



# ***Unit Specific Manual For Selection of Junior Officers***



**STEEL AUTHORITY OF INDIA LIMITED  
CENTRE FOR ENGINEERING & TECHNOLOGY**

(An ISO 9001:2015 certified unit of SAIL)



*There is a little bit of SAIL in everybody's life*

**This document has been prepared for SAIL by:**

**Centre for Engineering & Technology**

Tathagat Ghosh, CGM (Raw Materials, Refractory, BE, C&C and IPSS), CET, Ranchi

Abhaya Kumar, GM & HoD (BE & IPSS), CET, Ranchi

Suman Kalyan, Senior Manager (P&A), CET, Ranchi

Assistance from:

Shyama Prasad Das, GM & I/c (Projects-PFC), CET, Ranchi

Brij Kishore Singh, Senior Manager (Finance), CET, Ranchi

Document Identification  
No.

CET/16/RN/PERS/JO  
MANUAL/2024/R=0

*Disclaimer*

*This document is the property of CET and is exclusively for the use of the intended client. This document has been prepared based on the inputs provided by the client. No part of this report shall be reproduced or transmitted in any form whatsoever without the written permission from the owner.*



*There is a little bit of SAIL in everybody's life*

## CONTENTS – CHAPTERS

Chapter no.	Description	Page no.
1	Introduction	1.1
2	Growth	2.1-2.2
3	Vision & values	3.1
4	Human resource	4.1
	Range of services offered	4.1
5	Team working and task forces	5.1-5.2
6	Deliverables	6.1-6.2
7	Quality management system	7.1-7.2
8	Organization structure	8.1
9	Roles and functions of various division	9.1
10	Revenue expenditure	10.1
11	Major projects handled	11.1-11.5
12	Thrust areas	12.1-12.2
13	Future of CET	13.1



सेल SAIL

*There is a little bit of SAIL in everybody's life*



## 1 Introduction

Centre for Engineering & Technology (CET) is the in-house, engineering & technology consultancy unit of Steel Authority of India Limited (SAIL). Formation of CET was approved by SAIL Board in its 83<sup>rd</sup> meeting held on 28<sup>th</sup> January, 1982. SAIL Board envisaged following major objectives for CET:

- 1) Formulation of schemes for capital expenditure based on long-term plan of Corporate Planning
- 2) Preparation of feasibility reports (FR) for investment plans complete with technical & techno-economics for arriving at investment decision
- 3) Assist Plants/ Units to formulate investment proposals
- 4) Preparation of detailed project reports (DPR)
- 5) Extend assistance to Plants/ Units on engineering & technical matters
- 6) Facilitate designer's supervision at the time of execution of projects

CET started functioning with its head office at New Delhi in 1983. Subsequently, it was decided to set up sub-centres at Integrated Steel Plant locations for more effectiveness & prompt services. Accordingly, CET sub-centres were set-up at Bhilai & Bokaro in 1986 and Durgapur & Rourkela in 1987.

In 1987, head office of CET was shifted from New Delhi to Ranchi. CET presently has sub-centres at Bhilai, Rourkela, Bokaro, Burnpur and Durgapur.



सेल SAIL

*There is a little bit of SAIL in everybody's life*

## 2 Growth

CET has grown steadily in phases. From initial stage of preparing study reports (SR), CET developed as a full-fledged consultancy organization.

In 1992 SAIL Management chalked out a greater role for CET and issued fresh guidelines for extending CET's services/ involvement in following areas:

- 1) AMR schemes to be engineered by CET
- 2) Projects for modernization/ technology up-gradation/ expansion are to be undertaken by CET/ external Consultant with involvement of CET

In early '90s, CET was identified as nodal agency for technological decisions on acquisition of technology in a systematic & judicious manner.

Accordingly, CET had acquired following technologies:

Sl. no.	Technology acquired	Year
1	<b>Hot blast technology (Hoogovens technical services, Netherlands)</b> for supply of hot blast at high temperature (upto 1250 <sup>0</sup> C) to blast furnaces	1986
2	<b>Bell less top (BLT) charging system (Paul Wurth SA, Luxembourg)</b> for better distribution of raw materials in blast furnaces for efficient use of gas	1987
3	<b>Ceramic welding technology (FOSBEL, UK)</b> for hot repair of coke Ovens	1988
4	<b>INBA cast house slag granulation technology (Paul Wurth SA, Luxembourg)</b> to avoid use of slag ladles/ granulation of liquid slag in BF cast house	1989

Over the years, CET has been involved in brown-field & green-field projects of SAIL Plants Units. In this regard CET had exhibited its in-house consultancy & engineering capability in 1995, when hot metal was tapped from indigenous 530m<sup>3</sup> mini blast furnace in Vishakhapatnam Iron & Steel Plant (VISP), Bhadravati. One of the major achievements of CET in past was successful commissioning of coke ovens battery-8, Bokaro Steel Plant (BSL) and rebuilding of coke ovens battery-6, Bhilai Steel Plant (BSP) where CET had provided consultancy from concept to commissioning in non-turkey mode.

CET has handled wide spectrum of projects ranging from raw material handling, coke ovens battery rebuilding, sinter plants, INBA cast house slag granulation plants, slab casters, CDI units, BLTs in BFs, reheating furnaces in rolling mills, modernization of rail & structural mill including long rail project, etc.



सेल SAIL

*There is a little bit of SAIL in everybody's life*

Today, CET is geared up to meet challenges ahead from raw materials to finishing mills.

With strategic significant projects in CET's basket today, SAIL management has exhibited its trust in CET's competence & commitment: entrusted

- 1) Beneficiation & pelletization plant at Dalli mines, revamping of roughing & finishing stand of Plate Mill, installation of refinishing complex in URM, replacement of EoT cranes in BBM dispatch yard, enhancement of roll turning capacity in Universal Rail Mill (URM), rebuilding of coke oven batteries 7&8 projects of Bhilai Steel Plant (BSP)
- 2) New 4<sup>th</sup> Caster in SMS-II, alternative mixed gas pipeline to CPP-I, new SMS-III projects of Rourkela Steel Plant (RSP)
- 3) Plant wide data network, up-gradation of automation of finishing mill of HSM, augmentation of power supply for new 2000 TPD oxygen plant projects of BSL
- 4) Power augmentation scheme for new oxygen plant, NDT facility for wheels, reverse osmosis (RO) plant for make-up boiler feed water at power plant, new gas booster house for rolling mills in Durgapur Steel Plant (DSP)
- 5) New 4<sup>th</sup> hot blast stove at BF5, new barrel reclaimer, OHP, RMHP, new steam pipe line, PBS2 to COB10 in IISCO Steel Plant (ISP)

Overview of project proposals of SAIL Plants/ Units being handled by CET (as in March' 2024) is placed below:

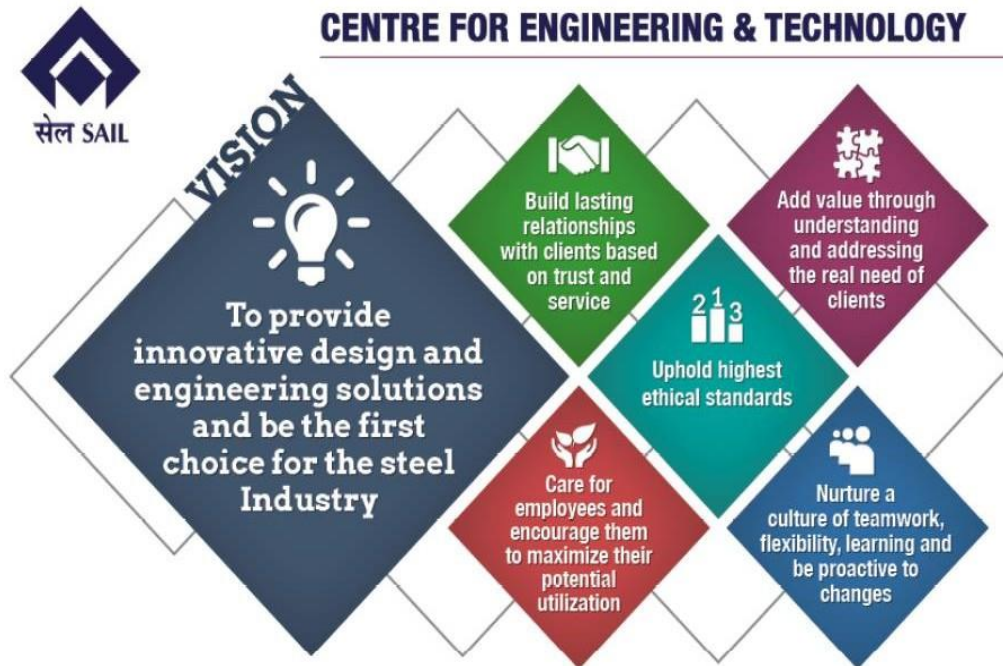
Sl. no.	Category	No. of assignments	Value (Rs, crore)
1	Under implementation (stage-II approved)	181	6,989
2	Under tendering (stage I approved)	98	10,227
3	Under consideration (FR finalized with Plants/ Units)	230	25,676
4	Under formulation	23	6,710
<b>Total</b>		<b>525</b>	<b>49,601</b>



सेल SAIL

There is a little bit of SAIL in everybody's life

### 3 Vision & Values

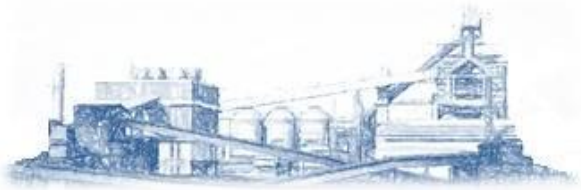


#### Vision of CET

To provide innovative design & engineering solutions and be the first choice for the steel industry

#### Values

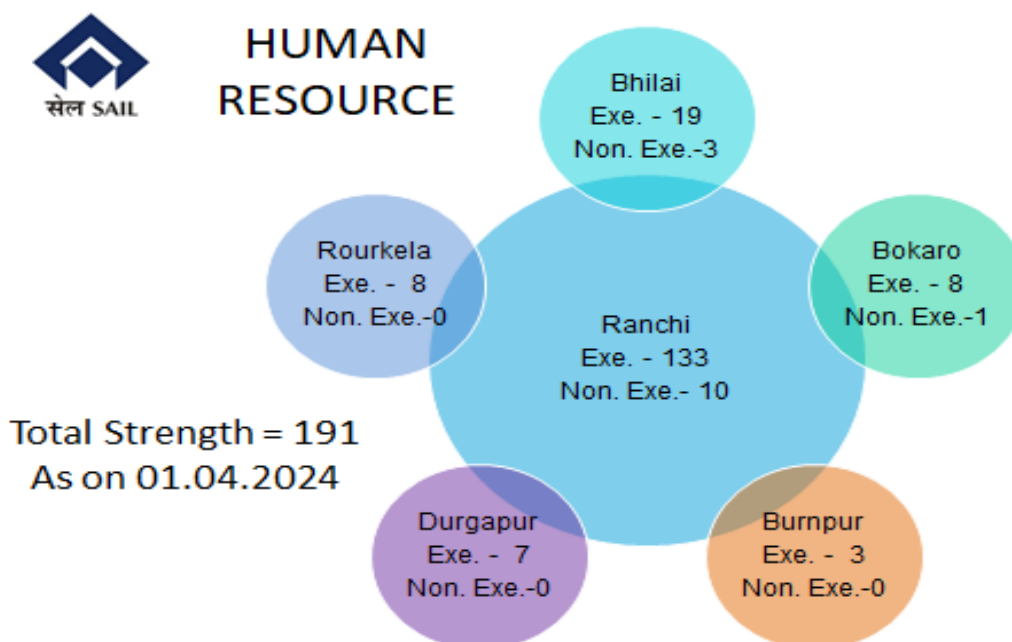
- 1) Build lasting relationships with clients based on trust and service
- 2) Care for employees and encourage them to maximize their potential utilization
- 3) Uphold highest ethical standards
- 4) Add value through understanding and addressing the real need of clients
- 5) Nurture a culture of teamwork, flexibility, learning and be proactive to changes



सेल SAIL

There is a little bit of SAIL in everybody's life

## 4 Human Resource



### Range of services offered

Following services are rendered to its customers (SAIL Plants/ Units) by CET:

- 1) Preparation of feasibility reports (FR)/ detailed project report (DPR) including basic/ detailed engineering (BE/ DE) to take investment decisions
- 2) Preparation of mining plans
- 3) Preparation of drawings
- 4) Preparation of draft investment proposals (board note)
- 5) Preparation of tender evaluation report (TER)
- 6) Preparation of technical note (TN), scheme, study report (SR), tender specifications (TS), tender document (TD) and expression of interest EoI
- 7) Approval of contractors' drawings
- 8) Facilitate designer's supervision during erection & commissioning
- 9) Facilitate post commissioning services
- 10) Formulation & implementation of IPSS standards





सेल SAIL

*There is a little bit of SAIL in everybody's life*

## 5 Team working through task forces

The essence & strength of CET lies in team working. Basic building block of CET's deliverables is quintessential "Task Force", formed specifically for every project.

### Task Force

Majority of the assignments received from customers are multi-disciplinary, hence to attend them, a task force (TF) comprising members from different domains (technology, engineering, services sections and sub-centres) is constituted. Member of task force is also referred as TFM.

### Task Force Leader

Each task force has a task force leader (TFL) who is generally from the Leader section termed as lead section (LS).

TFL has the responsibility and authority for:

- 1) Completion of all activities as per committed (activity) schedule
- 2) Fulfilling quality objectives by TFMs in their respective domain
- 3) Keeping head of lead section (LS) periodically informed of status

The TF (TFL & TFMs) has the responsibility and authority for:

- 1) Planning activities for each specific assignment, collecting data/documents, interacting with customer, preparing documents as per the commitment made on the assignment
- 2) Fulfilling quality objectives
- 3) Keeping concerned head of sections informed of status

### Working methodology on Projects

Assignments are received from SAIL Plants/ Units (customer) at respective sub centers of CET, from where they are forwarded to Projects (PFC) section, CET Ranchi. PFC section consults the requirement of customers with concerned (technology, engineering) section(s). Subsequently the assignment is placed & discussed in the forum of ED, CET for acceptance/ non-acceptance of assignment by CET. The formal letter conveying CET's decision on the assignment is sent to the customer.



सेल SAIL

*There is a little bit of SAIL in everybody's life*

Once an assignment is accepted, a TF is formed and TFL/TFMs are nominated. The TFL discusses the assignment with TF to workout various details and formulates the action plan for timely completion of the assignment. Supervision/ monitoring of work is done by the head of lead/ members sections at periodical intervals by way of review of progress/ work. Design review of all technical documents like report / specifications is done by way of presentation by TFL assisted by TFMs in presence of ED-CET, senior executives and head of sections. The reports and specifications are released to the customers after compliance of suggestions received in design review.

Procedures under CET's quality management system (QMS) are defined for acceptance of assignments, planning/ preparation of documents/ drawings. These procedures ensure fulfillment of quality objectives, requirements of the product, provision of resources, identification of responsibilities for various activities, necessary review/ verification specific to documents/ drawings. Appropriate records are maintained as records to establish/ ascertain that documents/ drawings have been prepared in line with laid down procedure of CET-QMS.

## 6 Deliverables

CET provides following services for iron & steel making process comprising selection of technology, engineering, process control & automation, & environmental aspects:

1) **Approach note (AN)**

In this document approaches/ alternatives to achieve given target or specific parameters are brought in along-with indicative block costs. The document assists management to take further action on the requirement.

2) **Feasibility report (FR)**

This document aims to explore possible alternatives to meet the requirement. It provides adequate information to client for taking future action on the requirement. It is a basic document to obtain approval of competent authority. FR comprises upshot of the proposal with Summary, Background, Selection of alternatives, Project description, Implementation schedule & strategy, Capital cost & financial analysis and recommendations chapters.

3) **Scheme (SC)**

4) **Study report (SR)**

5) **Technical note (TN)**

6) **Tender document (TD)**

7) **Expression of Interest (EoI)**

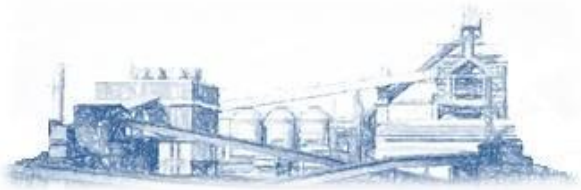
8) **Board note/ draft investment proposal (DIP)**

Sanction for a project is obtained in two stages:

**Stage I:** In-principle approval for 'go-ahead' of project proposal/ tendering

**Stage II:** Final approval for actual sanction & placement of order after finalization of bidder(s) for execution of work. Project proposals are sanctioned by sanctioning authority; CEO of Plant/ Unit, Chairman SAIL or Empowered committee of Directors and Board of Directors as per delegation of powers.

For obtaining approval for tendering (stage I) and sanction (stage-II) for to place order on the finalized bidder(s) after tender evaluation, DIP is prepared for the plant. Final investment proposal is submitted by plant to



सेल SAIL

*There is a little bit of SAIL in everybody's life*

the relevant approving/ sanctioning authority.

9) **Detailed project report** (DPR)

10) **Mining scheme/ plan** (MNP)

Mining scheme is a statutory document under rule-12 of mineral conservation and development rules (MCDR) 1988 of Gol. This document is to be submitted at every of five years and comprises mining plan for the forthcoming five years Indian Bureau of Mines (IBM) grants fresh mining lease/ renewal on the submitted mining scheme/ plan.

11) **Tender specification** (TS)

This document provides consolidated scope of work, supply & services of a project proposal and basic design parameters to the bidders for to prepare/ submit technical bids. It is a part of NIT (notice inviting tender) floated inviting bids.

12) **Ordering specification** (OS)

13) **Tender evaluation report** (TER)

This document analyzes/ compares technical offers and recommends technically accepted ones out of eligible bids identified from submitted bids against NIT.

14) **Price bid evaluation report** (PBER)

15) Drawings are integral part of majority documents of CET to customers. As per need, detailed engineering drawings are also provided.

## 7 Quality Management System

On 25<sup>th</sup> May 1994, CET had acquired ISO: 9001 certification for design, engineering & consultancy services to steel industry.

Quality management system (QMS) manuals of CET have been periodically reviewed & updated in the changing business scenario. Latest edition of CET QMS manual in compliance to ISO 9001:2015 was published on 5<sup>th</sup> March 2022. SAIL management has appointed TUV-NORD India Pvt Ltd. in 2023 for ISO certification of its Plants/ Units including QMS of CET.

Present QMS of CET is based on PDCA (Plan, do, check & act) approach comprising:

- 1) Understanding/ complying customers' requirements
- 2) Providing adequate resources
- 3) Treating every activity for fulfilling customer requirements as process
- 4) Monitoring of processes for analysis & control
- 5) Monitoring customer satisfaction by obtaining/ evaluating feedback from customers on services provided
- 6) Continual improvement in QMS based on analysis of data
- 7) Active involvement/ commitment of management to achieve organizational objectives as per QMS manual

QMS comprises:

- 1) Quality policy explaining quality intentions & directions of organization and specifies quality objectives to be achieved in measurable terms.
- 2) CET quality & procedure manuals and support QMS documents (internal/ external Issues, needs/ expectation of interested parties, opportunities & action plan, risk assessment & contingency plan)

### QUALITY POLICY OF CET

*"Rendering innovative & cost effective technical consultancy services with focus on environmental, social and governance (ESG) principles along with achieving customer satisfaction through continual improvement in terms of quality of deliverable services & timeline."*



सेल SAIL

*There is a little bit of SAIL in everybody's life*

### **सेट की गुणवत्ता नीति**

**“पर्यावरण, सामाजिक और शासन (ईएसजी) के सिद्धांतों को ध्यान में रखते हुये, नवाचार और लागत प्रभावी तकनीकी परामर्श सेवाओं के प्रतिपादन के साथ-साथ हमारी सेवाओं की गुणवत्ता और समय-सीमा के अनुपालन में निरंतर सुधार के माध्यम से ग्राहक संतुष्टि प्राप्त करना”**



## 8 Organization Structure

Chief of CET is the Executive Director with four functional domains; Technology, Engineering, Project and Services as stated below:

### Technology

- 1) Raw materials section
- 2) Coal, coke & chemical section
- 3) Iron & sinter section
- 4) Steel section
- 5) Rolling mills section
- 6) Refractory section

### Engineering

- 1) Mechanical section
- 2) Utilities section
- 3) Electrical section
- 4) Process control & automation section
- 5) Computerization & information technology section
- 6) Civil & structural section

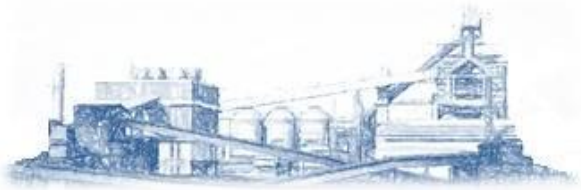
### Project

- 1) Project formulation & co-ordination section
- 2) Cost & techno-economics section
- 3) Business excellence section
- 4) IPSS secretariat

### Services Division

- 1) Contract & commercial section
- 2) Personnel & administration section
- 3) Finance section

To provide prompt services to clients, CET has sub-centers at Plant (Bhilai, Rourkela, Bokaro, Burnpur and Durgapur)



सेल SAIL

*There is a little bit of SAIL in everybody's life*

## 9 Roles and Functions of Domains

- 1) Detailed technical studies of schemes/ projects referred by Plants/ Units and Corporate Office
- 2) Preparation of FRs/ DPRs addressing technical/ technological & techno-economic aspects to enable Plants/ Units prepare investment proposals
- 3) Providing detailed engineering (DE) support, technical/ ordering specifications, assistance in evaluation/ finalization of tenders, designers supervision for implementing sanctioned schemes and proposals
- 4) Assisting Plants/ Units to clarify proposals at the time of scrutiny by appraising/approving authorities
- 5) Preparation of DE & investment proposals and co-ordinating implementation
- 6) Coordination of work with outside engineering and technical consultants
- 7) Identification of technology improvement measures along with RDCIS in Plant processes and plan for adoption of by acquiring design and know-how capability
- 8) Develop/ update company standards and co-ordination with national & interplant standardization organizations by IPSS secretariat





सेल SAIL

*There is a little bit of SAIL in everybody's life*

## 10 Revenue Expenditure

Revenue expenditure of CET in last ten years is stated below:

<b>Year</b>	<b>Revenue expenditure (Rs in crores)</b>	<b>Consultancy charges from Plants/ Units (notional earning) (Rs in crore)</b>
2013-14	48.98	46.36
2014-15	65.41	56.94
2015-16	73.48	72.77
2016-17	68.00	65.69
2017-18	63.00	60.31
2018-19	67.00	54.05
2019-20	68.00	57.49
2020-21	70.00	63.22
2021-22	88.00	74.60
2022-23	90.00	80.00



सेल SAIL

*There is a little bit of SAIL in everybody's life*

## 11 Major Projects Handled

### Commissioned during 2023-24

#### **Bhilai Steel Plant**

- 1) Provision of de-fuming system cast house, BF-7
- 2) Replacement of Russian makes vertical turbine pumps. PH-11, WMD
- 3) Installation of ultrasonic testing machine in short rail area, RSM
- 4) Slab weighing scale, Plate Mill

#### **Bokaro Steel Plant**

- 1) Modification of approved review-mining plan along with PMCP for Topailore lease, Gua Ore Mines (2023-24 to 2026-27)
- 2) Preparation of review-mining plan along with progressive mine closure plan in respect of Durgaiburu lease, Gua Ore Mines (2023-24 to 2026-27)
- 3) Revamping of five ESPs, RMP
- 4) Replacement of bottom charging, bell-less top & stove PLCs along with thyristorization of skip winch drive, BF-4

#### **Rourkela Steel Plant**

- 1) Replacement of electrics & automation, Galvanizing Line-1 & Pickling Line-2, CRM
- 2) Replacement of 33 kV Switchboard, CPP-1
- 3) Up-gradation of ETP

#### **Durgapur Steel Plant**

- 1) Refurbishment of 63/12 MN Press at Wheel & Axle Plant
- 2) Rebuilding of salt handling section in Ammonium Sulphate Plant, CCD
- 3) Installation of reverse Osmosis Plant for make-up boiler feed water, Power Plant
- 4) Installation of new 80 MVA transformer (MX-7) and 220 & 33kV bays, MRS
- 5) Installation of new gas booster house, Rolling Mills



## **Under Implementation**

### **Modification in washing circuit, CSW Plant, Dalli Mines, BSP**

Existing beneficiation facilities in CSW (crushing, screening & washing) plant is combination of washing of ore & classification of sinter fines through set of duplex spiral classifiers to get rid of -0.2 mm. Classification done by existing classifiers is not effective & unable to reduce silica load efficiently from sinter fines, hence target grade with respect to silica is not met.

Quality of balance reserves in Dalli mechanized, Dalli manual, Jharan Dalli & Mahamaya mine indicate Silica content in feed to CSW Plant at Dalli will increase in future. Hence, problem will aggravate in future and intervention for silica reduction is essential for efficient operation of existing/ new BF's of BSP. With reduction in silica in iron ore fines, quality material for BF-8 shall be ensured along with gainful utilization of high silicious (above 10%) ore available at Dalli, Jharandalli & Mahamaya mines. Further, there shall be mineral conservation & improvement in productivity & reduction of coke rate in BF's.

### **Installation of refinishing complex in URM, BSP**

Salvaging shorter length (13/ 26m) rails causes delay in evacuation due to increased cutting frequency in carbide saws & subsequent visual inspection. Further, when defects in rails increase due to rolling/ metallurgical reasons, generation of shorter length rails increases affecting production of finished rails. New refinishing complex is being installed to overcome the constraints.

### **Replacement of converters vessel, trunion ring & support system and secondary emission control for three converters, SMS-II, BSP**

SMS-II has three BOF's each of capacity 130t (max.). All three converters are of Russian make commissioned in 1984-85. DPR capacity of SMS-II is 1.5 Mtpa & 2.75 Mtpa was produced in 2013-14. Presently, converters are prone to breakdowns. It is proposed to replace all three converter vessels along with tilt drive system. Also it is proposed to install a centralized ESP based secondary emission control system for three converters to restrict work zone dust level to comply CPCB norms. To be commissioned in 31 months from stage II approval.

### **Rebuilding of Coke Oven Battery 6, BSL**

COB-6 is >35 years old and due for rebuilding. Considering poor health, hot



repairs were done in November 2014 to keep it running till COB-7 is commissioned. Production has been discontinued in December 2017 after COB-7 commissioning. COB 5 & 6 are twin batteries and share common facilities such as coal tower 3, upstream/ downstream facilities; coal tower, quenching tower, wharf, etc. Some of these common facilities will be replaced/ revamped during common shutdown after production is discontinued in COB-5 for cold repairs. Rebuilding of COB-6 is techno-economically viable & recommended for implementation along with cold repair of COB-5.

### **New Sinter Plant II, BSL**

Project comprises a new 360m<sup>2</sup>sinter plant, 450 tpd lime kiln and raw material handling package. Project is being implemented through four packages.

### **Installation of 2000 TPD Oxygen Plant (BOO basis)**

2000 tpd oxygen plant is being installed on BOO basis to cater to oxygen requirement of BSL along with existing 1250 tpd BOO plant. This will help to achieve production of 5.07 Mtpa of hot metal from 4 BFs operation only with higher oxygen enrichment (@5% except BF-2 with 6%) for 4.655 Mtpa crude steel. Total requirement of oxygen will be 116 TPD. Considering supply of 1250 tpd from existing BOO plant, balance will be met from proposed new plant.

### **Up-gradation of Automation, Finishing Mills, HSM, BSL**

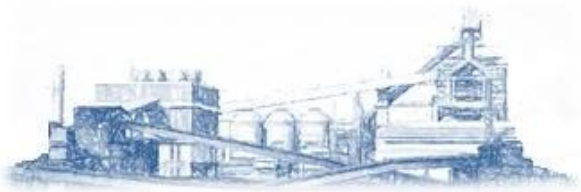
Existing automation system of finishing mill & coilers has become obsolete requires up-gradation to fulfill market demand of high quality HR coils. Proposed up-gradation is a step towards to state-of-the-art system.

### **Installation of Electrolysis Plant for supply of Hydrogen to CRM-III, BSL**

Project will ensure uninterrupted supply of H<sub>2</sub> to CRM-3, during maintenance work in existing H<sub>2</sub> Plant. Proposal comprises of supply & installation of 250 Nm<sup>3</sup>/h electrolysis based hydrogen generation plant, electrolyzer proper, auxiliary system (hydrogen & oxygen gas separators, coolers, moisture separators & driers, compressors & boosters, hydrogen gas purifiers, electrolyte station, electrolyte recirculation system pumps (1W+1S), etc)

### **Reconstruction of unused Stove 4, BSL**

Since commissioning of BF-2 stoves after reconstruction, BSL has been encountering various operational & maintenance problems. Hot blast



temperature available with existing stove is  $\sim 900^{\circ}\text{C}$  with average wind volume of  $\sim 240,000 \text{ Nm}^3/\text{h}$ . Lower HBT is due to poor health of stove dome & stove refractory. To repair/ reline existing three stoves, one after another, without resorting to 2 stove operation & consequent adverse techno-economic performance, reconstruction of unused stove 4 is a necessity.

### **Installation of 4<sup>th</sup> stove in Blast Furnace No. 5 of ISP**

BF-5 is the largest useful volume 4160 m<sup>3</sup> in SAIL. Being single BF, it is only source of hot metal production & BF gas generation. Three stoves of BF-5 are in operation since commissioning (Nov'14) and showing hot spots in various points and approaching mid-term repair. In case repair is taken one after another, BF-5 will be restricted to two-stoves operation, which will lead to lower operating hot blast temperature. This will lead to decrease in hot blast temperature, decrease in productivity, increase in coke rate in BF-5 with disability of coal dust injection which will adversely impact overall economics of hot metal production and production volume.

In order to avoid the above situation 4<sup>th</sup> stove in BF-5, is being installed to ensure three-stove operation during relining/ repair of existing stoves.

### **Blast Furnace Stove-4.3, DSP**

Stoves of BF-4 have outlived normal campaign life of 20 years, rebuilding of all three stoves is essential to facilitate BF operation with top pressure, 1.5 kg/cm<sup>2</sup>. Rebuilding of stove 4.3 has been taken up first and others' will follow.

### **On-line heat treatment furnaces in Wheel & Axle Plant, DSP**

Wheel & Axle Plant/DSP is in process of developing LHB wheels for which stringent heat treatment schedule is to be followed to achieve mechanical properties. Hence, installation of on-line heat treatment facility is a necessity.

### **4<sup>th</sup> Slab Caster and new LF in SMS-2, RSP**

Proposal aims to at bridge gap of  $\sim 0.6$  Mtpa cast slabs & enhance production to 3.7 Mtpa. Project scope includes new slab caster, ladle furnace & associated facilities in extended shed of SMS-2. Being implemented under single package.

### **Rebuilding of Coke Oven Battery 2 with coke sorting plant, RSP**

There are six top charged coke oven batteries (COB) in RSP. Hot metal production capacity of RSP has been increased from 2.45 Mtpa to 4.5 Mtpa



सेल SAIL

*There is a little bit of SAIL in everybody's life*

after commissioning of the new BF-5. To feed coke to BF-5, 7m tall COB-6 has been installed. Production in COB-2 was stopped in March 2016. Keeping in view of coke requirement in Plant, health issues of existing COBs & limited capital investment, proposal for rebuilding of COB-2 has been envisaged.



## 12 Thrust Areas

### **Mining, beneficiation and agglomeration**

SAIL has envisaged producing 50 Mtpa of crude steel by 2030. To attain this level of production, raw material security is indispensable. In future, CET will concentrate on technologies for selective mining, lean ore beneficiation and agglomeration of iron ore fines to charge in BF's. Projects undertaken by CET for Rowghat mines of BSP & mines of OGOM & JGOM are step in this direction. Focus will be use of green energy in steel making to reduce carbon footprint.

### **Introduction of stamp charge batteries/ rebuilding of Coke Oven Batteries**

Rebuilding of COBs is planned activity. While rebuilding, modern technologies such as stamp charging system, CDCP & other pollution control system will be introduced in old/ new batteries installed at RSP, ISP & BSL, it is expected that substantial reduction can be achieved in conversion of coal to coke in stamp charged batteries due to use of inferior grade coal.

### **Iron making and alternate iron making**

- 1) Apart from revamping of existing BF's, SAIL will adopt setting up 4000m<sup>3</sup> or more BF's with all modern facilities. CET will be associated with concept to commissioning of such BF's.
- 2) In order to conserve metallurgical coal, need was felt to utilize non-coking coal available in adequately for coal dust injection (CDI) at 150 kg/thm in BF's.
- 3) In present competitive market scenario, BF's need to be to produce at lower cost, which necessitates high campaign life, high productivity & low fuel rate. Up-gradation/ modernization of BF's have been accordingly planned.
- 4) In new installations, alternate iron-making technology; FINEX is being explored.
- 5) Green Iron & steel making technology for sustainable environment

### **Primary, secondary steel making and continuous casting facilities**

- 1) Introduction of dry gas cleaning system with energy recovery in new BOFs
- 2) Introduction of secondary emission system in old BOFs
- 3) Secondary refining of steel; ladle furnace, vacuum de-gassing & refining unit, etc., to produce ultra-clean steel/ improve properties of steel as per requirement of end product. CET has implemented such projects in SAIL Plants.



सेल SAIL

*There is a little bit of SAIL in everybody's life*

- 4) Modern continuous casting facilities such thin slab-casting, profile-casting, strip-casting and casting along with on-line rolling will be introduced in all Plants. Such projects have been formulated/ being implemented by CET.

### **Improvement in Finishing Facilities for Value Addition**

- 1) Meeting specific requirements of customer is of paramount importance in present steel scenario. Customers require various types, sizes & tolerances of steel products for specific & critical applications. Such requirements though, require additional facilities to be added but at the same time add value to the products and help increase in market share.
- 2) CET will be involved in technical solutions for balancing facilities for full utilization of potential capacity of existing facilities.

### **CET's role in De-carbonization**

Globally, transformation to green steel is under way & path to transformation requires key industry stakeholders (regulators, customers, investors, consultants, steel producers & policy makers) of Indian steel industry to work cohesively. In-line with this requirement for sustainable growth, SAIL is planning pathway for de-carbonization.

CET in its role of in-house consultant has an important role to facilitate SAIL management/ Plants in selection of latest implementable technologies in areas of energy optimization as well as reduction in carbon footprint. Accordingly CET is selecting more environment friendly technologies wherever feasible in new projects. Further, CET is also indicating quantum of CO<sub>2</sub> emission in its Feasibility reports to apprise SAIL management regarding environment friendliness of the projects.

CET is also member of committee formulating decarbonization roadmap of SAIL





सेल SAIL

*There is a little bit of SAIL in everybody's life*

## 13 FUTURE OF CET

CET, by virtue of handling projects of both AMR and greenfield ones, is geared up to take up projects in forthcoming modernization of SAIL Plants/ Units with special focus on clean technologies which will step-up productivity while reducing specific energy consumption.