signed 57 MoUs with 27 companies under the Production Linked Incentive (PLI) scheme, which is expected to generate investment of about Rs.30,000 crore and create additional capacity of about 25 MT of specialty steel in next five years.

In view of the rising concerns worldwide, the Gol has also started promoting Green Steel. The Centre plans to support Green Hydrogen based DRI projects as well as push primary steel producers to increase the usage of scrap in steel production.

As per World Steel Association's April, 2023 Short Range Outlook, after growth of 8.2% in 2022, India's Finished Steel Consumption is expected to show healthy growth of 7.3% in 2023. India remained a bright spot in the Global Steel Industry in 2022. Having managed inflation well, the Indian economy is on a healthy growth track, with a rising share of investment in GDP, thanks to strong Government spending on infrastructure. The Real Estate sector is also expected to grow, backed by affordable

housing projects and urban demand. Private investment is improving on the back of the Production Linked Investment (PLI) Schemes.

Steel Prices : Price regulation of iron & steel was abolished on 16.1.1992. Since then, domestic steel prices are determined by the interplay of market forces. Domestic steel prices are influenced by trends in raw material prices, demand – supply conditions in the market, international price trends among others. As a facilitator, the Government monitors the steel market conditions and adopts fiscal and other policy measures based on its assessment. The fluctuations in retail prices of steel (TMT, HRC and CRC) may be seen from the following graph:



Road ahead

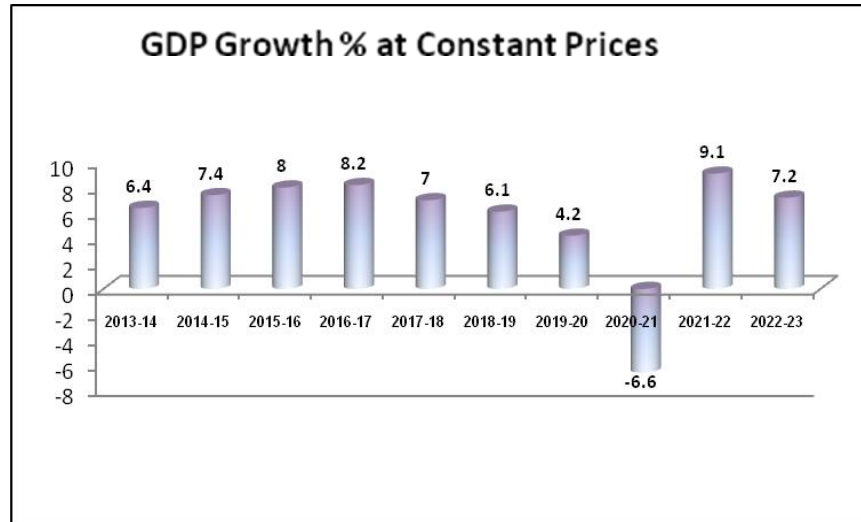
India is the world's second largest producer of crude steel and its steel making capacity is projected to increase to about 300 MT by 2025. Huge scope for growth is offered by strong economy, India's comparatively low per capita steel consumption and the expected rise in consumption due to increased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

Major threats include import dependency of coking coal, rising Chinese exports, overcapacity, worldwide focus towards Green Steel and high dependency on imports of steel making equipment

1.4 Outlook for Indian Economy

India's GDP grew by 7.2% in FY'22-23 as against 9.1% expansion in the previous fiscal. Despite the rate of GDP growth, coming at a slightly lower rate than the previous year, India remained one of the fastest growing economies among major global players.

The GDP growth of 7.2% was higher than the 7% median estimate in a Bloomberg survey as well as the Govt. forecast made three months ago.



RBI successively raised Repo rates from a level of 4.0% in April'22 to a level of 6.5% in April'23 to contain the shooting inflation rate (CPI) which had reached eight year high of 7.8% in April'22. However, inflation has come down subsequently to 4.8% in June'23.

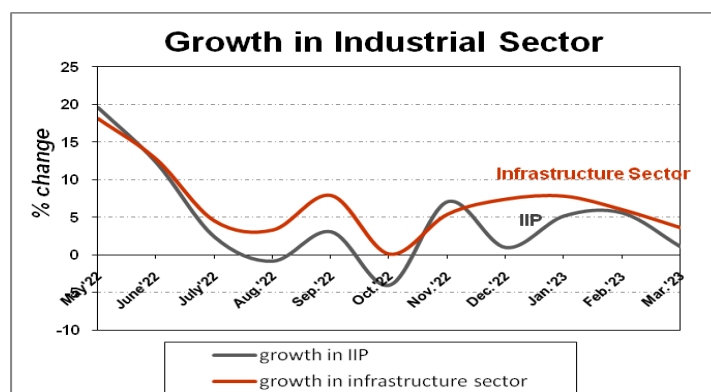
Growth in Index of Industrial Production in the FY'22-23 was 5.1% as compared to 11.4% in the previous year. Growth in Manufacturing, Capital Goods and Consumer Durables sectors in FY'22-23 was 4.5%, 12.9% and 0.5% respectively as compared to 11.8%, 16.9% and 12.5% in the preceding year.

India's merchandise exports faced tough conditions in FY'22-23, due to strong global headwinds and slowdown in major advanced economies. The merchandise exports in FY'22-23 rose to US\$ 447.46 bn., up by just 6.0% over last year. Merchandise trade deficit during the year was US\$ 266.78 bn. due to rising imports especially of coal, oil and gas. However, due to good performance of Services sector, overall trade deficit during FY'22-23 was US\$ 122 bn.

Government of India is giving strong impetus on infrastructure development and increased the outlay for capital investment in the Union Budget for the financial year 2023-24 by whopping 33% to Rs.10 lakh crore, which would be around 3.3% of GDP.

Industry leaders have expressed confidence in the resilience of Indian economy. Amidst all the gloom enveloping the advanced economies, India has emerged as an island of hope for global investors, as its strong domestic demand rebounds after a pandemic-induced slowdown.

The automobile sector is considered to be a strong indicator of the prevailing economic scenario. India's total automobile sales in the Financial Year 2022-23, as per Federation of Automobile Dealers Associations (FADA), witnessed a double-digit growth of 21%, at 2.21 crore nos. (approx.), wherein, all categories, except tractors saw a double-digit growth. Tractors sales, meanwhile, grew by only 8%.



Forecasts for India GDP growth for FY'23-24

<i>RBI</i>	6.5%
<i>IMF</i>	6.1%
<i>Fitch</i>	6.3%
<i>ADB</i>	6.4%
<i>Deloitte India</i>	6 – 6.3%
<i>S&P</i>	6%

1.5 Steel Policies and Recent Initiatives of Ministry of Steel

A. NSP 2017 – Vision, Mission & Objectives

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.

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 indirectly. 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.

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 today is 2nd largest steel producer in the world. There is significant potential for growth given the low per capita finished steel consumption of 82 Kg in India, as compared to world average of 224 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.

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.

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.

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

NSP 2017 aims to increase focus on expansion of MSME sector, improve raw material security, enhance R&D activities, reduce import dependency and cost of production, and thus develop a “technologically advanced and globally competitive steel industry that promotes economic growth” eyeing self-sufficiency in production, developing globally economical steel manufacturing capabilities by facilitating investments and cost-efficient productions with adequate availability of raw materials.

With focus on R&D, the technology would be of utmost focus over the next decade and MSME steel plants would be the key drivers to achieve the additional capacity required for India’s consumption led growth and improvement in the overall productivity and quality.

Expected impact / outcome of NSP 2017 The following targets have been set in the NSP 2017:

S.No.	Parameter	Projections (2030-31)
1.	Total crude steel capacity (in MTPA)	300
2.	Total crude steel demand/production (in MTPA)	255
3.	Total finished steel demand/production (in MTPA)	230
4.	Sponge iron demand/production (in MTPA)	80
5.	Pig iron demand/production (in MTPA)	17
6.	Per Capita Finished Steel Consumption (in Kgs)	158

The other expected impacts are as under:

a) India to be world leader in energy efficiency and sustainability, in association with suitable agency, will constantly monitor techno-economic performance of all the steel plants within the country vis-a-vis the global best practices. Transfer of technology for production of automotive steel and other special steels will be facilitated by JVs with global leaders.

b) 145 Indian Standards for steel and 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 end-use applications, under the mandatory scheme to ensure protection of human health, environment and safety.

c) Attain global standards in Industrial Safety and Health The Ministry is coordinating with steel companies to ensure that on the job trainings on maintaining a safe workplace are provided to employees of the steel companies.

d) Substantially reduce the Carbon footprint of the industry In order to address the environment related issues, the Ministry is facilitating the formation of a forum to chalk out best practices and is also focusing on development of a Waste Management Plan for the industry.

e) Domestically meet the entire demand of high grade automotive steel, electrical steel, special steel and alloys.

Segment wise demand projections :

Segments	Demand (15-16)	Demand (30-31)
Infrastructure (oil refinery, highway, bridges, port, air-port, transportation, urban infrastructure, industrial sheds, pre-fab buildings)	9.5	90
Construction (Real Estate)	23.5	45
Engineering & Fabrication (Capital Goods, Consumer Durables, boilers, General engineering)	35	43
Automotive	2.5	10
Railways	2	5
Packaging (LPG cylinders, grain bins, GI boxes)	2	6
Energy (power projects, wind mills, power transmission)	3	11
Ship Building	4	3
Oil & gas pipeline		4
Defence, space, nuclear		2
Others		11
Total	81.5	230

B. Policy for providing preference to Domestically Manufactured Iron and Steel Products (DMI&SP) Policy in Government Procurement

The Government had introduced DMI&SP Policy on 8th May, 2017 to provide preference to domestically produced iron and steel material in Government tenders. Further, to fine tune this objective, the Policy was revised on 29th May, 2019 and on 31st December, 2020. The salient features of the Policy are as under:

- This policy provides preference to Domestically Manufactured Iron and Steel Products (DMI&SP) in Government procurement.
- The policy covers a list of 49 manufactured products of iron and steel. The policy also covers capitals goods for manufacturing iron and steel products.
- While earlier the domestic content was specified as 15-50% on the 49 products of iron and steel, the new list of 49 products have minimum prescribed value addition

ranging between 20-50% making it difficult for imported steel to compete with domestic bidders for government contracts.

- Each Ministry or Department of Government and all agencies/entities under their administrative control is under the purview of the DMI&SP policy as notified by the Ministry of Steel. All Central Sector Schemes (CS)/Centrally Sponsored Schemes (CSS) for which procurement is made by States and Local Bodies come within the purview of this Policy, if that project / scheme is fully / partly funded by Government of India.
- The policy is applicable to projects where the procurement value of iron and steel products is greater than Rs.5 lakh. The policy is also applicable for other procurements (non-project), where annual procurement value of iron and steel products for that Government organization is greater than Rs. 5 lakh. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this policy.
- The policy is applicable to purchase of iron and steel products by private agencies for fulfilling an EPC contract and/or any other requirement of Ministry or Department of Government or their CPSEs and also to capital goods for manufacturing iron and steel products in compliance to prescribed quality standards, as applicable.
- No Global Tender Enquiry (GTE) shall be invited for tenders related to procurement of iron and steel products. No Global Tender Enquiry (GTE) shall be invited for tenders related to procurement of Capital Goods for manufacturing iron and steel products having estimated value upto Rs. 200 Crore except with the approval of competent authority as designated by Department of Expenditure.
- The policy has provisions for waivers to all such procurements, where specific grades of steel are not manufactured in the country, or the quantities as per the demand of the project cannot be met through domestic sources.

The policy is envisaged to promote growth and development of domestic steel Industry and reduce the inclination to use low quality and low cost (unfairly traded) imported steel in Government funded projects.

Impact of the DMI & SP Policy

The increased domestic value addition is expected to contribute to the vibrant steel sector and the associated industries by generating employment and domestic market for their products. This policy has provided and expected to provide significant savings to the Indian Economy and restrict the use of low quality and cheap imported steel in Government funded projects, alongside developing domestic capability for import substitution. DMI&SP Policy has so far resulted in import substitution of Rs. 26,600 Crore approximately.

C. Steel Import Monitoring System (SIMS) for import data dissemination

Steel Import Monitoring System (SIMS) has been institutionalized which is an online platform for advance registration of intended imports of steel in order to provide granular data on steel imports, 0-60 days in advance to help the Ministry and the industry identify the exact grade being imported into the country in order to plan domestic manufacturing, besides giving advance warning about any surge in imports. SIMS platform was launched on 16th September 2019 for import consignments started at the Port of Entry w.e.f. 1st November 2019. SIMS has enabled the domestic industry to plan their pricing and production strategy and helped the country move towards Aatmanirbhar Bharat in steel making.

D. Quality Control Orders/BIS

Government has been facilitating supply of quality steel for critical end-use applications such as infrastructure, construction, housing and engineering sector. Ministry of Steel is the leading Ministry with maximum coverage of products under the BIS certifications marks scheme. A total of 145 Indian Standards on Steel and Steel products have been covered under Mandatory Quality Control Orders. These orders prohibit, import, sale and distribution of substandard steel products. The imposition of QCO is in the public interest or for the protection of human, animal or plant health, safety of the environment, or prevention of unfair trade practices, or national security as stated in the BIS Act, 2016. Through the aforementioned orders, Ministry of Steel has so far covered 99 Carbon Steel, 44 Stainless Steel and Alloy Steel products standards and 2 Ferro Alloys under the mandatory BIS Certification Scheme. In addition, as per the data of imported steel grades shared with BIS, more than 250 new steel grades have been included in the existing standards and 5 new standards are under preparation. This exercise is facilitating the upgradation of the Indian Steel Standards at par with Global Standards. This exercise is also facilitating indigenization of many of the imported steel grades for import substitution and “Make in India” initiative. QCO notified by Ministry of Steel and also the experience gained from the discussions held with the stakeholders have resulted in several benefits which are highlighted below:

- Strengthening of the Indian Standards and also formulation of new standards by BIS based on the information provided by Ministry of Steel.
- Promote indigenisation of the imported steel grades by bringing in the importers and the domestic steel producers together.
- Preventing unfair trade practices such as misdeclaration and under-invoicing of the imported steel consignments. Based on the information shared by Ministry of Steel, the relevant authorities have imposed measures such as ADD, penalties for misdeclaration, etc.

E. other Key Initiatives :

E.1 Production Linked Incentive (PLI) Scheme: PLI Scheme for domestic production of specialty steel has been approved with an outlay of Rs. 6322 crore by the Cabinet. The five broad categories of Specialty steel, identified under the scheme, are used in a variety of applications including white goods, automobile body and components, pipes

for transportation of oil and gas, boilers, ballistic and armour sheets, high-speed railway lines, turbine components, distribution and power transformers. The Scheme has been notified on 29.07.2021 and detailed Scheme Guidelines were published on 20.10.2021. The application process through online system was available from 29.12.2021 till 15.09.2022.

The scheme is set to commence from FY:2023-24 (PLI to be released in FY:2024-25). 57 MoUs have been finalized out of 67 applications from 30 companies which were selected under the Production Linked Incentive (PLI) Scheme for Specialty Steel. This will attract committed investment of Rs. 29530 crore with a downstream capacity addition of 25 million tonne and employment generation potential of 70000.

E.2 Decarbonization in Steel Sector: Ministry of Steel is continuously engaging with the stakeholders from the steel industry and the concerned stakeholder Ministries/ Departments such as Ministry of Environment, Forests and Climate Change (MoEF&CC), Ministry of Power, Bureau of Energy Efficiency (BEE), Ministry of New and Renewable Energy (MNRE), NITI Aayog etc to achieve net zero emissions by 2070. Detailed discussions on decarbonization and improvement of resource efficiency in Steel Sector were also held in meetings of Consultative Committees of Parliament on “Transition towards Low Carbon Steel-Green Steel on 6th May, 2022” and “Roadmap for Circular Economy in Steel Sector” on 1st July, 2022”. Further, Ministry of Steel hosted a session on the 6th Day of COP 27 event in Sharm-ElSheikh, Egypt on 11th November, 2022 wherein discussion was held on the issues of reducing carbon emissions hinging on technologies such as Green Hydrogen in steel making, Carbon Capture, Storage and Utilization (CCUS), Best Available Technologies on Energy Efficiency as well as transition to Renewable Energy.

E.3 PM GatiShakti National Master Plan: With the help of Bhaskaracharya Institute for SpaceApplications and Geoinformatics (BiSAG-N) the infrastructure Ministries have uploaded their rail, road, port networks, etc. on PM GatiShakti National Portal. Ministry of Steel has onboarded itself on PM GatiShakti Portal (National Master Plan portal) with the help of a mobile application created by BiSAG-N, by uploading the Geo locations of more than 2100 (Twenty one hundred) steel units (including big players) functioning in the country. The Geo location of all the Iron ore Mines and Manganese ore mines has also been uploaded. Ministry of Steel is in the process of uploading the geo locations of the existing slurry pipelines and the laboratories functioning in the steel sector. In addition, Ministry of Steel, in line with the goal of PM GatiShakti Master Plan, has identified 22 high impact projects to develop multimodal connectivity and bridge the missing infrastructure gaps. Planned expansion of railway lines, creation of new inland waterways, roads, ports, gas pipeline connectivity will result in creating much needed logistics solution which will drive the steel sector towards achieving its targeted goals by 2030-31, as delineated in NSP 2017.

E.4 Engagement with Secondary Steel Sector: A major segment of iron and steel industry is the segment of secondary producers which contributes more than 40% to

the production of crude steel. The role of secondary steel sector in infrastructure development is immense. Not only does infrastructure development provide a stimulus to steel demand but steel intensive construction also leads to rapid building up of infrastructure. Considering the importance of this sector, which mostly consists of MSMEs, Ministry of Steel has organised a seminar under the chairmanship of Hon'ble Steel Minister with the aim of providing a platform to players in the Secondary Steel sector to share their views on the challenges faced by the sector and ways in which the Ministry can create an ecosystem in which the industry can thrive. The issues raised during the discussion were taken up with concerned Ministries such as Ministry of Finance, Ministry of Port, Shipping and Waterways, Ministry of Coal, Ministry of MSMEs and Ministry of PNG. Ministry of Steel also organized seminars at Bhuvneshwar, Indore, Roorkee and Surat to interact with secondary steel producers and consumers to enhance steel demand in the country.

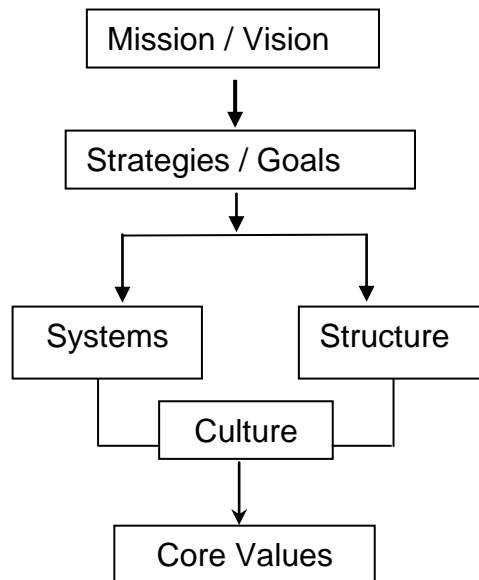
E.5 Steel Prices: Certain measures were taken by the Government to provide relief from high prices of crucial raw materials and intermediates, which included iron and steel. Accordingly, modifications were made in tariffs on raw materials of steel and other steel products vide notification dated 21.05.2022 whereby Import duty on Anthracite/Pulverized Coal Injection (PCI) coal, Coke and Semi-coke and Ferro-Nickel were reduced to zero. Export duty on Iron ores/ concentrates and iron ore pellets was raised to 50% and 45% respectively. In addition, 15% export duty was imposed on pig iron and several steel products.

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, rationale 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 from 158 thousand tonnes (in 1959-60) to 1.6 MT (in 1961-62). 2.5 MT phase of Bhilai was completed on 2nd September, 1967 after commissioning of Wire Rod Mill. The last unit of 1.8 MT phase of Rourkela was Tandem Mill commissioned on 17th February, 1968 and 1.6 MT phase of Durgapur was completed on 6th August 1969 after commissioning of furnace in SMS. Thus, with the completion of 2.5 MT stage in Bhilai, 1.8 MT in Rourkela and 1.6 MT phase of Durgapur, the total Crude Steel output from HSL was raised to 3.7 MT in 1968-69 and 4 MT in 1972-73.

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.

SAIL formed in 1973, as a holding company, for :

- Hindustan Steel Ltd. (HSL)
- Bokaro Steel Limited (BSL)
- Salem Steel Limited (SSL)
- Hindustan Steel Construction Ltd. (HSCL)
- Bharat Coking Coal Ltd. (BCCL)
- National Mineral Development Corporation (NMDC)

In 1978 SAIL was restructured as an operating company :

- Steel making subsidiaries of HSL, BSL and SSL were dissolved and merged
- HSCL, BCCL and NMDC were spun off as independent companies

RINL set up in 1977 continued to be part of SAIL till it became a separate company in February'1982.

Subsequently, companies taken over as subsidiaries :

- Indian Iron & Steel Company ("IISCO") in 1979, (merged with SAIL in Feb.2006)
- Maharashtra Elektros melt Limited ("MEL") in 1986 (merged in July'2011)
- Visvesvaraya Iron & Steel Limited in 1989 (merged with SAIL in 1998)

Erstwhile Bharat Refractories Limited (BRL) merged with SAIL on 28th July'2009 and is known as SAIL Refractory Unit.

SAIL Refractory Company Ltd. (SRCL), became SAIL's subsidiary in December'2011

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 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 57,000 as on 1.12.2023. During FY22-23, the company has clocked its best-ever production while achieving an all-time high revenue from operation of Rs.1,03,768 Cr. and EBITDA of Rs. 9,379 cr.

3.4 Expansion & Modernisation of SAIL:

Steel Authority of India Limited (SAIL) has completed 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, and to introduce customer centric processes and have matching infrastructure facilities in the Plant to support higher production volumes.

Items	(Million Tonnes)	
	Capacity Before Expansion	Current capacity
Hot Metal	16.58	21.79
Crude Steel	15.22	19.15
Saleable Steel	14.60	18.00

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 Mill at Durgapur and Cold Rolling Mill with coupled pickling line & tandem cold Mill at Bokaro Steel Plant, have been installed.

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 MTpa 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 plant was the first in India to produce wide (3600 mm wide) heavy plates. A major exporter of steel products, Bhilai specialises in shaped products, such as heavy rails, heavy structurals, merchant products and wire rods.

Eleven times winner of Prime Minister's Trophy for Best Integrated Steel Plant in the country, Bhilai Steel Plant (BSP) is India's largest producer & supplier of world class rails for Indian Railways including world's longest 130 metre rails in single piece and 260 metre long rail welded panels, and a major producer of large variety of wide and heavy steel plates and structural steel. The plant also specializes in other products such as wire rods and merchant products. The entire range of TMT products (Bars & Rods) produced by the Plant is of earthquake-resistant grade and superior quality. The plant also produces heavy structurals including channels and beams.

Current production capacity of the plant is as under :

Hot Metal – 6.28 MT (Million Tonnes)

Crude Steel – 5.95 MT

Saleable Steel – 5.55 MT

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, Aktiengesellschaft, Duisburg, Germany 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 among India's few Plants producing 100% of the steel through the globally profuse Continuous Casting route since 1998. RSP is the only SAIL plant having capability to produce large dia pipes.

Situated in Odisha, it was the first integrated steel plant in India to produce 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 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. It also produces cold rolled non-grain oriented (CRNO) sheets. RSP is geared up producing defence and space quality plates through a Special Plate Plant.

The Plant has undergone modernization upgradation in two phase. 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.

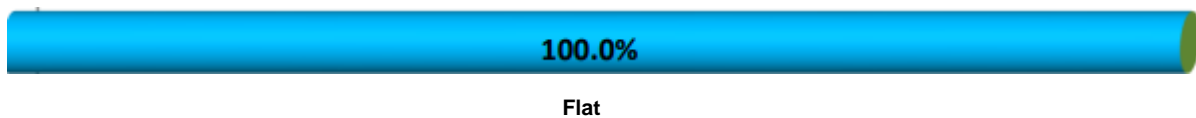
Current production capacity of the plant is as under :

Hot Metal – 4.65 MT (Million Tonnes)

Crude Steel – 3.85 MT

Saleable Steel – 3.67 MT

Product Mix:



PRODUCT-MIX RSP

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

Durgapur Steel Plant (DSP)

Situated at a distance of 158 km from Calcutta, the Grand Trunk Road and the main Calcutta-Delhi railway line pass through Durgapur. It is situated on the banks of the Damodar river.

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 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).

Current production capacity of the plant is as under :

Hot Metal – 2.40 MT (Million Tonnes)

Crude Steel – 2.20 MT

Saleable Steel – 2.12 MT

Unique feature of this plant is its Wheel & Axle Plant for making forged wheels and axles, catering to Indian Railways. Over the years plant has developed various types of wheels as per need of Railways.

Products from DSP's state of the art Medium Structural Mill (MSM) have been accredited with stringent CE marking certificate to promote their export.

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 from the earlier dependence on foreign sources of know-how and consultancy, design and equipment, engineering, supervision and erection to almost a full measure of self-reliance and confidence.

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 designed to produce flat products like Hot Rolled Coils, Hot Rolled Plates, Hot Rolled Sheets, Cold Rolled Coils, Cold Rolled Sheets and Galvanised Plain Sheets/Coils.

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.

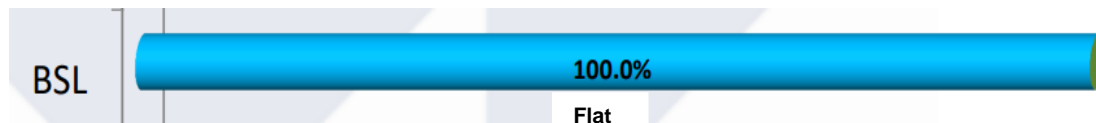
Current production capacity of the plant is as under :

Hot Metal – 5.69 MT (Million Tonnes)

Crude Steel – 4.65 MT

Saleable Steel – 4.24 MT

Product Mix:



Product-mix
HR Coils, HR Plates, HR sheets
CR Coils and Sheets
GP sheets/coils

IISCO Steel Plant (ISP), Burnpur

This full-fledged integrated steel plant is one of India’s oldest. 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.

Promoted by Burn & Co., the Indian Iron and Steel Company was incorporated on 11 March 1918. The iron works were set up at Hirapur. IISCO produced iron from an open-top blast furnace at Hirapur in West Bengal.

An open-top blast furnace, had earlier been set up in 1870 at Kulti, by a company known as Bengal Iron Works Co. (BIW), founded by James Erskine. The plant was taken over by the Government in 1881. In 1889, it was taken over by the newly formed Bengal Iron & Steel Co. Around 1904, Bengal Iron & Steel Co. (BISCO) converted the open top furnaces into closed top furnaces, and installed facilities for producing steel, through open hearth furnaces. The unit held the proud distinction of being the owner of India’s “oldest unit producing pig iron by modern methods” at Kulti.

BISCO 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 MT of ingot steel and 0.8 MT of saleable steel.

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.

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).

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 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.

Current production capacity of the plant is as under :

Hot Metal – 2.77 MT (Million Tonnes)

Crude Steel – 2.50 MT

Saleable Steel – 2.42 MT

Product Mix:



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

Alloy Steels Plant (ASP)

A 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.

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.

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.

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.

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.

Chandrapur Ferro Alloy Plant (CFP)

Chandrapur Ferro Alloy Plant, (CFP) erstwhile Maharashtra Elektros melt 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.

CFP has an installed capacity of 1,24,000 TPY Silico-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 and one no. 45 MVA Submerged Electric Arc Furnaces, two nos. Manganese Ore Sintering Plants, Furnace gas based Power Plant 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) was 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:

SRU has four production units, out of which three are situated in Jharkhand and one in Chhatisgarh. The units at Jharkhand include (i) Bhandaridah with a production capacity of 26,000 tons of Tap Hole Mass for Blast Furnace, various Castables and Fire Clay Bricks, (ii) Ranchi Road with a production capacity of 7,500 tons of Basic Masses and Magnesia carbon Bricks and (iii) 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.

1) Iron ore Mines

SAIL operates 14 iron ore mines spread over the states of Jharkhand, Odisha and Chhattisgarh. There are 22 mining leases held by SAIL for operation of these mines. Most of these leases were granted in the 50's and 60's or earlier and almost all of them are undergoing second/subsequent renewal/extension of lease along with various statutory clearances.

State	JHARKHAND	ODISHA	CHHATTISGARH
Mine	Kiriburu, Meghahatuburu, Gua and Chiria (4)	Bolani, Barsua & Kalta, Taldih (4)	Rajhara Mechanical, Mahamaya, Dulki, Jharandalli, Dalli Mechanical and Rowghat (6)

Barring a few leases in Jharkhand, Odisha and Chhattisgarh, all other iron ore leases have been extended as per Mines & Minerals (Development & Regulation) (Amendment) Act, 2015. In addition, issue of execution of composite license for Thakurani (Block-A) is pending with Odisha Government.

Iron ore Production :

Iron ore mines of SAIL currently produce about 34 Million Tonne Per Annum (MTPA) of iron ore. Details of the iron ore produced during last five years including current year are placed below:

Quantity: Million Tonnes

MINE	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24 (Apr-Oct)
JHARKHAND						
Kiriburu	3.89	3.91	3.83	4.05	4.05	2.06
Meghahatuburu	3.66	3.73	2.97	3.56	3.67	1.98
Gua	3.67	3.69	3.10	4.15	3.96	2.37
Chiria (Manoharpur)	0.73	0.74	0.55	0.08	0.34	0.30
ODISHA						
Bolani	5.63	5.92	6.24	7.05	7.11	4.26
Barsua	1.86	1.75	2.26	2.55	2.29	1.42
Taldih	0.30	1.01	1.09	1.25	1.34	0.70
Kalta	1.72	1.71	2.49	3.17	3.19	1.48
CHHATTISGARH						
Rajhara Mechanical	3.52	3.46	3.98	3.49	3.54	2.19
Mahamaya						
Dulki						
Jharandalli	3.37	3.36	3.55	4.80	4.22	2.36
Dalli Mechanical						
Rowghat	-	-	-	-	0.07	0.23
TOTAL	28.35	29.28	30.06	34.15	33.78	19.33

1.2 Coal Mines

Coking Coal is critical raw material required by the steel industry. Indigenous availability of appropriate qualities of coking coal is limited due to which the steel industry is dependent upon imported coking coal. SAIL imports about 80-85% imported coal and blends it with coking coal from own washery and washed coking Coal available from CIL.

SAIL has Chasnalla, Jitpur and Ramnagore working coal mines allocated to erstwhile IISCO. Chasnalla and Jitpur colliery are located in Jharia coal field, Dhanbad, Jharkhand and produce coking coal while Ramnagore Colliery is located in Raniganj coalfield which produces non-coking coal.

Raw coking coal produced from Chasnalla and Jitpur mines is processed at Chasnalla Washery along with raw coal from BCCL/CCL sources. Presently about 0.7 Mtpa washed coking coal at 18% Ash is being produced from Chasnalla washery and supplied to steel plants. Middlings are also supplied to steel plants for power generation.

In addition to above, washed coking coal is also supplied from BCCL/CCL washeries. Thermal coal produced from Ramnagore (West Bengal) is also supplied to steel plants through Chasnalla washery siding after blending it with the middling of Chasnalla Washery.

SAIL is in the process of developing a 4 Mtpa raw coking coal mine at Tasra which is also located in Jharia coal field, Dhanbad. For development of a 4 MTPA, mine at Tasra Coal Block, Consortium of M/s Power Mech Projects Limited & M/s P C Patel Infra Pvt. Ltd. was appointed as MDO and Coal Mining Service Agreement (CMSA) was signed on 08.09.2023.

1.3 Limestone, Dolomite mines : In addition, SAIL holds captive mining leases of limestone and dolomite mines -

1. Kuteshwar limestone Mines, M.P.
2. Nandini Limestone Mine, Chhattisgarh
3. Hirri Dolomite Mine, Chhattisgarh

Central Coal Supply Organisation (CCSO)

CCSO, Dhanbad, is responsible for daily movement of washed Coking Coal and Power grade coal to all Integrated Steel Plants of SAIL and also coordinates movement of Raw Coal from BCCL to Chasnala Washery.

Functions of CCSO

- 1) Linkage planning for all steel Plants under SAIL.
- 2) Proper assessment of quality of indigenous coal at loading points.
- 3) Liaisoning with the Coal Companies to supply coal as per the desired quality and quantity to SAIL Plants.
- 4) Liaisoning with Railways to supply rake as per the requirement plan of SAIL Plants.
- 5) Liaisoning with third party for joint sampling of rakes at loading point.
- 6) Maintaining all records and statistics related to production and dispatch of coal.
- 7) Exploring new source of coking coal for washing at Chasnala and other Washeries.
- 8) Ensuring long terms security of Coking Coal for SAIL Plants through participation in linkage auction of Coking Coal conducted by CIL.
- 9) Meeting short term additional requirement of Coking Coal through participation in exclusive auction of Coking Coal conducted by CIL.

Supply of Coal from CCSO

SAIL / CCSO currently plans to supply approx. 2.6 MTPA of washed coking coal and 4 MTPA of Boiler coal from domestic sources including captive colliery at Chasnalla to different SAIL Plants.

Central Marketing Organisation (CMO) : -

SAIL's marketing set-up, is the India's largest industrial marketing set-up. The Sales & Marketing of all prime products produced by SAIL is undertaken by Central Marketing Organisation (CMO), except for Stainless Steel produced by Salem Steel Plant (SSP) which is directly dealt by SSP. However, Mild Steel Hot Rolled Coils produced at Salem Steel Plant are sold through CMO.

CMO handles prime products of the 5 Integrated Steel Plants & 2 Special Steel Plants, located across the Country in the states of West Bengal, Jharkhand, Odisha, Chhattisgarh & Karnataka.

Total Sales during FY 2022-23 was about 16.2 MT, including 0.425 MT in exports.

SAIL has been contributing in Nation building since inception by servicing the requirement of various Infrastructure Projects and also projects of Strategic Importance. The focus on Nation building has expressed itself in the growth of sales in different categories like TMT, Structural and PM Plates.

Extensive Network: SAIL has the largest marketing network among all steel producers in the Country. As on 31st, March 2023, SAIL's functional network of marketing offices consists of 37 Branch Sales Offices, 5 Customer Contact Offices, 18 Departmental Warehouses and 17 functional Consignment Agency yards, 2 Consignment handling agency yards. Marketing efforts are further supplemented through SAIL's Retail Channel that reaches quality products to remote corners of India.

The CMO Head Quarter is located at Kolkata. In addition to sale of steel products, other activities performed by CMO include Warehousing & Logistics, Branding & Brand promotion, Market Analysis and Research, Development of new products, Creation and Management of new Distribution Channels etc.

SAIL exports steel products through its International Trade Division (ITD), New Delhi.

Wide range of Products: The products handled by CMO include Hot Rolled Coils & Sheets, Cold Rolled Coils & Sheets, Galvanised Products, Plates, Reinforcement Bars, Structural, Rails, Wheels & Axles, Wire rods, Pipes & Tubes, Electrical Sheet, Semi-finished Steels, Alloy Steel products, etc. in numerous grades and sizes.

Inspired by the Government's clarion call for "Atmanirbhar Bharat" and "Vocal for Local",

SAIL is relentlessly making efforts in developing grades/sizes, which can play important

role in these Missions. The new grade of steel developed by SAIL's Salem Steel Plant "Duplex Stainless Steel" is an effort in that direction. This steel has superior corrosion resistance with higher strength and formability and has been mainly imported so far. SAIL

came up with new grades of steel like -

ISP: AWS A5.17 EM12K, 5.5 mm and AWS A5.23 EA2 (Mo bearing) at WRM for welding applications

DSP: Ultra Low Nb Structural (E-350 BR) IS 2062 E410 C. Channel 300 was rolled at DSP for first time.

BSP: IS 7887 CAQ Gr1 and EWNR Wire Rods 5.5/6/7mm at WRM

RSP: HSFQ 450 and MC-30/40/55 at HSM II

BSL: EN 10025-5/ IS 11587 HR Coils at HSM.

International presence: International Trade Division of CMO, located at New Delhi, is responsible for exports of SAIL products. During 2022-23, SAIL Steel was exported to about 8 Countries. Major countries where exports of SAIL products have been undertaken in 2022-23 are UAE, Qatar, Saudi Arabia, Italy, Nepal, Sri Lanka, Bangladesh and Indonesia. During Q1 of 2023-24, 0.15 Million Tonne was exported to four Countries namely UAE, Italy, Nepal and Sri Lanka.

To increase SAIL's footprint globally, continuous efforts are being made to add new markets. Apart from traditional markets in the neighbouring region, exports are also being targeted in new markets of Europe and Canada.

SAIL has a leadership position in consumer mind space and is always striving to bridge the ever changing expectation gaps with improved services, products and processes.

Some of the Marketing efforts and initiatives by SAIL are broadly listed below:

Development of new products and customer outreach

Continuous efforts are being made at SAIL to develop new products required by steel users. New products have been developed for various commercial and strategic applications like Steel for Shipping containers, Weather resistant steel for Vande Bharat Coaches, High Strength Steel for Pre-Engineered Buildings, Fire-resistant steel, Seismic grade TMT bars, Special steel plates for submarines, New Electrical steel grades, High Tensile Structural & Plates with improved ductility for Defence, Various grades of API for Oil & Gas pipeline; High Tensile grades for EME segment, High Carbon Wire rods for Wire drawing, etc. SAIL supplied major portion of Stainless steel to Railways- Vande Bharat Coaches.

SAIL has continued the thrust on "NEX " brand of structurals. Efforts have been made to popularise usage of steel in designing in general and increase usage of "NEX " Brand of SAIL Structural through virtual meeting with customers, webinars and participated in virtual workshop sessions in-house and also by structural designers & Architects. To popularize and give impetus to the use of SAIL Structural, company has undertaken various campaigns to promote NEX from SAIL. Further various creative designs and content have been developed which is being used in form of posters , banners , standee and hoardings during various customer meets/ Architect & Structural Designer meets to popularize NEX Brand of SAIL Structural. In addition Tier I Distributors of Structural are promoting NEX brand through advertisements/hoardings etc.

SAIL has an extensive dealership network comprising more than 4800 dealers spread across the Country. SAIL is in the process of strengthening its retail channel to reach steel to the hinterland and individual steel consumers. In order to reach out to the end customer in the Retail Segment through an efficient distribution channel and providing value addition through products, delivery and services to customers, a 2-Tier Distributor Channel has been established by SAIL across the Country.

For enhancing usage of steel in designs, SAIL has been conducting workshops/lectures at engineering colleges across the Country. Seminars have been held for architects and designers on the theme "New Challenges in Steel Design & Construction" for promoting steel structure designs.

Cross functional teams comprising representatives from Marketing and Plants are formed for development of new products. Physical meetings/interactions over virtual modes are organized with various stakeholders to enhance product knowledge, facilitate product development and create product recognition and recall.

SAIL has been actively pursuing with various Ministries to put emphasis on Life Cycle Cost in projects and on Government initiatives aiding increased usage of Steel.

SAIL participates in webinars, conferences, seminars, etc. on Steel and its' usage conducted by Industry & professional associations and institutes, including sponsoring programs where deemed suitable.

SAIL is actively utilizing its Social Media accounts like Twitter, Facebook, Instagram, LinkedIn, YouTube etc. for promoting Steel Usage.

Important customers are provided single window service by a dedicated Key Account Manager. This has improved communication, quality of service and customer satisfaction, particularly for large customers who are spread over multiple locations across the Country and would otherwise need to contact SAIL at many points.

Efforts to enhance Availability and Reach

Towards digitalization AI based Chatbot '**SAIL SARATHI**' has been introduced for facilitating easier navigation & information accessibility for customers and visitors.

SAIL also owns an E-portal (www.sailsuraksha.com) where customers can book TMT orders online.

In order to help promote and build acceptance of steel usage in rural areas, SAIL has an ongoing programme under "Gaon Ki Ore" campaign, for working with village level public decision makers, opinion makers, masons, builders, etc. Under the campaign, 363 workshops have been conducted during the financial year 2022-23 across the Country with focus on small consumers, etc. During Apr-May '23-24, 90 workshops have been held.

Research & Development Centre for Iron & Steel (RDCIS)

Research & Development Centre for Iron and Steel (RDCIS) is the corporate R&D unit of SAIL. Set up in 1972, RDCIS is registered under DSIR as an approved R&D unit. RDCIS is the nodal agency for product development and intellectual property management in SAIL. It undertakes R&D projects in diverse realms of iron and steel technology under the categories of Basic Research, Product Development, Plant Performance Improvement, Scientific Investigation and Development and Technical Services. RDCIS has around 121 dedicated and competent scientists and engineers who are specialists in their fields.

RDCIS provides customers with prompt, innovative and cost-effective R&D solutions, develops and stabilizes new products and continually enhances the capability of its human resources to emerge as a centre of excellence. The major efforts are directed towards product development, cost reduction, quality improvement, energy

conservation and value-addition to products of SAIL and in providing application engineering support for products at customers' end through a well established marketing network of SAIL.

RDCIS offers technological services to various organizations in the form of transfer of know-how of technologies developed by RDCIS, consultancy services / contract research, specialized testing services and training. This helps to establish its credibility as a knowledge centre, besides generating revenue through external earning.

RDCIS also enters into collaborative agreements with various institutes of national repute, Govt. of India organizations and international organizations to upgrade its knowledge base and develop new technologies and products.

RDCIS plays an increasingly vital role towards meeting the current as well as future needs of the SAIL steel plants/ units and its external customers. This depends on the availability of research facilities and their utilization. The Centre has created state-of-art facilities to ensure in-depth scientific research in diverse fields of iron and steel technology. It is equipped with more than 500 advanced diagnostic equipment and 5 pilot facilities under 15 major laboratories.

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 major central trade unions and management of major steel producers of the Country, on promoting safety. Occupational health and pollution control measures.

Centre for Engineering & Technology (CET)

Centre for Engineering & Technology (CET), 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. 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.

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)

Environment Management Division (EMD), established on 23rd June, 1988, is the corporate unit of Steel Authority of India Limited (SAIL) headquartered at Kolkata and is certified with Quality Management System (QMS) linked with ISO 9001: 2015. The division is under the Directorate of Technical, Project & Raw Materials and headed by the Executive Director (EMD).

The primary role of EMD is to apprise the management of environment and pollution control activities at plants, mines and units located across India. It also plays a pivotal role in consolidation of the efforts of the plants, mines and units towards environment protection and resource optimization through its multifarious activities. Overall activities of EMD are described below:



SAIL, as a responsible corporate organization, is always committed to maintain a clean and sustainable environment in and around its plants and units by integrating sound environmental practices for control and prevention of pollution from all its activities.

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 and Scope 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 Government 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.

The MoU in respect to SAIL is being finalized by Department of Public Enterprises [DPE] on consolidated basis only (i.e. including all subsidiaries and JVs of SAIL). MoU target setting and its evaluation in respect of SAIL's subsidiary maybe done by SAIL on the same principles as being followed for SAIL by DPE.

4.2 The MOU Framework:

The parameters included in the MoU process are market oriented reflecting the shareholders' interest in terms of growth in revenue, return on net worth, asset turnover ratio and market capitalization for listed CPSEs.

The parameters are further indexed to past performance and future projections of the CPSE; vision of the Administrative Ministry; sectoral benchmarking and peer comparison (if any). Vision provided by the Administrative Ministry is also considered for Benchmarking.

All the parameters are quantifiable and verifiable from the documents in public domain.

Besides certain government's priorities/ programmes such as CSR, procurement from MSEs, 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.

4.3 Digital dashboard:

A digital dashboard with a centralized portal developed by DPE is being used for entering, signing, monitoring and evaluating MoU agreements. The CPSEs and Administrative Ministries would be on boarded with appropriate user roles.

4.4 MoU Evaluation:

Once the Company's data from its audited balance sheet and P&L Statement is available on the dashboard, the score would be automatically calculated against the benchmarked targets. There would be no adjustment in MoU agreement due to changes in **MoU exchange rate, prices of raw material or finished goods or due to offset for any other reason as these are deemed to be normal business activity and audited statement of accounts declared shall prevail.** The criterion for evaluation of score is as below:

- Proportionate marks for achievement of 50% to 100% Targets - Applicable to all parameters unless specified by DPE for a certain parameter.
- No marks for achievement below 50.00% of Targets.
- Score on all parameters would be added to arrive at aggregate score.

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

The Final aggregate Score is arrived at after deduction of marks towards non-compliance from the aggregated score.

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

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 Liberalization Era**'.

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

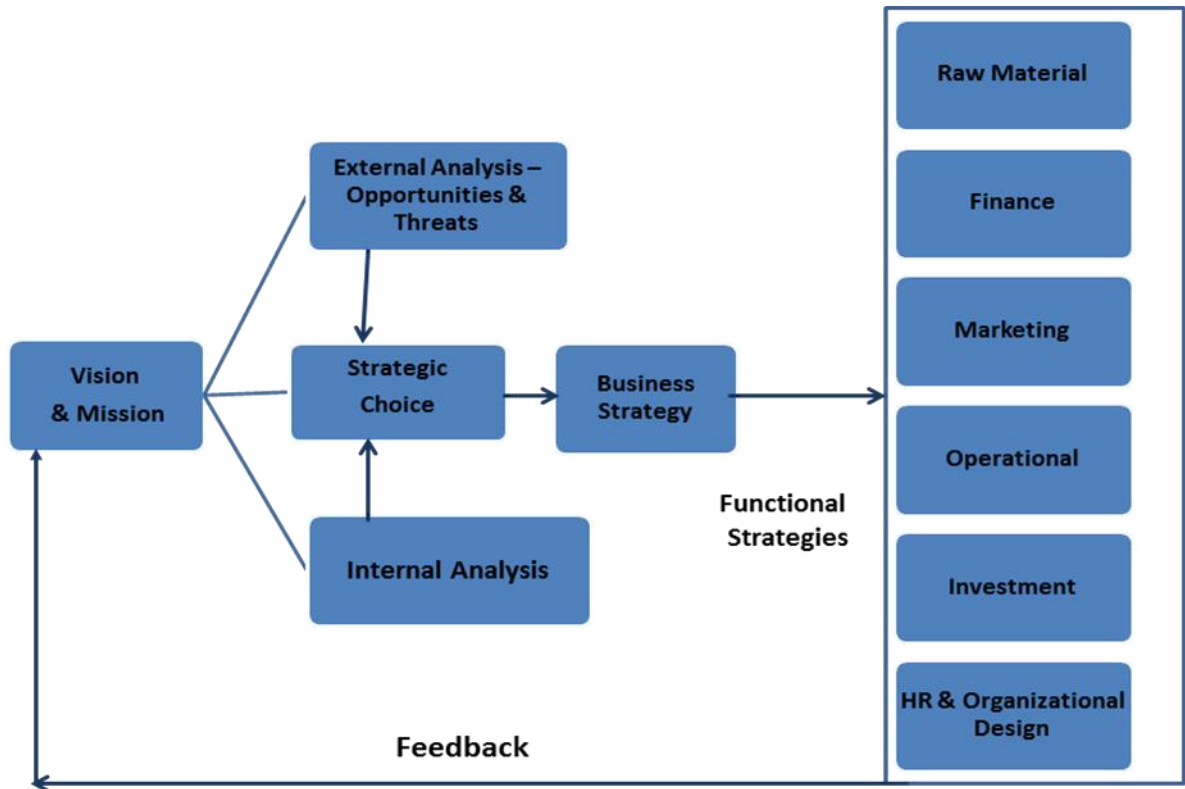
Post 1990s, the dramatic changes in the Indian economy made it critically important to understand how the steel sector and in particular individual steel producers are moving into the global economy. Therefore, it has become imperative to

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 distribution controls removed

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

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 range 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

- 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

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		<ul style="list-style-type: none"> International Coal Ventures Ltd set up as JV with CIL, RINL, NMDC and NTPC to acquire coal assets globally
ENERGY		<ul style="list-style-type: none"> JVs with NTPC and DVC for power plants for captive consumption
CEMENT		<ul style="list-style-type: none"> Bhilai Jaypee Cement Ltd. -Slag based cement plant of 2.1 million tonne per annum capacity with grinding unit at Bhilai & clinkering unit at Satna
WAGON MANUFACTURE		<ul style="list-style-type: none"> JV for manufacture of specialized wagons
E-PORTAL		<ul style="list-style-type: none"> JV with Tata Steel to promote e-commerce activities in steel and related areas
STEEL PROCESSING		<ul style="list-style-type: none"> JV with BMW Industries Ltd. JV with Prime Gold group

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.

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, Chhattisgarh 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

Year	Hot Metal (mtpa)	Iron Ore Consumption (mtpa)	Linkage of Iron Ore
2022-23	19.41	33.20	Existing Mines
Post Expansion 2030-31	33.36	57.75	<ul style="list-style-type: none"> • During the expansion, Gua, Taldih, Rowghat & Bolani production capacity shall be enhanced to meet the Iron Ore requirement. • SAIL is having plan to install Pellet manufacturing Plants at different plants/mines location having total capacity of 19.2MTPA by 2030-31.

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 2023)

Mines	Existing Capacity (in mtpa) as in Dec'23	Capacity after expansion (in mtpa)	Remarks
Kiriburu	5.50	5.50	<ul style="list-style-type: none"> At Bolani, Tertiary crusher installation is in final stage. Gua: Capacity expansion through MDO route. Is under process. **Depleted resources and quality constraints at Dalli-Rajhara.
Meghahatuburu	5.00	5.00	
Bolani	9.50	10.00	
Gua	4.25	10.00	
Rajhara, Dalli	8.70	7.00**	
Barsua, Kalta, Taldih	9.0	14	Expansion through MDO route for Taldih mines for 7 mtpa under progress. EC for 16mtpa ROM (Barsua-4+Taldih-8+Kalta-4) granted.
Rowghat/Kalwar Nagar	0.3	12.00/1.00	<p>MDO has been engaged wef 25.09.2017 for development of 14mtpa mine.</p> <p>Interim mining to a tune of 3 lakh tonne per annum started on 05.02.2021.</p> <p>Fresh EC of 2mtpa has been granted for interim mining.</p>
Chiria	0.75	0.75	Further expansion will be taken up after availability of lease extension/Forest Clearance.

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 1700 MT. Presently, SAIL manages 10 iron ore mines and 3 operating flux mines.

Mine s	State	Year of Commissioni ng	Rated Capacity (in MT) as on Dec'23	Finished Production (2022-23)(in MT)
Iron Ore				
Kiriburu Iron Ore Mine	Jharkhand	1964	5.5 0	4.00
Meghahatuburu Iron Ore Mine	Jharkhand	1985	5.0 0	3.70
Bolani Ore Mines	Odisha	1960	9.5 0	7.10
Gua Ore Mines	Jharkhand	1919	4.2 5	3.95
Manoharpur Ore Mine	Jharkhand	1901	0.7 5	0.35
Barsua Iron Mines	Odisha	1960	3.0 0	2.30
Kalta Iron Mine	Odisha	1966	4.0 0	3.20
Taldih Iron Mine	Odisha	2016	2.0 0	1.35
Rajhara, Dalli	Chhattisgar h		8.7 0	7.75
Rowghat	Chhattisgar h	2021	0.3 0	0.10
Flux				
Kuteshwar Limestone Mines	Madhya	1974	2.3 2	1.00

(Limestone)	Pradesh			
Bhawanathpur Limestone Mine	Jharkhand	1979	0.12	-
(Limestone)				
Tulsidamar Dolomite Mines	Jharkhand	1970	0.30	-
(Dolomite)				

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.

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 (concurrent) 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 requirement of 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 demurrages.

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. 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 and coal chemicals. In addition, SAIL also supplies 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 policies 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
- 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.

Investment in Capacity Creation

Funding agencies: various banks

Design and consultancy organisation: MECON, M N Dastur & Company, foreign collaborations, BHEL, foreign equipment suppliers etc.

8.3 Organizing Production

Sources of Inputs:

Coal India Limited (CIL), 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:

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

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 SAIL Consultative Committee, 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. In addition CAG also audits SAIL from time to time.

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

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, is well known. 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 1 tonnes of coking coal, 500 units of electricity and 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.

Indian Railways is a very important stakeholder for SAIL.

e) Coal

Steel plants need good metallurgical coal for conversion to hard coke, which is required as a fuel and reductant in blast furnaces.

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.

f) Power

The steel plants need a large amount to power and are heavily dependent on public utilities like DVC.

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.

Chapter – 9

Environment Management in SAIL

9.1 Introduction:

From times immemorial, steel has played a crucial role in the development of societies as well as nations at large, and continues to be the backbone of the modern industrial society. No material yet invented by man can match the versatility of steel in terms of strength, availability, durability, formability, affordability, recyclability and cost. Steel is at the core of a green economy, in which economic growth and environmental responsibility work hand in hand. As a product, it is the most eco-friendly amongst all the materials. Once steel is produced, it becomes a permanent resource because it is 100% recyclable without loss of quality and has a potentially endless life cycle. Steelmaking processes and related activities consume materials and resources and generate significant amount of emission, effluent and wastes. Air, water and land are affected due to the environmental impacts of the steelmaking operations.

The sustainable consumption of resources by employing efficient processes and activities helps in alleviating the overall environmental impacts of an industry by reducing wastage of resources, thereby mitigating the production of wastes, emission and effluent. Pollution control measures ensure that wastes, emission and effluent are properly treated and disposed in a manner to have none or minimal environmental impacts at the end of the process. Key environmental concerns for the iron and steel industry are the emission of air pollutants, effluent, production of greenhouse gases and the management of solid as well as hazardous wastes.

SAIL lays a strong emphasis on environment impacts and its mitigation, along with production and profitability and considers clean environment practice at the core of its every industrial activity. The **Corporate Environmental Policy** emphasizes conducting our operations in an environmentally responsible manner to comply with applicable regulations and striving to go beyond.

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:

- Protect the environment by integrating sound environmental practices for control and prevention of pollution from all its activities.
- Comply with legal and other requirements pertaining to the environment, forests and wildlife and to go beyond.
- Systematic approach of environment management by accreditation with Environment Management System.

- 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.
- Promoting innovative environment-friendly processes and products.
- Ecological restoration of degraded mined out landscapes.
- Integrate principle of “reduce, recover, recycle and reuse” in its operations for conservation of natural resources, including water, to ensure sustainable future.
- Continual improvement of environmental performance by setting challenging targets, transparent reporting system and robust review mechanism.
- Continuously monitor emissions, discharges and ambient air quality and uplink with SPCB and CPCB portals for self-regulation of environmental deviations, if any.
- Communicate environmental performance to all stakeholders through annual report, Board report, Corporate Sustainability Report and all such means from time-to-time.
- Engaging employee for commitment and responsibility towards environment protection through capacity building.
- Promoting environmentally responsible behaviour amongst all stakeholders.

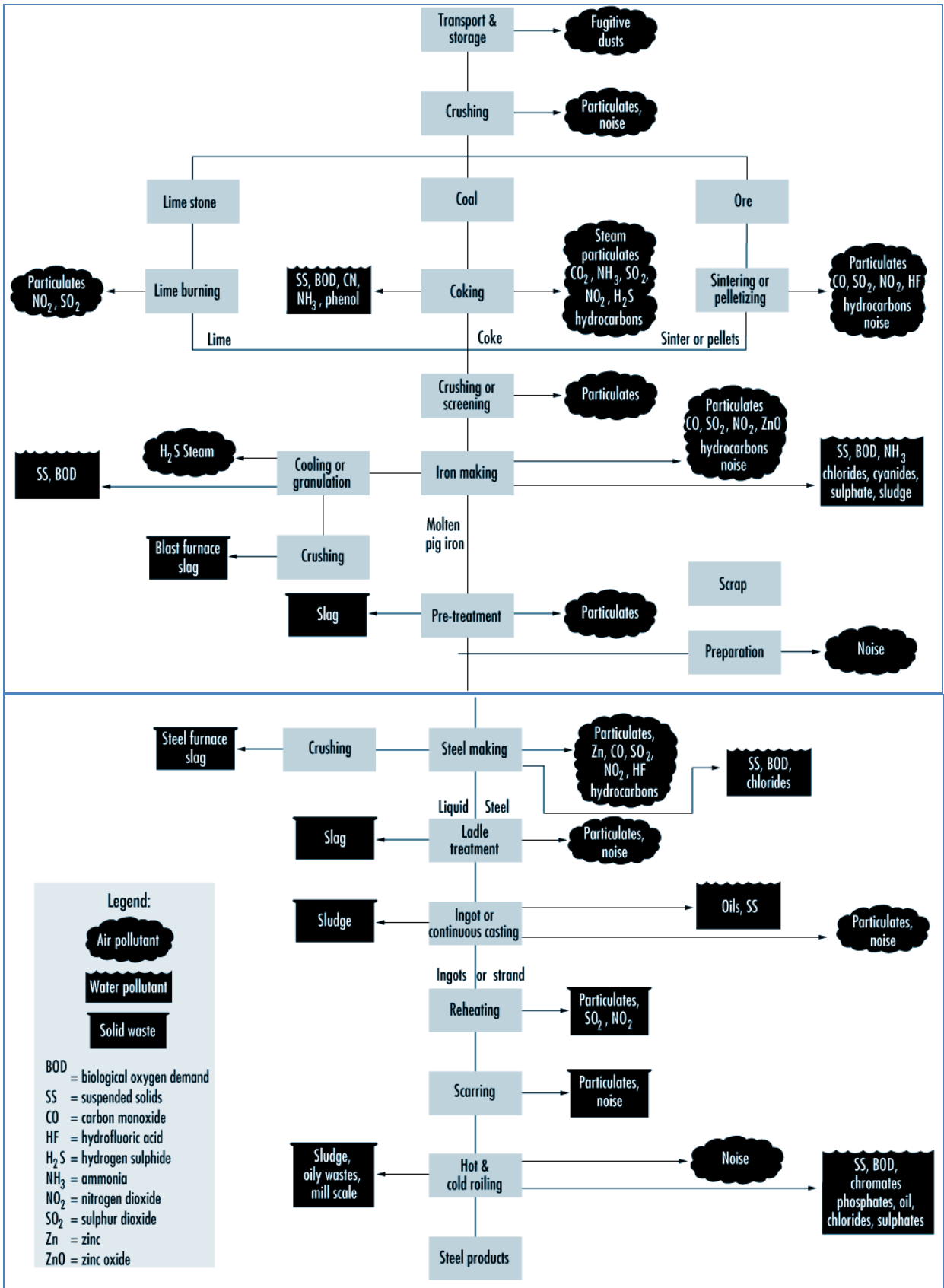
Environmental concern associated with steelmaking

The production of steel in an integrated steel plant involves several operations, starting from use of raw materials like iron ore, coal and flux in production of hot metal and further processing of hot metal into steel and subsequently, rolling of steel into finished products in the rolling mills.

Several environmental pollutants are released in an integrated steel plant during the various processes from raw materials to finished products. Emissions such as carbon dioxide (CO₂), sulphur oxides (SO_x), nitrogen oxides (NO_x) and dust are generated due to use of energy and raw materials in the steelmaking process. Water is used throughout the plant for cooling, heat transfer, descaling, dust scrubbing, quenching and other processes, thus converting to wastewater after use. One more factor which affects the environment is the noise which is produced during the operations of plant machineries. During the course of steelmaking process, many solid wastes are generated which include blast furnace (BF) slag, BF flue dust, BF sludge, BOF slag, BOF sludge, mill scale, waste refractory bricks etc. BF slag and BOF slag contribute the major share of solid wastes generation in the steel industry.

In short, there are four types of pollutants, viz. air emissions (primary and secondary emissions), effluent discharges, generation of noise and solid waste. The generation quantity of various types of pollutant differ from one steel plant to other depending upon the steelmaking processes adopted and pollution control equipment installed.

Different pollutants and sources of pollution in an integrated steel plant are depicted below:



9.2 Environment Management

As an environmentally conscious and responsible company, SAIL takes its responsibility sincerely towards protection of the environment both at its plants & mines and the community in which it operates, and is dedicated towards the practices of environmental techniques/procedures to achieve sustainable development. Environment management at SAIL is a multi-layered process. All environmental programmes at SAIL plants/units and mines address critical issues such as resource optimisation, environment protection, mitigation of adverse environmental impacts, if any, as well as smooth operational and maintenance programmes for environment and pollution control devices and facilities.

SAIL established the corporate unit “Environment Management Division” (EMD), headquartered at Kolkata, on 23rd June, 1988, for sound management of environment at plants/units and mines of the company as well as promote sustainable environment management practices across SAIL. EMD has its unit office at Delhi. EMD is certified with Quality Management System (QMS) linked with ISO 9001:2015.

The primary role of EMD is to apprise the SAIL management regarding the environment and pollution control activities at plants/units and mines located across India. It also plays a pivotal role in consolidation of the efforts of the plants/units and mines towards environment protection and resource optimization through its multifarious activities involving

- proactive interface between SAIL units and the regulatory agencies,
- monitoring and assessment,
- technology dissemination and
- awareness campaigns etc.

Salient activities of EMD are outlined below:

- Coordination with the plants/units and mines for environmental compliance
- Development of Management Information System (MIS)
- Environmental appraisal of project proposals
- Sustainability Reporting, Managing ESG Risks, Sustainable Development (SD) Projects, Development of Corporate Environmental Vision/Policy and Action Plans
- Reporting of deviations w.r.t. Environmental Rules & Regulations, Directions issued by different regulatory authorities to SAIL Board through Board Sub-committee on Health, Safety & Environment
- Facilitating both SAIL and individual units for participation in various environment related awards
- Review of environmental performance of SAIL plants/units and mines
- Facilitating SAIL plants/units and mines for the following activities:
 - Obtaining statutory clearances like Environmental Clearance (EC), Consent to Operate (CtO), Authorisation etc.
 - Solid Waste Management, Water Conservation, Plantation

- Addressing Climate Change Issues, Life Cycle Inventory & Life Cycle Assessment (LCA)
- Liaisoning with State/Central statutory authorities/ministries
- Implementation of Environment Management Systems: EMS (ISO 14001)
- Organising workshops/ training programmes
- Coordination with World Steel Association (WSA), Indian Steel Association (ISA), & other Indian Industrial bodies/associations.
- Compiling environmental data/information for replies to the queries raised in the Parliament

Along with corporate EMD, Environment Control Department (ECD) was also set up at individual plant to closely monitor the environmental performance of the plants and take care of the statutory environmental requirements at plants. Similarly, Environment Cell had also been established at mine level to look after the environmental activities at the mines. Major functions of these departments are:

- Monitor and report the quality of emission from the stacks, effluents and ambient air in and around plants as per the guidelines issued by statutory agencies, viz. Ministry of Environment Forests & Climate Change (MoEFCC), Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB), etc.
- Obtain clearances/consents/authorisation as per regulatory requirements.
- Submit compliance reports to statutory bodies as per requirement of various rules/regulations.
- Coordinate with statutory authorities of state on environmental issues for smooth functioning of plants.
- Prepare action plans for improving the environmental performance of the plant and implement the same.

Compliance of Statutory Requirements:

The Iron and Steel industry in India is guided by the following principal environmental acts and rules:

- **The Water (Prevention and Control of Pollution) Act, 1974**
 - The Water (Prevention and Control of Pollution) Rules, 1975
- **The Air (Prevention and Control of Pollution) Act, 1981**
 - The Air (Prevention and Control of Pollution) Rules, 1982
- **The Environment (Protection) Act, 1986**
 - Environmental (Protection) Rules, 1986
 - Noise Pollution (Regulation & Control) Rules, 2000
 - Environmental Impact Assessment (EIA) Notification, 2006
 - Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016
 - Bio-medical Waste Management Rules, 2016
 - Solid Waste Management Rules, 2016
 - Plastic Waste Management Rules, 2016
 - Construction and Demolition Waste Management Rules, 2016
 - E-Waste Management Rules, 2022

- Battery Waste Management Rules, 2022

SAIL, as a responsible Corporate Organisation, takes care of environment right from the very first day of construction of any new project/activity and during the course of its operation as well.

SAIL plants/units and mines obtain prior Environmental Clearance (EC) in case of any new project and expansion/modernization of the existing project in line with the EIA Notification, dated 14th September, 2006.

Similarly, as per the provisions of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981, Consent to Establish (CtE) before establishment of a new project and Consent to Operate (CtO) are regularly obtained from the concerned state pollution control board prior to start of its operation.

Authorisations for handling and management of hazardous waste and bio-medical waste are also obtained as per the requirement of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Bio-Medical Waste Management Rules, 2016 respectively.

9.3 Pollution in Steel Plants

Control of Air Pollution:

Starting from handling of raw materials to production of finished steel, air pollution control equipment/facilities like Bag Filters, Electro Static Precipitators, Multi Cyclones, Venturi Scrubbers, De-dusting Systems, De-fuming Systems, and Covered conveying Systems etc. are installed in all the pollution-prone areas to control Particulate Matter (PM) emission.

Emission of SO₂ is controlled through use of coal with low sulphur content and desulphurized coke oven gas as fuel. For abatement of NO_x emission, specially designed (multi-slit) ignition burners are installed along with optimised process parameters.

During the modernisation-cum-expansion programme (MEP), various state-of-the-art energy-efficient technologies/facilities such as Coke Dry Quenching (CDQ) with tall Coke Oven Batteries, Coal Dust Injection (CDI), Top gas Pressure Recovery Turbine (TRT) & Waste Heat Recovery (WHR) from hot stoves of Blast Furnaces, Waste Heat Recovery (WHR) from sinter coolers of Sinter Plants, Continuous Casting, Walking Beam Reheating Furnace equipped with Rolling Mills, Torpedo Ladle for hot metal handling are installed in all the plants. Apart from these, by-product gases are utilised for captive generation of power.

Control of Water Pollution:

In order to preserve water quality of natural water bodies, Effluent Treatment Plants (ETPs) are provided with each individual shop of all the plants to treat and recirculate the industrial waste water for further use. Moreover, Sewage Treatment Plants (STPs) have also been installed in the steel townships and plants to treat the sewage for achieving the stipulated standards.

Over and above, comprehensive water conservation schemes for treating and recycling waste water are being implemented to achieve long term goal of Zero Liquid Discharge (ZLD).

Besides, revamping/upgrading of localized recirculation systems and water auditing by third party, installation of rainwater harvesting schemes is one such environment-friendly initiative towards water conservation. SAIL has been implementing Rain Water Harvesting (RWH) systems and artificial recharge to ground water since long and adopted it as an integral part of water conservation measures. Considering the factors like geographic conditions of the site, regulatory guidelines and availability of infrastructure facilities, rain water harvesting systems are being implemented with utmost care. Further, in consonance with 'Catch the Rain' campaign of Ministry of Jal Shakti, rain water harvesting facility is envisaged during conceptualization of any upcoming project and is incorporated in the technical specifications of the proposal.

Control of Noise Pollution:

Various noise controlling measures like acoustic enclosures, hoods, acoustic lagging are adopted to reduce noise level at sources like high speed machineries viz., compressors, fans and blowers. Induced Draught (ID) and Forced Draught (FD) fans are properly equipped with silencers and insulated casing. Noise-proof and air-conditioned control rooms are provided for the operators wherever required.

Management of Wastes:

SAIL is committed in its Corporate Environmental Policy to reduce solid waste generation and maximise its utilisation to achieve 100% and follows the principle of 4R's (Reduce, Reuse, Recycle and Recover) in the area of solid waste management to be sustainable in the steel sector.

The molten BF slag is granulated through Cast House Slag Granulation Plants (CHSGPs) installed at BFs and is sold to cement industries for its consumption as an input material. BOF slag containing iron bearing particles is processed and the metallic part from the slag lumps is separated out before its recycling back to the process. BOF slag is used either in blast furnace as a replacement of limestone, or in sinter making through base-mix. The other wastes such as BF flue dust, mill scales, lime/dolo fines, refractory waste etc. either reused fully in the process or sold to the external agencies for its further use.

With an aim to achieve the maximum benefit from the concept of “Waste to Wealth”, various R&D based studies have been taken up either through in-house research wing or in association with other eminent research centres or academies of national repute to explore potential avenues for enhancing BOF slag utilization.

SAIL as an industry partner has participated in the Ministry of Steel’s sponsored R&D project “Development of steel slag based cost effective eco-friendly fertilizers for sustainable agriculture and inclusive growth” through ICAR-IARI.

SAIL plants have been extensively using steel slag for making internal roads since long. SAIL has also taken steps for utilisation of BOF slag in rural road construction under Pradhan Mantri Gramin Sadak Yojna (PMGSY).

Apart from the above mentioned solid wastes, some of the wastes like used/spent oil, benzol acid tar sludge, decanter sludge/tarry waste, ETP sludge etc. generated during iron and steel making process are hazardous in nature. Utmost care and effective steps for safe handling, transportation and disposal of these wastes are taken at SAIL. These wastes are safely disposed either in the captive Secured Landfill Facility (SLF) or through the authorized handling agency. Some hazardous wastes are reused/co-processed.

Promotion of Renewable Energy Sources:

Many schemes towards promotion of renewable energy have been implemented in SAIL plants/units, mines and peripheral villages/areas. Most of the SAIL guest houses and hospitals are equipped with solar water heaters/solar lighting systems. As a part of commitment to sustainable energy practices, 6.425 MW solar units have already been commissioned at SAIL.

Switching over to LED Illuminating Systems:

SAIL plants/units are gradually shifting to more energy-efficient and durable LED lighting system, in consonance with the Government of India’s initiative “Unnat Jyoti by Affordable LEDs for All (UJALA) Scheme”.

More than 7.34 lakh LED lights have already been installed in recent years and energy-efficient LED illumination systems have been envisaged for the units/buildings under the upcoming projects. SAIL has an ambitious target for complete replacement of the conventional lights.

Developing Greenery:

Structured plantation programmes are carried out every year in all the SAIL plants/units and mines depending on availability and prevalence of local species, local soil characteristics and prevailing meteorological conditions. Since inception, a cumulative of more than 21.82 million saplings have been planted at SAIL.

Biodiversity forms the basis of human survival on earth. Living resources (plants animals and microbes) and their habitats form an integral component of the biodiversity. Zoological and botanical parks are being maintained in townships of SAIL plants for preservation of several species of flora and fauna.

VASUNDHARA - a step towards Biodiversity Conservation and Ecosystem Management:

Vasundhara Biodiversity Park in an area covering 409 acres of land has been developed near the township at Durgapur Steel Plant with water body and development of flora and fauna of local species to address the concerns for ecology, biodiversity and environment management. The local people living in peripheral villages, including residents of the Steel Township, are the beneficiaries in respect of the visual aesthetics, the greenery with a clean & calm environment away from the harsh noises of daily city life.

Eco-restoration of mined out areas:

Restoration and rehabilitation of degraded ecosystem is essential for maintaining and enhancing biodiversity as well as replenishing the ecosystem services. Mined out area and water body of mine voids of Purnapani Limestone Mines have been taken up for ecological restoration by SAIL in association with Delhi University.

About 250 acres of old barren overburden dumps and water voids in 200 acres of limestone mined area in Purnapani have been successfully restored to fully functional ecosystem that generates ecosystem services & goods and sequesters CO₂.

After successful restoration of Purnapani Limestone & Dolomite Quarry, fresh initiatives have been taken for eco-restoration of Meghahatuburu Iron Ore Mines and Kiriburu Iron Ore Mines. Institute of Forest Productivity (IFP), Ranchi was engaged for collaborative execution of works related to eco-restoration of mined out areas and waste dumps of 10 ha land at Kiriburu Iron Ore Mines & 8.5 ha land at Meghahatuburu Iron Ore Mines in Saranda Forest Division over a period of five years till 2025-26.

Environment-friendly disposal of Polychlorinated Biphenyls:

This project being the first of its kind in the country and in compliance with the “Stockholm Convention” on Persistent Organic Pollutants (POPs) was taken up by SAIL at Bhilai Steel Plant in partnership with MoEFCC and UNIDO.

The Stockholm Convention is a global treaty to protect human health and the environment from POPs. Use of Poly-Chlorinated Biphenyls (PCB), a POP in any form shall be completely prohibited by 31st December, 2025. PCBs are used in transformers as dielectric fluid and also as cleaning solvent.

The “National PCBs Disposal Implementation Plan” being administrated through the MoEFCC, Govt. of India, focuses on the reduction and elimination of PCBs in the industrial sector of India.

Environment Management System (EMS):

Environmental Management System (EMS) linked with ISO: 14001 is a voluntary approach to manage the immediate and long-term environmental impacts of an organisation's products, services and processes. SAIL has been a torch-bearer in the establishment of the EMS in the steel industry in our country. In mid-90's, SAIL started implementation of EMS ISO: 14001 in its Salem Steel Plant. Presently, all the integrated steel plants, major units and warehouses of SAIL are compliant with EMS ISO: 14001 Standard. Implementation of EMS has helped SAIL plants and units to ensure that their performance is always well within the applicable regulatory requirements.

9.4 ESG Concerns & Green Steel

Environmental Social & Governance (ESG) initiatives have become a strategic imperative for nearly all organizations over the past year. Increased focus and pressure from investors, regulators, employees and other stakeholders make ESG a topic that is not only critical at the board level, but also essential to cascade throughout organizations operationally.

Adopting ESG principles means that corporate strategy focuses on the three pillars of the environment, social, and governance. This means taking measures to lower pollution, CO2 output, and reduce waste. It also means having a diverse and inclusive workforce, at the entry-level and all the way up to the board of directors. ESG may be costly and time-consuming to undertake, but can also be rewarding into the future for those that carry it through.

The Emergence of ESG Clearly, one of the major risks organizations face today is related to the environment. In 2019, the World Economic Forum's Risk Report listed weather events, climate change and natural disasters as the top risks by likelihood and impact. That has not changed. However, several other risks have surfaced based on the extraordinary events of these last two years.

Social factors have become front and center in many discussions. Economic disparities, the effects of the pandemic and a host of other events have led to an awakening – highlighting the responsibility of companies to understand and respond to social shifts. Behind this responsibility lies the capability within organizations to govern the business with methods that create agility to alter course due to market shifts but also discipline to address environmental and social concerns. These concepts are also not new. Corporate social responsibility (CSR) has been on the table for several years. But this new world has shined a spotlight on the ESG issues. The issues hit the bottom line with customers, investors and even an organization's own employees watching closely. Being investor and climate driven, ESG is fundamentally a forward-looking Integrated Risk Management (IRM) approach to discern which companies are likely to thrive and which are likely to decline in a world growing in environmental and social uncertainty. ESG is more concentrated on the ability to sense and anticipate what is

needed to prosper without doing harm to people and planet than it is about backwards looking control frameworks.

Reducing Carbon footprint in Steel Industry

Steel is one of the core pillars of today's society and, as one of the most important engineering and construction materials, it is present in many aspects of our lives. However, the industry now needs to cope with pressure to reduce its carbon footprint from both environmental and economic perspectives. As per Ministry of Steel, GOI, the iron and steel industry globally accounts for around 8 per cent of total carbon dioxide (CO₂) emissions on an annual basis, whereas in India, it contributes 12 per cent to the total CO₂ emissions. Thus, the Indian steel industry needs to reduce its emissions substantially in view of the commitments made at the COP26 climate change conference.

India's steel sector accounts for about 12% of India's carbon dioxide (CO₂) emissions, with an emission intensity of 2.55 tonne of CO₂/tonne of crude steel (tCO₂/tcs) compared with the global average emission intensity of 1.85 tCO₂/tcs. The steel industry is responsible for around 240 million tonnes of CO₂ emissions annually and we expect this to double at an exponential rate by 2030, considering the Indian government's infrastructure development targets.

There are multiple technology pathways that could help in the transition from traditional methods to low emission intensity technology like green hydrogen, renewable energy, carbon capture, usage and storage technology with Blast Furnace (BF)/Basic Oxygen Furnace (BOF) or Direct Reduced Iron (DRI)-Electric Arc Furnace (EAF), scrap-based Electric Arc Furnace (EAF) etc. Of these technologies, the green hydrogen-based route is the cleanest method of producing steel. However, green hydrogen is expensive and investing in the technology could render steelmakers uncompetitive as they sell a highly commoditised product.

The Ministry of Steel is committed to Net-Zero target by 2070. Towards this, in short term (FY 2030), reduction of carbon emissions in steel industry through promotion of energy and resource efficiency as well as renewable energy is being focused. For the medium term (2030-2047), utilisation of Green Hydrogen and Carbon Capture, Utilisation and Storage are the focus areas. For long term (2047-2070), disruptive alternative technological innovations can help achieve the transition to net-zero. For this purpose, Ministry of Steel is continuously engaging with various stakeholders.

Steps taken by MoS, GOI for promoting decarbonization in steel industry include:-

- (i) Steel Scrap Recycling Policy, 2019 enhances the availability of domestically generated scrap to reduce the consumption of coal in steel making.
- (ii) Ministry of New and Renewable Energy (MNRE) has announced National Green Hydrogen Mission for green hydrogen production and usage. The steel sector has also been made a stakeholder in the Mission.

- (iii) Motor Vehicles (Registration and Functions of Vehicles Scrapping Facility) Rules September 2021, shall increase availability of scrap in the steel sector.
- (iv) National Solar Mission launched by MNRE in January 2010 promotes the use of solar energy and also helps reduce the emission of steel industry.
- (v) Perform, Achieve and Trade (PAT) scheme, under National Mission for Enhanced Energy Efficiency, incentivizes steel industry to reduce energy consumption.
- (vi) The steel sector has adopted the Best Available Technologies (BAT) available globally, in the modernization & expansions projects.
- (vii) Japan's New Energy and Industrial Technology Development Organization (NEDO) Model Projects for Energy Efficiency Improvement have been implemented in steel plants.

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.
- 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.

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 a critical repair shop of Electric Motors. Apart from motors, 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/repared and tested after necessary repair and overhauling.

10.3 Gas Utilities & Water Management

Gas Utilities consists of following sections:

(a) Oxygen Plant

Oxygen Plants (both Captive & Outsourced) produces Oxygen, Nitrogen and Argon for steel making. These products are produced in both gases form and liquid form. Purity of Liquid Oxygen & Gaseous Oxygen maintained is above 99.55%, Liquid Nitrogen & Gaseous Nitrogen below 10 ppm impurity and Liquid Argon below 2 ppm impurity.

Oxygen, Nitrogen and Argon gases are separated from air using Cryogenic Distillation Process in Air Separation Units (ASUs). Dust free air is compressed in Air Compressors followed by pre-cooling of the compressed air. Moisture and other hydrocarbon are removed in absorber bed. Selective distillation of various components of dry air is done at their respective boiling temperatures in ASUs. Cooling required for separation is produced in expansion Turbine and Heat exchanger. High Pressure Oxygen, Nitrogen and Argon is produced using IC pumps and by using Nitrogen Compressor. High pressure Gaseous Oxygen, Nitrogen is directly sent to customers in gaseous pipeline grid. Liquid Oxygen, Nitrogen and Argon are stored in cryogenic storage vessel. Buffer vessels of oxygen, nitrogen and argon are provided to take care of fluctuating demands of consumers.

Use of Oxygen, Nitrogen and Argon

Oxygen is primary used in increasing oxygen enrichment in Blast Furnace and for production of Steel. In Blast Furnace, Oxygen enrichments helps in reducing coking coal, increasing PCI (pulverised coal injection), optimizing furnace chemistry and furnace temperature, thus oxygen helps in production of molten iron known as hot metal. Steel is produced in Basic Oxygen Furnace (BOF), High pressure Oxygen is blown in BOF which contain Hot metal, this process reduces carbon percentage in hot metal, and thus Steel is produced. Liquid Oxygen is also supplied for medical purpose across country in mobile cryogenic tankers.

Nitrogen being an inert gas is required in various departments Plants. It is used for maintaining inert atmosphere during PCI grinding in Blast Furnaces, purging operation for controlling explosive mixtures in pipelines and furnaces, Pneumatic gas for valve operation. Nitrogen is also used as seal gas for various equipments and slag splashing in BOFs in SMS department.

Argon being chemically inert gas is used in production of special steel. Inert atmosphere is maintained in RHOB using argon gas. It is also used for bottom purging in convertors of SMS-II

(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 five wings:

- 1) Metallurgical Testing
- 2) Chemical Testing
- 3) Mechanical Testing

4) Inspection

5) 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), Optical Emission & Xray, Plastometer (for plastic properties of coal), RI-RDI (for hot properties of sinter), ONH Analyser (for analyzing content of Oxygen, Hydrogen & Nitrogen in steel samples)

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, proper embossing and 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.

NABL accreditation has been obtained in the field of chemical and mechanical testing for steel products by DSP & BSP. The laboratories of other SAIL Plants such as RSP & ISP are in process.

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 coordination & planning activities in major manufacturing units of the Plant, in line with its production capability and as per the Targets assigned. The highest efficiency in production is obtained by manufacturing the required quantity of product, in the required quality and by the required time, using the best and most economical method.

PPC provides facilitating service which ensures execution of market requirements, by planning right from the the input raw materials requirement to preparing the detailed production schedule for major production units for different time periods (annual, quarterly, monthly, weekly, and daily).

The function of Production, Planning & Control is always dynamic governed by Dynamic Market Demands, Policies & strategies of Competitors.

Coordination & Planning activities starts with analysing Customer requirements (received from Central Marketing Organization, SAIL), planning raw materials for the Production units, preparing production schedule and monitoring its production and despatch along with ensuring optimum Inventory levels.

Functions of 'Production Planning & Control Department' has been divided into four parts as follows:

A. Product (Sales Co-ordination): This section is the nodal agency for order serving and dispatch. It is responsible for receipt of orders from CMO, planning for dispatch through daily interaction with CMO, shipping units of mills and traffic department and organizing despatches. Road despatches are also executed through issue of release orders. This section also deals with order serving of IPT & export orders.

B. Planning: Function of this section includes (i) Long term planning which deals with the Annual Performance Plan (APP) and budget exercise for the corresponding year, through interactions with the department taking into consideration the repair plan and the current market scenario. The major operational norms are also finalized during the exercise.

(ii) Planning & scheduling which deals with the formulation of monthly product-mix by interacting with CMO during monthly sales meeting, daily heat planning for SMS and feed stock planning for the finishing mills.

C. Plant Control: Operating 24X7, this section is involved in monitoring, collection and compilation and reporting to senior officials of all details pertaining to production and breakdown of all units of the plant to keep production uninterrupted. Plant control functions as the apex control of several departmental control cells. It is the nodal agency for prioritization of resource deployment and handling emergency situations.

D. Statistical Cell: Being the central data bank of the whole plant, the statistical section deals with preparation and compilation of data and circulation of MIS on daily, weekly, monthly and annual basis. Preparation of reports for statutory agencies and liaison with corporate office are other functions of this section.

11.2 Management Services (MS) Department (Consists of Industrial Engineering Department (IED) and Business Excellence Deptt) helps in developing effectiveness and efficiency in any standardized ISO Parameters , 5'S implementations & ISO Audits activities etc . 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 optimization, Productivity and System improvement and Techno-economic Parameters standardization, Different ISO certifications have been the broad objective of Management Services Department.

Activities Of Industrial Engg.Deptt.

- ❖ Online scrutiny and recommendation of indents as Nodal Officer/Convenor of ISC.
- ❖ Implementation of Srujani -The Creativity Award Scheme of RSP.
- ❖ Comprehensive AMC of Photocopiers (Xerox make machines) of RSP.
- ❖ Formulation, Amendments & Upkeep of ED(W) Procedure Orders.
- ❖ To look after for formulation & revisions the DOP (Delegation of Powers) of RSP & Mines.
- ❖ Calculation of Monthly Incentive and Reward Schemes of non-executive employees of RSP
- ❖ Performance Index (PI) schemes of RS(Elect) and SPP deptt.
- ❖ Committee members in different activities like HRPE, DRCC, Empanelment of different Contracts, CRC as & when required.
- ❖ AMR related activities on Central Survey Committee & allotment of O&M.
- ❖ Study and recommendations of different administrative and mobile equipments of RSP including administrative items like (AC. PC, Photocopier M/cs).

- ❖ Committee members for VRP, PMSA etc. as well as Standing Insurance Claims Committee of RSP (SICC), Outsourcing Committee.
- ❖ Different Special Committee as and when required Like Non-plan capital expenditure related activities etc.

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 Introduction:

SAIL believes that excellence in Safety and Health yields excellent business results, therefore at SAIL nothing is more important than the Safety and Health of the people working in and around the steel plants & units. To ensure this, SAIL has been continually & consistently improving its safety and health management systems & practices with the ultimate aim to have safe and healthy workplace. Safety is fully adhered in all processes and operations inside Plants/ Units premises. Safety & Health issues are monitored and guided from the apex level of management i.e. our Board as well as Board Sub-committee on Health, Safety & Environment. All pertinent issues related to safety & health are discussed and deliberated as opening item at all appropriate forums in various levels of management hierarchies.

SAIL envisions to become as one of the industry's leaders in safety performance. To realize this vision, SAIL has a Corporate Safety Policy and Guiding Principles aiming at providing a safe and conducive work environment to all its employees, contractors and all stakeholders / people associated in its operations including those living in the neighborhood of its Plants, Mines and Units. All safety activities & measures are planned in consonance with the Safety Policy.

With the aim of continuous improvement, the safety & health objectives are planned and set well in advance and successfully achieved through well-established OH&S management programmes.

SAIL has achieved consistent improvement and steady growth in Safety and Occupational Health parameters as a result of proper systems, procedures and improved work practices. Internationally established standards like ISO 45001, ISO 9001 and ISO 14001 are adopted for Safety, Occupational Health, Quality and Environment protection based upon the P-D-C-A philosophy of continual improvement.



Safety Setup

Effective leadership is critical in achieving and sustaining a positive Safety culture that supports the goal of zero harm. Safety performance is regularly monitored at the highest level of management i.e. Board, Chairman and Directors' level. The efforts of

the Company for achieving a safe and healthy environment are guided and monitored by a Board Sub Committee on Health, Safety & Environment (BSC on HSE) on quarterly basis.

Director I/cs & Executive Directors of respective Plants & Units closely monitor safety aspects on day-to-day basis. A full-fledged Safety Engineering Deptt. (SED) functions at each Plant/ Unit to ensure safety in operations & maintenance/ repair jobs. Fire Services Deptt., fully equipped with necessary resources & facilities, remains on alert for meeting various emergency requirements, relief & rescue operations as well as monitoring fire prevention related aspects. In each department/ shop, Departmental Safety Officer (DSO) & Safety Steward/ Captain ensures adherence to laid down standards & safe working procedures. DSOs play an important role by monitoring safety aspects at the forefront on daily basis and working in close coordination with SED. In Project & expansion areas, Zonal Safety Officers (ZSOs) are deployed to monitor safety during various phases of project / construction work.

1.1 Systems & Procedures

The entire Safety Management System of SAIL hinges around 3 E's of accident prevention i.e. Engineering, Education & Enforcement.

a) Engineering: Safety is ensured by incorporating engineering measures & features i.e. thru' built-in features at design stage.

Safety interlocks, limit switches, alarms & detectors, CCTVs, Fire retardant paint on cables etc. are few examples of Engineering measures which protect the men & machines from abnormal situations. These measures/ devices/ facilities are checked periodically for smooth & effective functioning.



b) Education: Emphasis is given on competency building on continuous basis to cover at least one-third of the workforce in various training programmes including safety & health. Safety training programs are being organised at CHRD of Plants/ Units round the year for regular employees as per fixed modules covering topics like statutory requirements, gas safety, electrical safety, crane safety, conveyor safety, material handling, Behavior Based Safety (BBS), occupational health & hygiene, first aid, stress management, preventive care for occupational diseases etc. For different work zones/ areas, 'Learning from Each Other (LEO)' workshops with participation of other Indian steel producers covering salient issues of concern as well as 'Large Group Interactions' are organised which helps in greater and effective sharing & learning. Besides, there are unit training centres at Departmental level where technical & safety

trainings are also organized as per need. For Contractual workers, Induction training of two days duration followed by job specific training covering areas specific hazards & associated risks as well as control measures is imparted before engaging them on the job. Practical training cum demonstration is organized for hazardous jobs like work at height, roof sheeting jobs etc. on training rig, especially fabricated for the purpose. Feedback is taken from the participants which is constructively used to bring further improvements.

c) Enforcement: Safety aspects have been incorporated in SOPs, SMPs & WIs which helps in maintaining necessary technological discipline. These documents provide vital guidance to the workmen and are reviewed periodically with changing technology / process requirements, occurrence of any incident etc. and updated accordingly. The updated version of the documents is made readily available on web portals / Knowledge Management (KM) portals and can be easily accessed and referred by all employees. 'Permit to Work' & 'Protocol' Systems, having necessary safeguards, are religiously followed during execution of hazardous & critical jobs involving multiple agencies. Emergency preparedness Plan has been prepared for handling emergency situations and mock drills with the involvement of all the connected agencies like deptt. concerned, SED, Fire Services, Gas Safety, OHSC etc., are conducted to assess preparedness.

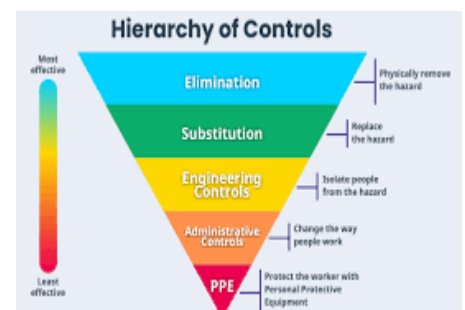
Usage of conventional as well as job specific Personnel Protective Equipment (PPEs) such as safety shoes, safety helmet, Ear plug/ muffs, nose mask, Fire-retardant garments, Full body harness, arc flash suits etc. by regular employees as well as contractual workers is ensured. Road safety, gas safety, height safety, handling of hot metal/ slag, electrical safety, material handling safety norms etc. are strictly enforced inside plant premises by constant monitoring.

1.2 As a compliance to advanced safety management system (ISO 45001), Hazard identification & Risk assessment (HIRA) has been done for most of operation & maintenance activities in Plants/ Units and appropriate risk control measures are being taken (as per risk control hierarchy) to bring the risk to acceptable limits (ALARP – As low as reasonable Practicable).



1.3 Compliance to Statutory requirements like the Factories Act, Mines Act, Rules & Regulations, Electricity Act & Rules, Petroleum Act & Rules, Explosive Act & Rules etc. is ensured.

1.4 All work related incidents are investigated to find out the root cause and appropriate actions are taken to prevent its recurrence. The needed corrective & preventive actions are taken to minimize the risk as per



the hierarchy of controls.

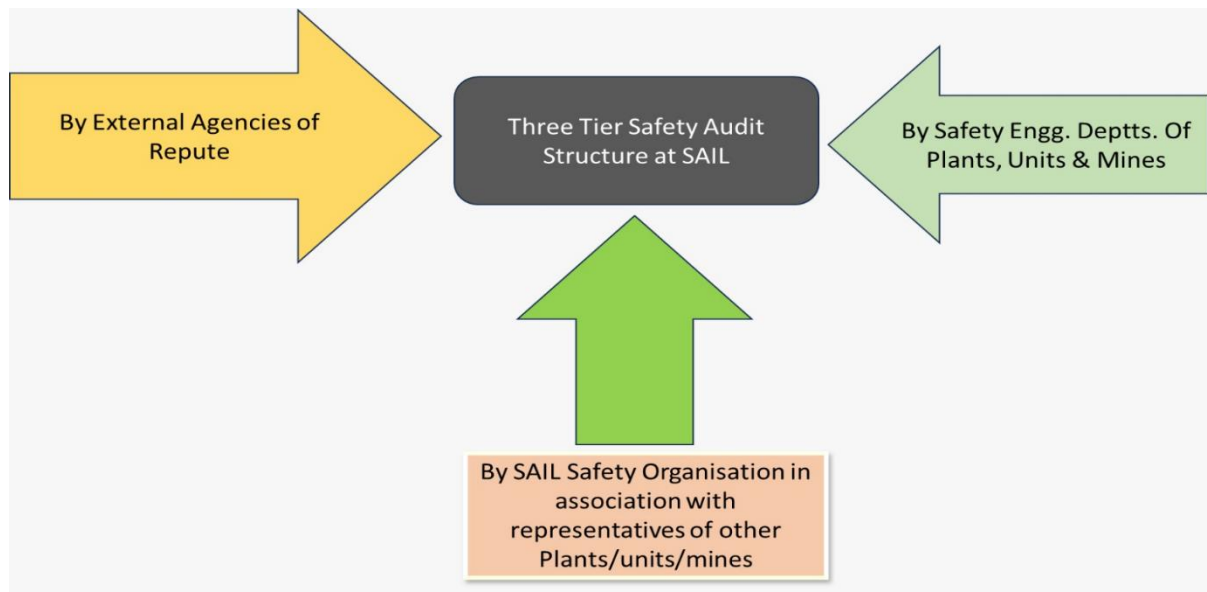
1.6 Employees involvement in Safety Management

Joint participation of management & workmen is important for a sustainable health and safety culture which is maintained by the Company's Health and Safety Committees. All of our employees are covered by the formal joint management-worker Health and Safety Committees at Plant/ Units and are duly involved and consulted on Health & Safety issues including in identification & mitigation of workplace hazards. Statutory Bi-partite forums like Central/ Apex Safety Committees, Departmental Safety Committees, Pit safety committee etc. function with participation of Company's top management, trade union representatives & employees. Meetings of these Committees are held in a scheduled manner in which all health and safety issues are deliberated for bringing continuous improvement of the OH&S Standards.

1.7 Safety Monitoring Mechanism

Three tier Safety Audits are being conducted at plants & units as mentioned below:

- a) Internally by concerned Area Safety Officer of Safety Engg. Department & DSO.
- b) Safety audit by SAIL Safety Organization.
- c) Externals safety audits by third parties as per statutory requirements.



Safety inspections are conducted at different levels in Plants & Units.

- a) Apex Inspection by HOD, Sectional I/Cs & DSO.
- b) By Safety Engg. Department associating DSOs.

- c) By Safety Engg. Department associating different departments like Civil Engg. Department, Electrical Department, Crane Engg Department, Structural Inspection Departments etc.
- d) Fire Safety Inspections by Fire Services Department associating DSOs & departmental personnel.
- e) Apex inspection by line managers & DSOs.
- f) Behavioural Interventions as a part of ongoing Safety Management consultancy, with a view to identify unsafe acts & situations in the plants.

1.8 Safety Review:

Periodic review of safety performance is made at top management level including DICs, Head of Works, and Head of Departments & Heads of Safety of respective plants / units. Issues of concern are discussed and strategic action plans are drawn on priorities to bring continuous improvement.

12.2 SSO- FORMATION, ROLES & RESPONSIBILITIES

At the Corporate level, SAIL Safety Organization (SSO) was formed in 1988, to coordinate, guide& facilitate the Safety and Fire service activities of Plants & Units. The major functions of SSO are:

- a) To facilitate in development of safety culture across the Plants & Units.
- b) Development of policies, systems and procedures for workplace safety improvement.
- c) Conduct periodic audits of Safety Management System of Plants & Units to ascertain its effectiveness and suggest measure to liquidate the gaps, if any.
- d) Competence building through training of employees.
- e) Performance monitoring by organizing periodic review meetings.
- f) Conducting on-the-spot study of fatal / serious incidents.
- g) Maintaining Incident/Accident Data Management & Information System.
- h) Carrying out secretarial functions of JCSSI (Joint Committee on Safety, Health & Environment in Steel Industry).
- i) Liaison with CO, MoS, Parliament cell, NSC, WSA etc.
- j) Spreading awareness through publications, competitions etc.

a) To facilitate in development of safety culture across the Plants & Units:

It is increasingly being recognized that Safety being a cultural issue, by bringing attitudinal change towards safety, change in mindset & behavior of the individuals will take place which will help in improving safety culture at company level. With this objective, a safety consultant of global repute has been deployed at 5 ISPs i.e. Bhilai, Bokaro, Rourkela, IISCO Steel Plant, Durgapur Steel Plants & Alloy Steels Plant for strengthening the safety management systems apart from addressing behavioural related issues. SSO played a key role in preparation of NIT mainly w.r.t defining the eligibility & capability criteria as well as evaluation of suitable bidders.

b) Development of policies, systems and procedures for workplace safety improvement:

- 'Inter Plant Standards in the Steel Industry (IPSS)' in the area of safety help in a big way in augmenting our safety standards. IPSS 1:11-Standards Committee on Personnel Safety Appliances and Procedures, which is headed by ED, SSO and represented by SAIL, Tata Steel Ltd., RINL, MECON, JSPL, HEC etc. formulates new standards as well as reviews and updates existing standards by utilizing knowledge & experience of domain experts as well as core safety professionals. IPSS standards are available for various kinds of jobs such as Working at Height, Roof sheet changing, Wagon tipping, demolition of building & structures in steel industry, loco operation, Gas Line jobs, Hydraulic safety, etc. The standards formulated by the committee serve as a useful reference document and are uploaded on IPSS portal which is available in the SAILNet as well as open domain i.e. internet and accessible for the benefit of common user.
- SAIL played a key role as one of the member of working group headed by ED, SSO which was constituted by MOS for preparation of comprehensive Code of Practices for enhancing the safety eco-system in the steel producers in the Iron & Steel sector. 25 nos. safety guidelines were finalized and uploaded on the MOS website for reference & use by all stakeholders. Further, process based safety guidelines are being framed in consultation with leading steel producers.

c) Conducting periodic audits of Safety Management System of Plants & Units to ascertain its effectiveness and suggest measures to liquidate the gaps, if any:

- To assess the effectiveness of prevailing OS&H systems, compliance to regulatory requirements and identify areas or improvement, Safety Audits are conducted by SSO on regular basis as per APP in accordance with Indian Standard IS 14489:2018 i.e. 'Code of Practice on Occupational Safety & Health Audit' associating sister plants.
- Major departments of all Plants/ Units including Mines and Warehouses are covered during such audits. Emphasis is laid on identifying issues of concern and carries out in-depth system-based audit. Compliance audits are also conducted to verify implementation status of suggested measures.
- System of conducting Theme based audits has been introduced recently, covering specific theme such as 'Fuel Gas Safety' in the plants.
- Of late, the audit process has been enriched by introducing reality check mechanism i.e. checking the actual level of safety perception among the working personnel, vis-à-vis desired level. Also surprise audit is carried out to any other deptt. or projects site.

d) Competence building through training of employees:

- HRD interventions in safety include organizing training programmes for safety officers and DSOs of Plants & Units at MTI / plant locations.
- Thrust has been laid by SSO to organize LEO workshops on identified areas of concern like Gas safety, Safety in Iron making/ steel making / Rolling, Electrical safety, Crane safety, Rail/ Road safety etc. with participation of SAIL plants as well as other private steel producers in India.
- For mines & collieries, customized training programmes are organized with the help of external expert agencies.
- In addition, a nos. of webinars are conducted through digital platforms on topics of relevance/ importance for the plant personnel with the help of experts from DGFASLI/ in-house domain experts.

e) Performance monitoring by organizing periodic review meetings:

- Structured review meetings are conducted by SSO through scheduled Heads of Safety & Heads of Fire Services meetings of all SAIL plants /units.
- Periodic visits of Head of SSO to Plants are held where interactions at various levels like HOS, HODs & CGMs, DSOs etc. are held and feedback is given to Head of Works & DIC.

f) Conducting on-the-spot study of fatal / serious incidents:

- On the spot study is carried out for fatal / serious incidents and report containing various aspects along with root cause analysis & recommendations to prevent recurrence, is circulated to all Plants & units for horizontal deployment.
- An e-book of fatal accident case studies is published every year by SSO and circulated to Plants & units learning & implementation.
- Compliance status of recommendations is monitored by SSO & at various levels in Plants/ Units.

g) Maintaining Incident / Accident Data base for generation of MIS reports:

- All incidents including near miss cases are compiled and analyzed by SSO on monthly & annual basis for determining the thrust areas.
- Daily, Monthly & Annual reports are published by SSO based on the information received from Plants& Units and circulated to all concerned.
- In accordance with MoS target of covering 100% employees in training programmes every year, training figures are compiled on weekly basis and communicated to MoS for dashboard.

h) Carrying out secretarial functions of JCSSI (Joint Committee on Safety, Health & Environment in Steel Industry):

Joint Committee on Safety, Health & Environment in the Steel Industry (JCSSI), a unique bipartite forum at national level with representation from major central trade unions and management of major steel producers of the country, acts as a common bridge by jointly evolving recommendations/ action plans for ensuring safe & healthy work environment in the entire steel industry. For recognizing and rewarding good safety performance of the member organizations & their employees, various competitions and an annual award function & meetings of the Committee are organized. Distinguished performance of the individuals is also suitably rewarded. Learning from each other approach is followed for sharing best practices of the participating steel producers through periodic meetings as well as various workshops / seminars, plant visits etc. Sharing of information among members is also facilitated through the JCSSI website - www.jcssi.com.

Some of the activities of JCSSI are:

- Scrutinizing key issues related to Safety, Occupational Health & Environment.
- Spreading awareness among the Committee members by sharing of best practices through meetings, workshops, seminars, plant visits etc.
- Organizing competitions amongst employees of member organizations for supporting and encouraging participation in Safety, Health & Environment.

- Organising annual award function for recognizing members for their outstanding efforts as per approved Ispat Suraksha Puraskar scheme.
- Analysis of causes of incidents/ accidents and sharing views on corrective measures.
- Printing and publishing information material like safety posters & calendars for distribution amongst member organizations for awareness generation.

i) Liaison with CO, MoS, Parliament cell, NSC, WSA etc.:

- SAIL is a Member of Occupational Safety & Health Committee of World Steel Association (WSA). Sharing of accident data in Annual Safety Survey of WSA is done by SSO which is published in Annual Safety & Health survey report.
- SAIL, SSO is having an MOU with National Safety Council (NSC) of India in the areas of safety audit & training.
- SAIL is a Member of Indian Steel Association (ISA) and periodic meetings of Health & Safety Committee are attended by ED, SSO.
- Draft replies to safety related Parliament / MOS / CO queries are prepared & submitted on time.

j) Spreading awareness through publications, competitions etc.:

- SSO Information Portal contains various safety related information like Annual & Monthly Reports, Safety manuals, checklists, protocols, accident briefs year wise, training PPTs, videos, animations etc. The portal is regularly reviewed and updated.
- E-Scan, an in-house magazine containing various articles, case studies & other informative material is published by SSO on half-yearly basis and circulated.
- Annual Performance Plan (APP) on Safety & Fire Services activities of SSO & Plants/ Units are compiled & published by SSO every year in booklet / e-book form and circulated to all Plants.
- Good safety initiatives taken by the employees from all plants & mines are identified and suitably rewarded in HazAn.Com - Hazard Analysis Competition organised by SSO which gives the employees an opportunity to showcase their work and spread the learning points at organisation level.
- With a view to disseminate learning points from incidents / accidents, system of sharing Safety Alert Messages (SAM) amongst all Plants & Units has been started.
- Good Safety Practices (G-SaP) prevailing in SAIL plants & units as well as steel industry are captured by SSO and disseminated amongst Plants & Units for awareness and implementation.

- National Safety Day, World Steel Safety Day etc. are celebrated by organizing various competitions for the employees of SAIL units at Ranchi & their wards, school children etc. to generate awareness.

NEW INITIATIVES BY SSO

1. SUKRITI:

An e-Book covering Good Safety Systems & Practices of the Steel Industry & important points of safety consultants compiled by SSO, was released by Director (T, P & RM), SAIL at MTI, Ranchi on 4th October 2023. This will facilitate all the Plants & Units in implementing the good practices.

2. SAMIKSHA:

An e-Book comprising of Learning from the Past incidents department / area wise was compiled by SSO with a view to ensure effective implementation of recommendations to prevent recurrence. The book was released by Director (T, P & RM), SAIL on 22nd March, 2023 at MTI, Ranchi in presence of EDs & senior officers of Ranchi based SAIL units. Subsequently, SAMIKSHA covering incidents upto December, 2023 was updated.

3. SURAKSHA MANTHAN:

A new initiative titled 'Suraksha Manthan' was launched to align the thinking & working of SSO with the Plants & Units. As a part of this, a meeting is organized on monthly basis under the leadership of ED, SSO with participation of Heads of Safety of all Plant & Units.

The pertinent issues including major accidents (if any) are discussed, good practices are shared and action plans are chalked out with a view to achieve the target of 'Zero fatality'.

4. SAMPARK:

A new safety interaction module was conceived for better communication and implementation for achieving zero fatality. As a part of this, detailed interactions are held with HODs, Line Managers & Senior Management in the plants/ units.

5. SPARSH:

A short & customized safety module titled "**Sparsh**" introduced by SSO in the beginning of all Training Programmes at MTI, Ranchi with a view to sensitize & orient the employees to achieve the target of "Zero Fatality" in SAIL.

6. Safety Operating Committee (SOC)

Safety Operating Committee (SOC) was formed for the first time and first meeting on the theme 'Safety during Steel Making' was organized during 12th-13th Oct '23 at DSP. The meeting was attended by 73 participants from 19 organisations like Directorate of Factories (WB), Major Technology Provider (Prime Metal, SMS Group), TATA Steel, JSW - Dolvi & Vijayanagar, AM/NS, Hospet Steel, NMDC, MECON etc.

HUMAN RESOURCES

At SSO, personnel are broadly categorized as non-executives and executives. There are 3 non-executives and 15 executives as on 1st January, 2024. It is ensured that employees engaged in performing various tasks are competent on the basis of appropriate education, training, skills and experience. The break-up of manpower in various grades is as follows:

Grade(s)	Nos.
E-9	01
E-8	01
E-7	04
E-6	02
E-5	05
E-3	02
S-11	02
S-9	01

The executives (E-7 & below) have been assigned one or more of the desk covering all Plants & units of SAIL. They coordinate and monitor with their respective desk on day-to-day basis and maintain two-way communication for retrieval / sharing of important information related with safety & fire services activities. Non-executive employees assist the executives in discharging their responsibilities and also perform any other tasks as assigned from time to time.

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

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 9001 Certified 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) The following aspects are however outside the scope of the scheme:

- 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 BUSINESS EXCELLENCE (BE)

Business Excellence (BE) encompasses proven and outstanding practices for management of organisations and achievement of continuous improvement of processes, systems and organisational culture. BE initiatives can be applied to all kinds of businesses whether private or public, for-profit or not-for-profit and small or large.

Over the years there have been many proven practices for organisational improvement like Total Quality Management (TQM), Six Sigma, Business Improvement, Process Improvement, Business Transformation and Lean Manufacturing etc. All these come under the purview of the broad term “Business Excellence”.

In today’s dynamic, competitive and volatile world, organisations aiming for excellence can cater best to the needs of the stakeholders. This includes adopting systematic approach towards process optimization, meeting customer needs & regulatory requirements.

Applying Business Excellence in manufacturing companies can improve operational practices, reduce costs, minimise wastages, improve quality, yield and on-time deliveries. This naturally translates to growth in sales, revenues and profits. On the non-tangible side, BE facilitates better employee engagement and satisfaction, communication as well as adoption of innovative practices.

MANAGEMENT SYSTEM STANDARDS

A Management System is the way in which an organization manages the interrelated processes of the business in order to achieve its objectives. These objectives can relate to a number of different topics, including product or service quality, operational efficiency, environmental performance, health and safety in the workplace and many more.

ISO (International Organisation for Standardisation) is an independent, non-governmental organisation with a membership of 170 national standard bodies including BIS (Bureau of Indian Standards). ISO is responsible for framing International Standards. It was established in 1947 and has its headquarters in Geneva, Switzerland.

ISO Standards are internationally agreed by Experts. ISO Standards are not Product or Service standards, they are Process standards and can be used by product manufacturers and service providers. These standards cover a huge range of activities covering industries from technology to food safety to agriculture and healthcare. ISO

has developed over 25000 International Standards and has 825 Technical committees and subcommittees to take care of standards development.

The Advantages of having ISO Standards:

- 1) Help businesses of any size and sector to reduce costs, increase productivity and access new markets
- 2) Development of national and international regulation
- 3) Reduce barriers to international trade
- 4) Creating a Continuous cycle of self-evaluation & correction

PDCA CYCLE

PDCA (Plan-Do-Check-Act) Cycle can be applied to all processes and management system standards as a whole.

It is a business methodology focusing on continuous improvement. Originally developed by Dr. W. Edwards Deming, the PDCA cycle is also known as the Deming cycle. It acts as a guiding principle for organizations to achieve ongoing growth and success.

The four steps in PDCA Cycle include:

1. **Plan** : Set objectives and build processes necessary to deliver results
2. **Do**: Implement what was planned
3. **Check**: Monitor and measure processes and results against the objectives
4. **Act**: Take actions to improve results

PDCA Approach helps organisations in systematically planning, executing, evaluating and refining processes to enhance efficiency and continuously improve the performance of an organization.

STRUCTURE OF ISO STANDARDS

High Level Structure (HLS) is a common structure established for all Management System Standards that are framed by the International Organization for Standardization (ISO).

The High-Level Structure or HLS is a set of 10 clauses as below:

- 1) Scope
- 2) Normative references
- 3) Terms and definitions
- 4) Context of the organization
- 5) Leadership
- 6) Planning
- 7) Support

- 8) Operation
- 9) Performance evaluation
- 10) Improvement

The advantage of HLS is that all ISO standards have a uniform set of clauses which helps in greater integration of multiple standards within one organization and they are easier to read and understand.

Integrated Steel Plants in SAIL are certified to the following ISO Standards (Either all or a selected few):

- ISO 9001:2015 Quality Management System(QMS)
- ISO 14001:2015 Environmental Management System(EMS)
- ISO 45001:2018 Occupational Health & Safety Management System(OHSMS)
- ISO 50001:2018 Energy Management System(EnMS)
- ISO 27001:2013 Information Security Management System(ISMS)
- ISO 37001:2016 Anti-Bribery Management System (ABMS)

Important Non-ISO Standards adopted by SAIL integrated plants include:

- SA 8000:2014 - Social Accountability Standard established by Social Accountability International (SAI). It is a framework for organizations of all types to conduct business in a way that is fair for workers and which demonstrates their adherence to the highest social standards.
- CE Mark Certification - Required for Exporting products to the European Market.

Implementing ISO Standards involves audits by external certification bodies. Recertification audits are held every three years and surveillance audits are organised annually.

14.3 QUALITY CIRCLES (QC)

Quality Circles are an effective way to improve quality and productivity through participation of the employees within the organisations. A Quality Circle is a small group of employees (4-6) who volunteer to help in solving departmental problems with limited resources. This small group utilizes the QC concept and techniques, display their creativity for self and mutual development. The various benefits from QCs include personality development, positive work environment, increased productivity, team spirit and cohesiveness.

The concept of quality circles first originated in Japan in the early 1960s, following a post-war reconstruction period during which the Japanese placed a great deal of emphasis on improving and perfecting their quality control techniques. As a direct result of work carried out to train foremen during that period, the first quality circles were conceived and the first three circles registered with the Japanese Union of Scientists and Engineers (JUSE) in 1962. In India, the concept of quality circles has

taken nearly twenty years to reach India after its birth in Japan in 1962. The Bharat Heavy Electrical Limited (BHEL) was the first to launch quality circles in 1980.

The Twelve Steps of Problem Solving in QC are:

- Step 1- Identification of Problem
- Step 2- Selection of Problem
- Step 3- Define the Problem
- Step 4- Analysis of the Problem
- Step 5- Identification of Causes
- Step 6- Finding out root Causes
- Step 7- Data Analysis
- Step 8- Developing Solution
- Step 9- Foreseeing Probable Resistance
- Step 10- Trial Implementation and Check Performance
- Step 11- Regular Implementation
- Step 12- Follow up Review

Quality Circles use various problem solving techniques viz: Flow Diagram, Brainstorming, Data Collection, Graphs, Stratification, Pareto Diagram, Cause & Effect Diagram, Scatter Diagram, Histogram and Control Charts in above stated 12 Steps for solving work related problems.

All integrated steel plants in SAIL have active QCs that have brought laurels for the company at National level(NCQC – National Convention on Quality Concepts) & International level(ICQCC - International Convention on Quality Control Circles) competitions
